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Conservation Energy Management on Fatigue in Hemodialysis Patients: A Literature Review

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Abstract

Background: Fatigue is a frequent complaint experienced by patients undergoing hemodialysis, potentially reducing their participation in daily activities. Conservation energy management is proposed as an effective approach to reduce fatigue in hemodialysis patients.

Objective: This study aimed to evaluate the effect of conservation energy management on fatigue in hemodialysis patients through a literature review.

Methods: This article is a literature review of research articles selected through searching three electronic databases, namely Science Direct, Wiley, and PubMed. The keywords used included 'conservation energy management', 'fatigue', and 'hemodialysis'. Inclusion criteria were English-language articles published within the last five years, focusing on quantitative research, involving adult samples, relevant full-text articles, and original articles.

Results: There were five articles that met the inclusion criteria. The findings showed that a conservation energy management program can reduce fatigue and improve quality of life in patients undergoing hemodialysis.

Conclusion: This study found that conservation energy management can be effective in reducing fatigue in hemodialysis patients.

Keywords: Conservation Energy Management, Fatigue, Hemodialysis

INTRODUCTION

Chronic kidney disease (CKD) is an increasing global health problem, and hemodialysis is the primary therapy for patients with end-stage renal disease (ESRD) (1). Hemodialysis, although essential for patient survival, is often accompanied by various complications that impair quality of life, one of which is fatigue (2). Fatigue in hemodialysis patients not only causes a decrease in energy and vitality but also impacts the patient's ability to participate in daily activities, interact socially, and maintain optimal mental and physical health (3).

Fatigue in patients undergoing hemodialysis is a multidimensional phenomenon caused by a combination of physiological, psychological, and social factors (4). Factors such as uremic toxin accumulation, anemia, malnutrition, and chronic inflammation can exacerbate fatigue. On the other hand, emotional instability, anxiety, depression, and limited social support also play an important role in aggravating this condition (5). Given the complexity of the causes of fatigue, a comprehensive management approach is necessary to improve the quality of life of patients (6).

Conservation energy management is one of the intervention approaches that is gaining attention in addressing fatigue in hemodialysis patients (7). This approach aims to help patients manage and utilize

their energy more efficiently, so that they can carry out their daily activities without experiencing excessive fatigue. The intervention involves educating patients on energy-saving techniques, scheduling activities, and providing advice on adequate rest and stress management (8).

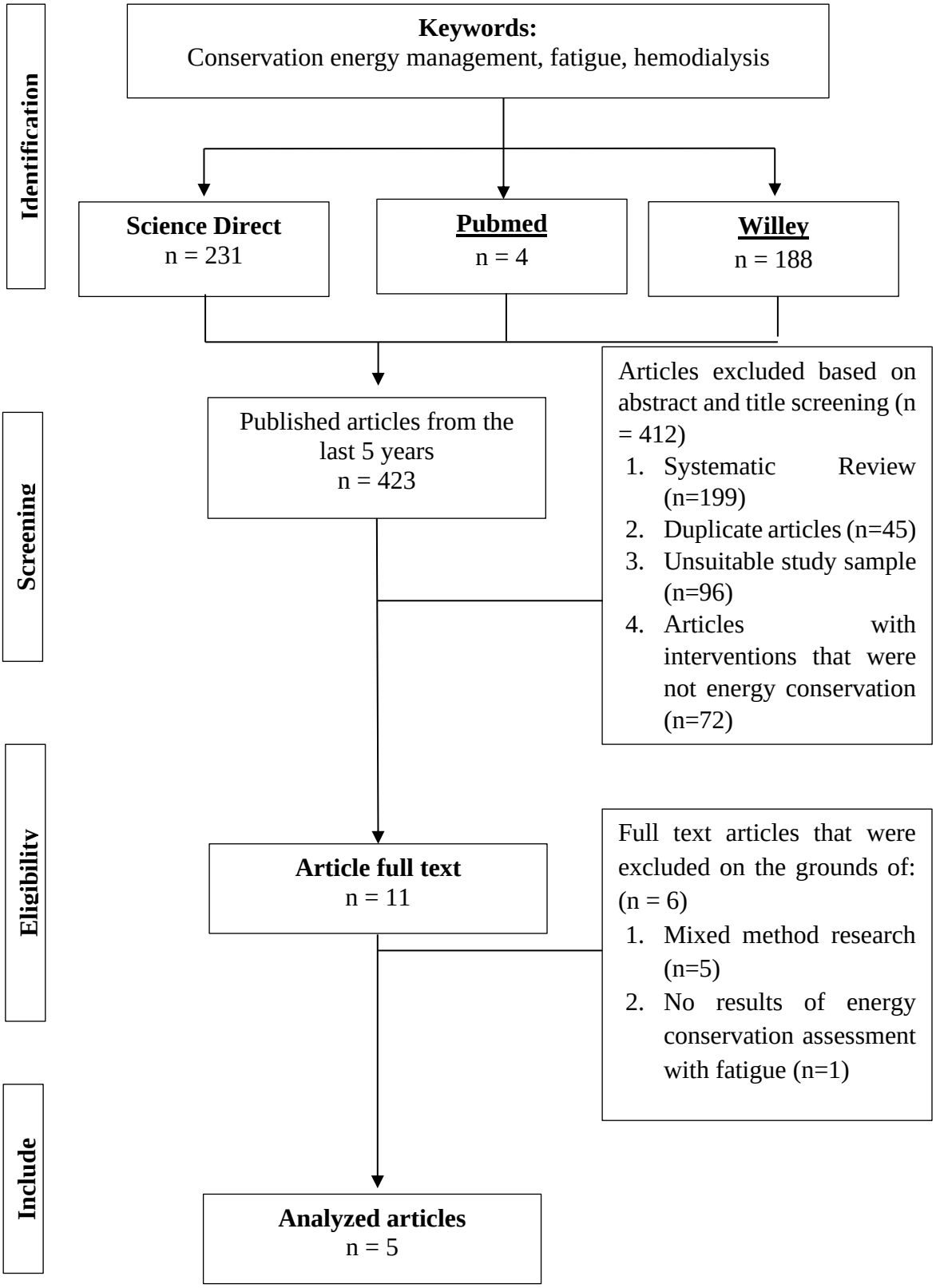
OBJECTIVE

This study aims to evaluate the effect of conservation energy management on fatigue in hemodialysis patients through a literature review.

METHODS

This article is a literature review that summarizes and analyzes the results of related research articles. The literature search was conducted using three major electronic databases: Science Direct, Wiley, and PubMed, using the keywords "conservation energy management" AND "fatigue" AND "hemodialysis". The search was conducted following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol and involved selecting articles based on predefined inclusion criteria. The article search period lasted from January to June 2024. The inclusion criteria in the literature search were as follows: (1) freely accessible English-language articles published within the last five years (2019-2024), (2) studies involving hemodialysis patients, (3) articles using quantitative research methods, (4) articles in full text, and (5) articles that were relevant and original research. The exclusion criteria included articles that did not have a full structure, articles in the form of systematic/literature reviews, and articles with qualitative research methods.

From the search, a total of 1,262 articles were found, with 231 articles from the Science Direct database, 4 articles from the PubMed database, and 188 articles from Wiley. After initial screening of 423 articles based on the exclusion criteria, 412 articles were eliminated because they did not meet the inclusion criteria. Further screening of the remaining 11 articles resulted in 5 articles that met all inclusion criteria and were ready for further analysis.


Identification
Keywords:
Conservation energy management, fatigue, hemodialysis
Science Direct
n = 231
Pubmed
n = 4
Willey
n = 188
Screening
Published articles from the last 5 years
n = 423
Articles excluded based on abstract and title screening (n = 412)
1. Systematic Review (n=199)
2. Duplicate articles (n=45)
3. Unsuitable study sample (n=96)
4. Articles with interventions that were not energy conservation (n=72)
Eligibility
Article full text
n = 11
Full text articles that were excluded on the grounds of: (n = 6)
1. Mixed method research (n=5)
2. No results of energy conservation assessment with fatigue (n=1)
Include
Analyzed articles
n = 5

RESULTS

Table 1. Journal Extraction

No	Title, Author, Year	Objective	Methods	Results	Conclusion
1.	A pilot randomised controlled trial of an energy management programme for adults on maintenance haemodialysis: the fatigue-HD study Janine F Farragher, Pietro Ravani, Braden Manns, Meghan Elliott, Chandra Thomas, Maoliosa Donald, Nancy Verdin, Brenda R Hemmelgarn 2022	To evaluate the feasibility of conducting a randomized controlled trial (RCT) of an energy management program for patients undergoing maintenance hemodialysis. Secondary objectives are to estimate the effects of the program on various aspects of fatigue and life participation.	Study design: Randomized controlled trial (RCT) with two parallel groups. Sample size: 30 participants undergoing maintenance hemodialysis recruited from six dialysis units in Calgary, Canada Sample selection: simple random sampling Inclusion criteria: 1. Patients undergoing maintenance hemodialysis 2. Clinically stable 3. Reported bothersome fatigue Exclusion criteria: 1. Patients who do not speak English 2. Patients who are clinically or cognitively unstable 3. Patients who plan to stop hemodialysis in six months 4. Patients who lived in long-term care facilities or had visual impairment that	1. Of the 253 patients screened, 159 patients were eligible and 42 patients gave informed consent to participate. 2. 30 patients met the eligibility criteria and were randomized (mean age 62.4 years, 60% male) 3. 22 participants completed all study procedures 4. The intervention program showed moderate effects on several measures of life participation and satisfaction at one week after the intervention	Energy management programs can improve patients' life participation although the direct effect on fatigue may not be very large

			precluded participation in the study. Instruments: 1. Canadian Occupational Performance Measure (COPM) to assess life participation performance and satisfaction 2. Fatigue Severity Scale (FSS) to assess fatigue severity 3. Fatigue Management Questionnaire (FMQ) to assess fatigue management 4. Modified Fatigue Impact Scale (MFIS) to assess the impact of fatigue on physical, cognitive, and psychosocial functioning Type of Intervention: Energy management program called Personal Energy Planning (PEP) to help patients manage fatigue	and large effects at 12 weeks after the intervention compared to the control group	
2.	Energy conservation education intervention for people with end-stage kidney disease	Evaluating the effectiveness of an energy conservation	Study design: Pragmatic cluster randomized control trial with repeated measures	1. Participants who re-ceived the energy con-servation	An energy conservation education program is effective in

	receiving haemodialysis (EVEREST): protocol for a cluster randomised control trial Sita Sharma, Kimberly E Alexander, Theresa Green, Min-Lin (Winnie) Wu, Ann Bonner 2021	education intervention for people with end-stage renal disease receiving hemodialysis	Sample size: 126 participants from a tertiary level dialysis center Sample selection: Participants will be randomized into intervention and control groups based on their hemodialysis treatment days. Inclusion criteria: Participants diagnosed with renal failure, undergoing hemodialysis for ≥3 months, aged 18 years and above, able to speak and understand Nepali, and willing to participate. Exclusion criteria: Participants with early-stage CKD, not dependent on hemodialysis, acutely ill, diagnosed with cognitive impairment, or unwilling to participate. Instruments: 1. Fatigue Symptom Inventory to measure fatigue 2. Integrated Palliative Outcome Scale renal (IPOS-renal) to measure other CKD symptoms 3. Nepalese version of the Canadian	education program experienced a significant reduction in the severity and frequency of fatigue compared to the control group. This suggests that energy conservation education is effective in reducing fatigue symptoms in HD patients. 2. Participants reported significant improvements in their job performance and satisfaction. This means that energy conservation strategies helped them in organizing and completing daily tasks more efficiently 3. There was a significant	reducing fatigue reducing other CKD symptoms improving job performance and improving health-related quality of life in patients with end-stage renal disease undergoing hemodialysis

			Occupational Performance Measure (COPM) to measure occupational performance 4. Nepalese version of SF-36 questionnaire to measure health-related quality of life	improve-ment in health-re-lated quality of life, in-cluding physical, psychologi-cal, and so-cial aspects. Participants felt more able to man-age their symptoms and live their daily lives better 4. In addition to fatigue, participants also re-ported a de-crease in other symp-toms of CKD, sug-gesting that energy con-servation education helps in managing the various symptoms associated with CKD	
3.	Effect of Educational Program on Energy Conservation during Daily Activities Living among Renal Failure Patients	Evaluating the effectiveness of educational programs in	Research design: Quasi-experimental with pretest and posttest in one group. Sample size: 50 renal failure patients	The results showed that there was a sig-nificant in-crease in knowledge and	An educational program on energy conservation is effective in

	Undergoing Hemodialysis Mariam I. El Shafaey, Monera B. El-Shemy, Kmal O. Okasha Kma, dan Shaimaa A. Khalil 2023	saving energy during daily activities in patients with kidney failure undergoing hemodialysis	undergoing hemodialysis Sample selection: purposive sampling Inclusion criteria: Patients with a diagnosis of chronic renal failure undergoing hemodialysis, aged between 18 and 65 years, and willing to participate in the educational program. Exclusion criteria: Patients with severe comorbidities or unstable mental health conditions that may affect participation in the education program.	application of energy conservation techniques during daily activities in patients after participating in the education program. This improvement was measured through pretest and posttest using questionnaires and observation sheets. Patients showed a better understanding of the importance of conserving energy and were able to apply the learned techniques in their daily activities, such as organizing breaks and using assistive devices	improving knowledge and application of energy conservation techniques during daily activities in renal failure patients undergoing hemodialysis. This intervention can help patients manage the fatigue often experienced due to their disease and treatment, thereby improving their quality of life. It is recommended to integrate similar educational programs into routine care for hemodialysis patients to achieve better health outcomes
4.	The Energy Conservation Strategies Can Improve Self Care	Knowing the effect of implementing energy	Research design: quasi-experimental with pre-test and post-	1. The self-care management score before	There was a significant difference between the

	Management of Chronic Kidney Disease Patients with Hemodialysis Nieniek Ritianingsih, Nawati, Farial Nurhayati 2023	conservation strategies on self-care management of chronic kidney disease patients with hemodialysis in the intervention group and control group.	test control group approach. Sample size: 32 people in the intervention group and 32 people in the control group Sample selection: purposive sampling Inclusion criteria: Patients undergoing hemodialysis Exclusion criteria: Not specified Instrument: Hemodialysis Patients Self Care Measurement Scale.	intervention in the control group was 73.28 and in the intervention group was 76.19. 2. The value of self-care management after intervention in the control group was 73.13 and in the intervention group was 80.00 3. Statistical analysis showed that there was a significant difference between the value of self-care management in the control group and the intervention group after the application of energy conservation strategies	self-care management scores in the control group and the intervention group after the application of energy conservation strategies. This suggests that energy conservation strategies can improve self-care management in chronic kidney disease patients undergoing hemodialysis

				with a p-value of 0.010.	
5.	Occupational performance improved by an energy conservation education program: findings from a cluster randomised control trial. Sharma, Sita; Bonner, Ann; Wu, Min-Lin (Winnie); Alexander, Kimberly E.; Green, Theresa 2022	Assessing the effectiveness of an energy conservation education intervention for end-stage renal disease patients receiving hemodialysis (HD)	Study design: Cluster randomized controlled trial with repeated measures Sample size: 126 participants Sample selection: Participants from tertiary level dialysis centers will be cluster randomized into intervention and control groups based on HD treatment days. Inclusion criteria: 1. Diagnosed with renal failure and undergoing HD for ≥3 months 2. Age 18 years and above 3. Able to speak and understand Nepali 4. Willing to participate. Exclusion criteria: 1. Being in the early stages of chronic kidney disease or not dependent on HD 2. Acutely ill 3. Diagnosed with cognitive impairment 4. Not willing to participate Instruments:	1. Participants in the intervention group showed a significant reduction in fatigue severity and frequency compared to the control group. Measurements were taken using the Fatigue Symptom Inventory (FSI) at weeks 4, 8, and 12 2. Other CKD symptom scores also decreased significantly in the intervention group compared to the control group 3. Participants who received the energy conservation education intervention	An energy conservation education program is effective in reducing fatigue and improving health-related quality of life in patients with end-stage renal failure undergoing HD

			1. Fatigue Symptom Inventory (FSI): Measures the perceived severity, frequency, and interference of fatigue 2. Integrated Palliative Outcome Scale renal (IPOS-renal): Measures common symptoms in people with kidney disease 3. Canadian Occupational Performance Measure (COPM): Measures changes in occupational performance over time 4. SF-36: Measures health-related quality of life with eight subscales	showed significant improvements in occupational performance and satisfaction. 4. HRQoL measured using SF-36 showed significant improvement in the intervention group compared to the control group in several domains such as physical functioning, physical role, and emotional well-being.	

DISCUSSION

1. Effect of Conservation Energy Management on Fatigue

Conservation energy management is effective in reducing fatigue in hemodialysis patients (9). The intervention programs implemented in this study showed that participants undergoing conservation energy management experienced significant reductions in fatigue severity and frequency (10). Farragher et al. (2022) reported that an energy management program can reduce fatigue and improve life participation in patients undergoing hemodialysis (9). This finding is supported by Bossola et al. (2011) who found that energy management strategies helped patients better manage their fatigue symptoms (11). In addition, Jhamb et al. (2019) confirmed that fatigue reduction through energy management contributes to increased participation in daily activities and improved overall quality of life (12).

2. Improved Quality of Life

Conservation energy management focuses not only on reducing fatigue, but also on improving the quality of life of patients. Sharma et al. (2021) reported that participants in this program showed significant improvements in various aspects of quality of life, including physical, psychological, and social functioning (7). Education and intervention programs provide patients with the understanding and skills to manage their energy more effectively, which in turn improves their ability to cope with daily activities better (6, 13). Motzer and Hertig (2004) found that significant improvements in quality of life were achieved through structured interventions and ongoing support in energy management in hemodialysis patients (14). In addition, Barsevick et al. (2004) showed that energy management is effective in reducing fatigue and improving quality of life in cancer patients, which can be applied to the context of hemodialysis patients (15).

3. Program Implementation Strategy

Different approaches in implementing conservation energy management programs have been identified. Some studies used a randomized controlled trial (RCT) design with repeated measurements, while others used a quasi-experimental design with pretest and posttest. The results of these studies consistently show the effectiveness of conservation energy management in reducing fatigue and improving the quality of life of hemodialysis patients. Farragher et al. (2021) reported that a community-based intervention program for energy management in hemodialysis patients provided significant results in improving patients' quality of life (16). In addition, Farragher et al. (2020) found that an energy management program implemented in hemodialysis patients can improve physical performance and reduce fatigue (8).

4. Educational Intervention

Energy conservation education is an important component of a conservation energy management program (17). Educational interventions help patients understand the importance of saving energy and teach techniques that can be applied in daily life (7). Reza et al. (2022) showed that participants who received energy conservation education reported increased knowledge and skills in energy management, which had a positive impact on their well-being (10). This education includes knowledge on how to organize rest periods, use assistive devices, and apply other techniques to reduce fatigue. Energy management education programs can improve patients' self-efficacy in managing fatigue (6).

Overall, the findings from this literature review support that conservation energy management is an effective approach in reducing fatigue and improving quality of life in hemodialysis patients. Implementation of this program in clinical practice can help patients better manage their fatigue symptoms, increase participation in daily activities, and improve overall well-being. Therefore, it is recommended to integrate conservation energy management into routine care for hemodialysis patients to achieve optimal health outcomes.

CONCLUSIONS

The conclusion of this review suggests that conservation energy management interventions are effective in reducing fatigue and improving the quality of life of hemodialysis patients. The use of these interventions in clinical practice is recommended, with recommendations for further research focusing on optimizing and customizing conservation energy management programs according to individual patient needs.

CONFLICT OF INTEREST: The authors declare no potential conflicts of interest in connection with the research, authorship and/or publication of this article.

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