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Page 275-288

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IMPROVING SLEEP QUALITY IN STROKE AND CHRONIC KIDNEY DISEASE PATIENTS: A SYSTEMATIC REVIEW OF NON-PHARMACOLOGICAL INTERVENTIONS

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ABSTRACT
Sleep disturbances are common in patients with stroke and chronic kidney disease, potentially worsening health conditions and reducing quality of life. Non-pharmacological interventions have received less research attention, despite the potential for non-pharmacological approaches to improve sleep quality without causing side effects. This systematic review aimed to evaluate the effectiveness of non-pharmacological interventions in this population. Randomized controlled trials involving patients with stroke and chronic kidney disease aged >18 years were searched in seven English-language databases. Methodological quality was assessed using the JBI critical appraisal tool, and data were synthesized. 9 RCTs met inclusion criteria and demonstrated significant benefits. Cognitive Behavioral Therapy (4 studies) consistently improved sleep quality and reduced fatigue, anxiety, and depression ($p < 0.001$). Reflexology (2 studies) decreased anxiety and improved sleep quality ($p < 0.001$). Acupuncture significantly improved ISI, PSQI, and HADS scores ($p < 0.001$–0.003). Lavender aromatherapy reduced depression and improved sleep quality ($p < 0.001$), while spiritual care improved sleep quality and spiritual well-being ($p < 0.001$). These findings highlight the role of nurses in implementing non-pharmacological interventions to address sleep disturbances and related psychological symptoms in patients with stroke and chronic kidney disease. Cognitive Behavioral Therapy is recommended for patients with insomnia and psychological comorbidities, reflexology and massage may be beneficial for those undergoing hemodialysis, while acupuncture, aromatherapy, and spiritual care can be tailored to individual needs. Further research is needed to assess their long-term effectiveness and their integration into broader clinical practice.

Keywords: Chronic Kidney Disease; Sleep Disorders; Non-Pharmacological Interventions; Stroke

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INTRODUCTION

Sleep disorders are clinical conditions characterized by difficulty or decreased quality of sleep. These conditions may be influenced by factors such as sleep duration and timing, the ability to fall asleep and remain asleep, the distribution of sleep stages, and the degree of restoration or alertness upon awakening (Crowe & Spiro-Levitt, 2024). In individuals with chronic illnesses, sleep disorders are a complex and reciprocal problem, where the disease and sleep

disturbance mutually influence each other. Sleep disorders impact physical function (such as fatigue, dizziness, injury, and even death), psychological symptoms (anxiety, depression, and mania), and cognitive impairment (decreased memory, learning ability, and risk of dementia) (Chennaoui et al., 2020).

The American Academy of Sleep Medicine classifies sleep disorders into six main categories: insomnia, sleep-related breathing disorders, central hypersomnolence, circadian rhythm sleep-wake disorders, parasomnias, sleep-related movement disorders, and other sleep disorders (Bathgate & Edinger, 2019, as cited in Alsolami, 2024). Insomnia was recorded as the most prevalent sleep disorder, affecting 93.7% (n = 6,995,674) patients, with prevalence showing a tendency to increase with age and peaking in the 50–60 age group (Ahn et al., 2024). The increasing incidence of insomnia carries the risk of accelerating premature death and worsening various chronic diseases, such as stroke, chronic kidney failure, and mental disorders such as anxiety and depression, and can be both a cause and a consequence (Fatma, 2023).

In stroke patients, 84% of sleep disorders occur due to brain tissue damage and various other factors, such as changes in the sleep environment, physical and psychological stress, immobilization, fever, medication effects, pain, and systemic disorders that affect sleep patterns (Khazaei et al., 2022). The prevalence of insomnia in stroke patients was recorded at 40.7% in the acute phase, 42.6% in the subacute phase, and 35.9% in the chronic phase (Hasan et al., 2021). This condition not only reduces quality of life but can also exacerbate complications, negatively impact physical and mental health, hinder rehabilitation, and increase the risk of relapse (Cai et al., 2021). In addition to stroke, sleep disturbances are also common in kidney failure patients, especially those in end-stage renal disease (ESRD). Their causes are multifactorial, including physiological dysregulation (electrolyte imbalances, impaired melatonin secretion, uremic toxins, iron deficiency), psychosocial issues (depression, anxiety, sexual dysfunction), chronic pain, a sedentary lifestyle, thirst, and hemodialysis-related factors such as irregular schedules and napping during treatment (Göktuna & Arslan, 2024). One study revealed that 86.6% of hemodialysis patients experience sleep disturbances (Li et al., 2021).

There are two main approaches to managing sleep disturbances: pharmacological and non-pharmacological. Among pharmacological interventions, the use of benzodiazepines is not recommended as a treatment for post-stroke insomnia because it can worsen sleep-disordered breathing and re-trigger motor deficits (Cai et al., 2021). Antidepressants such as mianserin and zolpidem can help treat sleep disorders, with zolpidem reportedly potentially increasing the secretion of brain-derived neurotrophic factor (BDNF) and protecting neurovascular tissue. However, their use is also associated with an increased risk of stroke, dependence, falls in the elderly, and impulsive behavior disorders (Cai et al., 2021). Therefore, the use of hypnotics requires careful consideration of the risks and benefits. In kidney failure evidence of safety and efficacy is limited, and these medications carry a significant risk of interactions and side effects. They are generally indicated for short-term insomnia and long-term use is not recommended although it may be necessary in certain situations (Gopal et al., 2025).

To overcome the limitations of pharmacological therapy, non-pharmacological interventions are a safer and more reproducible alternative. A review by Chu et al. (2025), which analyzed 29 studies focusing on interventions to improve sleep disturbances in patients with kidney disease such as aromatherapy, muscle relaxation, music therapy, yoga, dialysis modifications, and nurse-led programs, showed promising effects in improving sleep quality. However, the available evidence is limited due to the small number of supporting studies, thus limiting the generalizability of the findings. Furthermore, the long-term effectiveness of these interventions is not fully understood and requires further research. Therefore, this study aims to evaluate the effectiveness of various non-pharmacological intervention strategies in addressing sleep disorders in stroke patients and chronic kidney disease patients undergoing hemodialysis, as a basis for developing evidence-based nursing practices.

METHODS

Study Design

This study is reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement (Page et al., 2021). The first step was to formulate a PICO with the research question being: Is cognitive behavioral therapy effective compared with other non-pharmacological interventions in improving sleep quality in adult patients with stroke and chronic kidney disease undergoing hemodialysis? The studies included in this review met the criteria for a Randomized Controlled Trial (RCT) focusing on non-pharmacological interventions to address sleep disturbances in patients with stroke and chronic kidney disease undergoing hemodialysis.

Search methods

A literature search was conducted from March to May 2025 in the PubMed, Scopus, Sage, Springer, ClinicalKey, ProQuest, and ScienceDirect databases. Keywords and synonyms were compiled using a Boolean search engine (AND, OR) to broaden and refine the search. Additional filters applied to all databases included publication year 2010-2025, English-language articles, and RCT study type. The following keywords were used in the literature search: ("stroke") AND ("chronic kidney disease" OR "CKD" OR "hemodialysis") AND ("non-pharmacological therapy" OR "complementary therapy" OR "behavioral intervention" OR "psychosocial intervention") AND ("sleep disorder" OR "sleep problem" OR "sleep disturbance" OR "sleep quality").

Inclusion and Exclusion Criteria

This literature review used the following inclusion criteria: (1) adult population (aged >18 years) with stroke and chronic kidney failure undergoing hemodialysis; (2) studies published from 2020 to 2025; (3) English-language articles; (4) quantitative studies with the Randomized Controlled Trials approach, because they have a high level of evidence, are able to assess causal relationships more validly, and reduce the risk of bias; (5) participants are male and female; and (6) articles are available in full text so that the quality assessment and data collection process can be carried out thoroughly. Meanwhile, the exclusion criteria include (1) studies with a population aged <18 years; (2) Articles that are not primary studies such as reviews, book chapters, conference abstracts; and irrelevant studies are excluded from further analysis.

Data Extraction

Data extraction was conducted systematically using a structured extraction form developed in accordance with the Joanna Briggs Institute (JBI) guidelines to ensure consistency, transparency, and methodological rigor. The extracted data included key study characteristics such as authors, year of publication, country of origin, study design (Randomized Controlled Trials), and sample size, as well as participant characteristics (age, clinical condition, and population group). In addition, detailed information on the interventions was collected, including the type of non-pharmacological intervention (e.g., Cognitive Behavioral Therapy, acupuncture, reflexology, aromatherapy, spiritual care), duration, frequency, and mode of delivery (face-to-face or digital). Outcome measures were also extracted, focusing on validated instruments assessing sleep quality and related psychological variables, such as the Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), and Hospital Anxiety and Depression Scale (HADS). The main findings of each study, including statistical significance, effect direction, and reported outcomes (sleep quality, fatigue, anxiety, depression, and quality of life), were systematically recorded. The extraction process was performed using predefined inclusion criteria and was cross-checked to minimize potential bias and ensure data accuracy. Given the heterogeneity in interventions, populations, and outcome measures, the extracted data were synthesized narratively to identify patterns, consistencies, and differences across studies

Quality Apprasial

This systematic review used the JBI Critical Appraisal of Randomized Controlled Trials (CRT) to assess the methodological quality of selected studies based on 13 criteria (Barker et al., 2023). Each question on the checklist was scored as "Yes," "No," or "Unclear," and results were categorized as good, fair, or poor quality. A total of 9 studies were assessed, with 6 being of good quality (≥11/13) and 3 being of fair quality (10/13). There were no low-quality studies. Fair-quality studies were included because they did not demonstrate significant potential bias. Sensitivity analyses demonstrated consistency of findings across categories, supporting the validity of the narrative synthesis. Details of the quality assessment results for each study are presented in Table 1. The results of these assessments were then used to inform the synthesis and interpretation of the research findings.

Table 1. Quality assessment of reviewed studies

Authors (years)	JBI Critical Appraisal Checklist for randomized Controlled trials	Quality Evaluation
Ymer Et Al. (2025)	84,6% (11/13)	good quality
Cao et al. (2022)	92,3% (12/13)	good quality
Pilon et al. (2023)	76,9% (10/13)	sufficient quality
Goktuna & Arslan (2024)	92,3% (12/13)	good quality
Yousofvand et al. (2023)	76,9% (10/13)	sufficient quality
Yin et al. (2024)	92,3% (12/13)	good quality
Fleming et al. (2024)	84,6% (11/13)	good quality
Chen et al. 2025)	84,6% (11/13)	good quality
Ghanbari et al. (2022)	76,9% (10/13)	sufficient quality

Note: good quality (100-80%), sufficient quality (79-50%), poor quality (<50%)

Data Analysis

The study selection process followed three main stages according to the PRISMA flowchart (Figure 1), including identification, screening, and inclusion. Study selection and data extraction were performed using a structured extraction sheet developed in accordance with JBI guidelines. To minimize bias, the extraction process was conducted systematically using pre-defined criteria, and all steps were cross-checked for accuracy. Given the substantial methodological and clinical heterogeneity across studies a narrative synthesis approach was applied. Included studies were categorized into two main population groups: patients with stroke or acquired brain injury and patients undergoing hemodialysis due to fundamental differences in the pathophysiology of sleep disorders and their potential response to non-pharmacological interventions. Studies were subsequently grouped by intervention type, and patterns of findings were examined based on effect direction and statistical significance.

The categorization of intervention effectiveness is described in Table 3 following the principles of JBI narrative synthesis, considering the consistency of results across studies, the strength of statistical significance, the durability of effects at follow-up, and the number of trials supporting each intervention type. This structured approach allows for critical comparisons across intervention modalities.

RESULTS

Search Outcome

Figure 1 displays the PRISMA flowchart. A total of 20,493 records were identified, of which 3,337 full-text articles were screened. After eligibility assessment and quality appraisal, 9 studies met the inclusion criteria and were included in the systematic review.

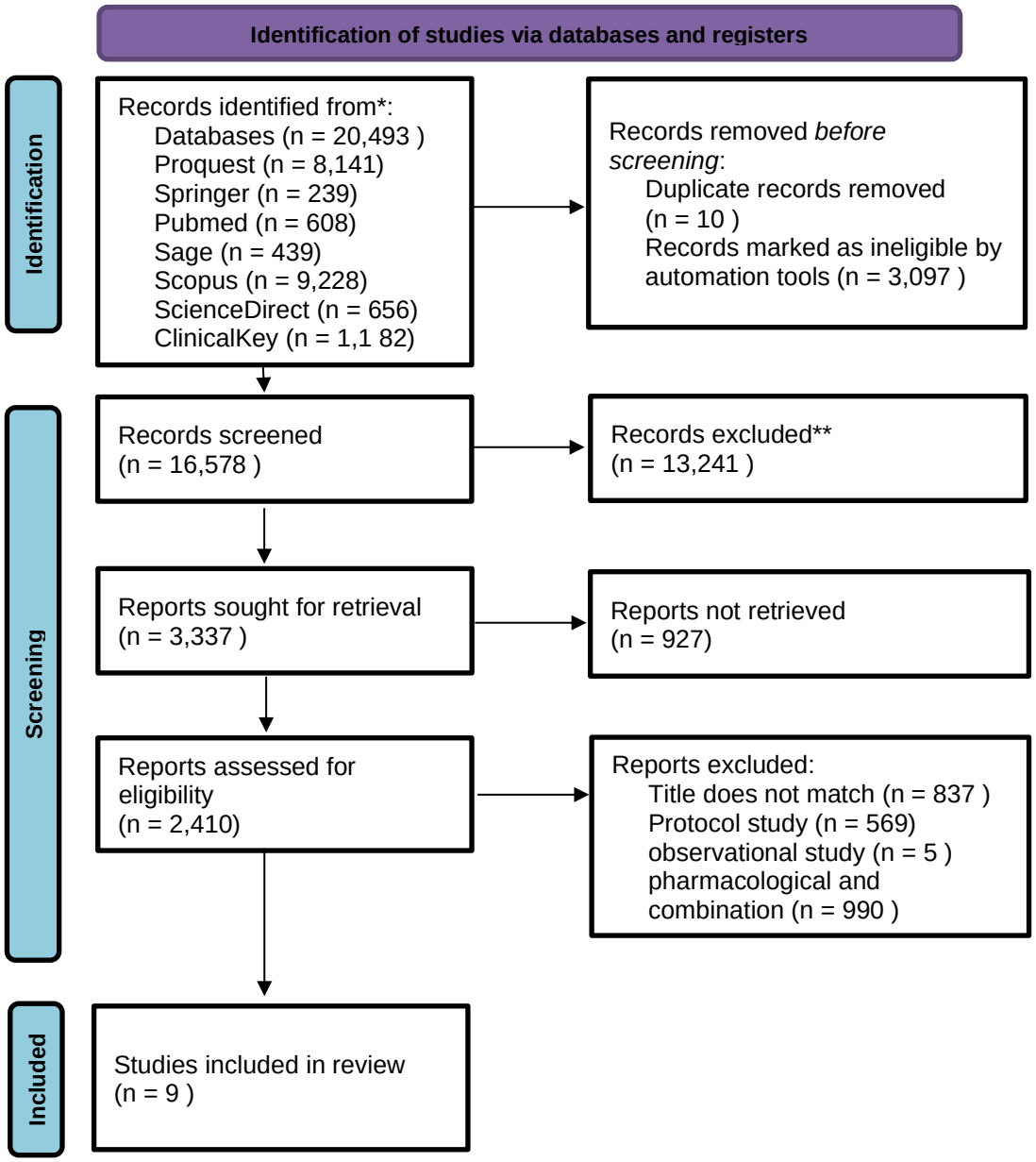

Figure 1. Prisma Flowchart

Quality Assessment Results

The 9 included RCTs investigated various non-pharmacological interventions for sleep disturbances in two populations: (1) 6 studies in individuals with stroke or acquired brain injury and (2) 3 studies in patients with chronic kidney disease undergoing hemodialysis. Intervention types, instruments, and key findings are summarized in Table 2.

Table 2. Characteristics of Studies Included in the Systematic Review Analysis

Authors (years), country, Journal,Title, Volume, Issue, DOI	Participants	Design	Intervention		Outcome	
			Type	characteristics	Measuring Tools	results
Lucy Ymer, Adam McKay, Dana Wong, Kate Frencham, Natalie Grima, Monique Roper, Sylvia Nguyen, Jade Murray, Gershon Spitz, Jennie Ponsford (2025), Australia, Journal of Rehabilitation Medicine, Randomized controlled trial of cognitive behavioral therapy versus health education for sleep disturbance and fatigue following stroke and traumatic brain injury, 57, jrm41302, DOI: https://doi.org/10.2340/jrm.v57.41302	N = 126 (86 CBT-SF, 40 HE) M Age: 47,06 (CBT), 49.47 (SE) Stroke/TBI	RCT	CBT-SF HE	Duration : 8 sessions @1hours (8 weeks) Format : face to face	PSQI, ISI, FSS, BFI, ESS, HADS, SF36v2, Self-efficacy Scale, Actigraphy	CBT-SF showed significantly greater and faster improvements than health education ($p < 0.001$).
Yan Cao, Yin-Jie Yan, Jian-Yang Xu, Abulikemu Liwayiding, Yi-Ping Liu, Xuan Yin, Li-Xing Lao, Zhang-Jin Zhang, Shi-Fen Xu (2022), China, Acupuncture in Medicine, Acupuncture for insomnia after ischemic stroke: an assessor-participant blinded, randomized controlled trial, 40(5), 443–452, DOI: https://doi.org/10.1177/09645284221077106	N = 144 (72 intervention), (72 control) M Age: 65,2 (intervention), 63,6 (control) Ischemic stroke	RCT	Aacupuncture	Duration: 12 sessions (3 sessions/week for 4 weeks Format: Face to face	ISI, PSQI, SSQoL, HADS, Actigraphy: SE, TST, SA	Acupuncture significantly reduced ISI and PSQI scores and improved SSQoL scores ($p < 0.001$). Furthermore, HADS scores also showed significant improvements in anxiety and depression ($p < 0.003$), although the positive effects on anxiety tended to be short-lived.
Louise Pillon, Nikita F. Frankenmolen, Janna van der Zijp, Roy P.C. Kessels, Dirk Bertens (2023), Netherlands, NeuroRehabilitation, A short add-on sleep intervention in the rehabilitation of individuals with acquired brain injury: A randomized controlled trial, 53(3), 323–334, DOI: https://doi.org/10.3233/NRE-230139	N = 41 (23 CBT-I + TAU, 18 TAU) M Age: 47,74 (CBT-I + TAU), 46,83 (TAU) ABI (stroke dan TBI)	RCT	CBT-I	Duration: 4 sessions for 6 weeks Format : Face to face	PSQI, HADS, DMFS, DBAS-16	CBT-I + TAU-based adjunctive therapy demonstrated significant improvements ($p < 0.001$) in sleep quality, anxiety, and depression. Furthermore, this therapy significantly impacted fatigue ($p = 0.049$) and reduced dysfunctional sleep-related beliefs ($p = 0.010$).

Authors (years), country, Journal,Title, Volume, Issue, DOI	Participants	Design	Intervention		Outcome	
			Type	characteristics	Measuring Tools	results
Vahid Yousofvand, Mohammad Torabi, Khodayar Oshvandi, Saeid Kazemi, Salman Khazaei, Mojtaba Khazaei, Azim Azizi (2023), Iran Complementary Therapies in Medicine, Impact of a spiritual care program on the sleep quality and spiritual health of Muslim stroke patients: A randomized controlled trial, 77, DOI: https://doi.org/10.1016/j.ctim.2023.102981	N = 117 (59 intervention,58 control) M Age : 56,58 (intervention), 56,15 (control) Stroke	RCT	Spiritual care program	Duration: 5 sessions, once a day for 5 days Format: Face to face	PSQI, SWBS, MRS	The experimental group showed significant improvements ($p < 0.001$) in sleep quality and spiritual health scores compared to the control group.
Xiao-Jun Yin, Gao-Ping Lin, Xiao-Yan Wu, Rui Huang, Cun-Jin Xu, Mei-Yan Yao (2024), China, Complementary Therapies in Clinical Practice, Effects of lavender essential oil inhalation aromatherapy on depression and sleep quality in stroke patients: A single-blind randomized controlled trial, 55, DOI: https://doi.org/10.1016/j.ctcp.2024.101828	N = 40 (20 intervention, 20 placebo) M Age : 63,35 (intervention), 60,75 (placebo) Stroke	RCT	Aromatherapy	Duration : every night before bed for 4 weeks. Format : Face to face	HAMD-17, SDS, PSQI	Lavender essential oil inhalation aromatherapy is effective in reducing depression and improving sleep quality in patients with post-stroke depression ($p < 0.001$).
Melanie K. Fleming, Tom Smejka, Ellie Macey, Ramon Luengo-Fernandez, Alasdair L. Henry, Barbara Robinson, Simon D. Kyle, Colin A. Espie, Heidi Johansen-Berg (2024) London, UK Journal of Sleep Research, Improving sleep after stroke: A randomised controlled trial of digital cognitive behavioural therapy for insomnia, 33(2), DOI: https://doi.org/10.1111/jsr.13971	N = 84 (48 intervention, 36 control) M Age : 58,5 (intervention), 58,7 (control) Stroke	RCT	dCBT	Duration: 6 sessions @15-20 minutes (6 weeks) Format : online	SCI-8	dCBT significantly reduced insomnia symptoms in stroke survivors ($p \leq 0.02$).

Authors (years), country, Journal,Title, Volume, Issue, DOI	Participants	Design	Intervention		Outcome	
			Type	characteristics	Measuring Tools	results
Gizem Goktuna, Gülsah Gürol Arslan (2024), Turkey, Explore, Effect of foot reflexology massage on sleep, anxiety and quality of life in hemodialysis patients: A single-blind, randomized, placebo-controlled trial, 20(6), DOI: https://doi.org/10.1016/j.explore.2024.103061	N = 45 (23 intervention, 22 placebo) M Age: 64,39 (intervention), 69,95 (placebo) kidney failure undergoing hemodialysis	RCT	Foot reflexology massage	Duration: 9 sessions (3 times/week for 3 weeks) Format: Face to face	RCSQ, STAI, NHP	Foot reflexology massage is effective in reducing anxiety levels, improving sleep quality, and improving the quality of life of patients undergoing hemodialysis ($p < 0.001$).
Wei-Ying Chen, Jin Li, Dan Xia (2025) China Tohoku Journal of Experimental Medicine Efficacy of Cognitive Behavioral Therapy Combined with Jacobson Progressive Muscle Relaxation in Improving Sleep Quality and Overall Well-Being in Hemodialysis Patients with Insomnia: A Randomized Controlled Trial 267 (2), pages 141–150 DOI: https://doi.org/10.1620/tjem.2025.J005	N = 160 (80 intervention, 80 control) M Age : 38,5 (intervention), 41,25 (control) kidney failure undergoing hemodialysis	RCT	CBT-I Jacobson Progressive Muscle Relaxation (JPMR)	Duration: 7 weeks Format : It is not explained whether it is face to face or online; it is only mentioned that monitoring is done via telephone.	Primary: ISI, PSQI Secondary: MFIS (fatigue), HADS-A, HADS-D, SF-36	CBT-I + JPMR showed significant improvements compared to CBT-I alone on insomnia (ISI P=0.040), sleep quality (PSQI P=0.032), as well as fatigue, anxiety, depression, and all SF-36 domains (P<0.05).
Alireza Ghanbari, Parvin Mangolian Shahrbabaki, Mahlagha Dehghan, Hossein Mardanparvar, Esmaeil Kargar Dowlat Abadi, Asghar Emami, Esmaeil Sarikhani-Khorrami (2022) Iran International Journal of Therapeutic Massage & Bodywork, Vol 15(2) Comparison of the Effect of Reflexology and Swedish Massage on Restless Legs Syndrome and Sleep Quality in Patients Undergoing Hemodialysis: A Randomized Clinical Trial DOI: https://doi.org/10.3822/ijtmb.v15i2.705	N = 90 (30 : Reflexology, 30 : Swedish Massage, 30 : Sham) M Age: 51.6 kidney failure undergoing hemodialysis	RCT	Reflexology Swedish massage Sham	Duration: All groups received 20-minute interventions per session, 3×/week for 4 weeks. Format : Face to face, conducted by therapist/researcher while patient is undergoing hemodialysis.	RLS Questionnaire PSQI	Reflexology was most effective for RLS and PSQI (P<0.001), and Swedish was superior to sham (P=0.003). At 1 month, the effects were no longer significant (RLS P=0.91; PSQI P=0.87).

Note. Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), Fatigue Severity Scale (FSS), Brief Fatigue Inventory (BFI), Epworth Sleepiness Scale (ESS), Hospital Anxiety and Depression Scale (HADS), Hamilton Depression Rating Scale – 17 item (HAMD-17), Self-Rating Depression Scale (SDS), State-Trait Anxiety Inventory (STAI), Short Form Health Survey versi 2 (SF-36v2), Stroke-Specific Quality of Life Scale (SSQoL), dan Nottingham Health Profile (NHP), Spiritual Well-Being Scale (SWBS), Modified Rankin Scale (MRS), Dysfunctional Beliefs and Attitudes about Sleep – 16 item (DBAS-16), Dysfunctional Morning Fatigue Scale (DMFS), Richards-Campbell Sleep Questionnaire (RCSQ), Actigraphy : Sleep Efficiency (SE), Total Sleep Time (TST), Sleep Activity (SA), Sleep Condition Indicator – 8 item (SCI-8), MFIS (Multidimensional Fatigue Inventory), Restless Legs Syndrome Rating Scale (RLSRS).

Analytical Findings result

1. The Effect of Intervention on Sleep Disorders in Stroke Patients

a) Cognitive Behavior Therapy Intervention for Insomnia, Health Education (HE)

Three studies have evaluated the effectiveness of cognitive behavioral therapy (CBT) in stroke patients. This intervention has been shown to significantly ($p < 0.001$) improve sleep quality, reduce anxiety and depression (Pilon et al., 2023; Ymer et al., 2025), and can be delivered digitally with similar results, with partial least squares effect sizes (η^2p) ranging from 0.07 to 0.12 (95% CI [−5.64, −1.16], $p \leq 0.02$) (Fleming et al., 2024). Compared with Health Education, CBT provided faster and more significant sleep improvements than Health Education with effect sizes ranging from 0.69 to 0.80 and a regression coefficient (β) of −1.50 (95% CI [−2.35, −0.64], $p < 0.001$) (Ymer et al., 2025).

b) Physical Therapy (Acupuncture)

Acupuncture has been shown to be effective and safe in improving sleep quality and psychological well-being in post-stroke patients ($p < 0.001$) through neurotransmitter modulation, increased levels of serotonin, norepinephrine, GABA, melatonin, and nitric oxide, as well as balancing cortical excitatory-inhibitory activity and increasing cerebral blood flow (Cao et al., 2022; Yang, 2021).

c) Inhalation-Based Interventions (Aromatherapy)

Aromatherapy inhalation of 2% lavender essential oil has long been used to improve sleep quality, reduce anxiety, and alleviate depression. Research by Yin et al. (2024) showed a significant decrease in PSQI, HAMD-17, and SDS scores in the aromatherapy group ($p < 0.001$). This effect is thought to be through modulation of the autonomic nervous system, which regulates sleep and life rhythms (Sattayakhom et al., 2023).

d) Holistic (Spiritual) Intervention

Spiritual interventions include spiritual needs assessments, religious support, supportive care, and personal evaluations. These interventions can increase inner peace, meaning in life, and emotional support (Yousofvand et al., 2023). Research shows that implementing a five-day spiritual intervention resulted in significant improvements ($p < 0.001$) in sleep quality and spiritual health compared to a control group (Yousofvand et al., 2023).

Compared with CBT, other interventions in stroke populations, such as acupuncture, aromatherapy, and spiritual care, showed benefits but with less consistency. Acupuncture significantly improved insomnia and sleep quality ($p < 0.001$), but the effects on anxiety were not always sustained. Aromatherapy and spiritual care provided short-term improvements ($p < 0.001$), but the sustainability of the effects was limited or not reported. Overall, CBT provided the strongest and most durable benefits, while acupuncture offered moderate effects, and aromatherapy and spiritual interventions tended to be transient.

2. The Effect of Intervention on Sleep Disorders in Patients with Kidney Failure Undergoing Hemodialysis

Among three randomized controlled trials (RCTs) involving hemodialysis patients, the interventions reflexology, Swedish massage, JPMR, and CBT-I combined with JPMR resulted in significant improvements in sleep quality ($p < 0.001$). Reflexology showed the strongest

immediate effect on sleep quality and RLS symptoms compared to Swedish massage ($p < 0.001$), but this effect diminished at one-month follow-up ($p \geq 0.87$). CBT-I + JPMR showed improvements in insomnia, sleep quality, fatigue, anxiety, and quality of life (all $p < 0.05$), suggesting broader psychological benefits compared to purely physical interventions such as massage. Overall, the physical relaxation-based intervention was effective in the short term, while the CBT-based intervention again demonstrated broader multidimensional effects.

Table 3. Comparison of Intervention Effectiveness Across Studies

Intervention Type	Population	Effectiveness on Sleep	Durability	Strength
CBT-based (CBT-I, CBT-SF, digital CBT)	Stroke/ABI & Hemodialysis	Strong ($p < 0.001$)	High	Highest
CBT-I + JPMR	Hemodialysis	Strong ($p < 0.05$)	Moderate	High
Acupuncture	Stroke	Moderate–Strong ($p < 0.001$)	Moderate	Moderate
Reflexology	Hemodialysis	Strong immediate ($p < 0.001$)	Low	Moderate
Swedish Massage	Hemodialysis	Moderate ($p < 0.003$)	Low	Low–Moderate
Aromatherapy	Stroke	Moderate ($p < 0.001$)	Low	Limited
Spiritual Care	Stroke	Moderate ($p < 0.001$)	Low	Limited

Overall, the comparative synthesis showed that CBT-based interventions consistently outperformed other non-pharmacological modalities across a range of populations, both in terms of magnitude and durability of effects, whereas physical and sensory relaxation-based interventions provided significant but mostly short-term improvements.

DISCUSSION

Findings from studies involving patients with stroke or acquired brain injury consistently indicate that CBT-based interventions are the most effective non-pharmacological approach to improving sleep disturbances in this population. Three randomized controlled trials demonstrated significant and sustained reductions in insomnia severity and improvements in sleep quality following CBT-based interventions, including CBT-SF, CBT-I, and digital CBT (Pilon et al., 2023; Fleming et al., 2024; Ymer et al., 2025). These improvements were often accompanied by secondary benefits in fatigue, mood, and quality of life, highlighting the multidimensional impact of CBT approaches.

In contrast, complementary interventions such as acupuncture, aromatherapy, and spiritual care demonstrated beneficial but more limited effects. A randomized controlled trial conducted by Cao et al. (2022) reported significant reductions in ISI and PSQI scores following acupuncture in patients after ischemic stroke. However, improvements in anxiety were not consistently maintained at follow-up. Similarly, Yin et al. (2024) found that lavender aromatherapy significantly improved sleep quality and depressive symptoms, although the intervention was limited to short-term outcomes and lacked ongoing follow-up. A spiritual care program evaluated by Yousofvand et al. (2023) demonstrated improvements in sleep quality and spiritual well-being, but its implementation may be context-specific and culturally dependent.

The superiority of CBT-based interventions in stroke survivor populations may be attributed to their ability to directly target maladaptive sleep-related cognitions, conditioned arousal, and disrupted sleep‑wake behaviors, which are commonly observed following neurological injury. Unlike sensory or relaxation-based therapies, CBT addresses the cognitive and behavioral

mechanisms underlying chronic insomnia, thereby contributing to greater durability of treatment effects.

Among patients with chronic kidney disease undergoing hemodialysis, CBT-based interventions and physical relaxation have been found to improve sleep quality. However, differences exist in the extent and sustainability of treatment effects. Physical interventions such as reflexology, Swedish massage, and JPMR produce significant short-term improvements in sleep outcomes. A randomized clinical trial by Ghanbari et al. (2022) showed that reflexology was more effective than Swedish massage and placebo treatment in reducing the severity of restless legs syndrome and improving sleep quality immediately after the intervention. However, these benefits were not sustained at a one-month follow-up.

Similarly, reflexology massage, studied by Göktuna & Arslan (2024) significantly improved sleep quality and anxiety levels in hemodialysis patients, but long-term outcomes were not assessed. These findings suggest that physical therapy primarily works through acute relaxation and sensory stimulation, offering immediate symptom relief but limited longevity. In contrast, a study by Chen et al. (2025) demonstrated that CBT-I combined with Jacobson's Progressive Muscle Relaxation (JPMR) resulted in significant improvements not only in insomnia and sleep quality, but also in fatigue, anxiety, depression, and all domains of quality of life. This broader effect profile supports the idea that integrating cognitive-behavioral components with relaxation techniques can better address the complex biopsychosocial burden experienced by hemodialysis patients. Overall, CBT-based approaches, especially when combined with relaxation strategies, offer more comprehensive and potentially lasting benefits in this population.

IMPLICATION AND LIMITATIONS

Implications

The findings of this review indicate that non-pharmacological interventions are effective in improving sleep quality and reducing psychological symptoms in patients with stroke and chronic kidney disease. Cognitive Behavioral Therapy (CBT) appears to be the most effective and sustainable approach, suggesting its prioritization in clinical practice. Other interventions such as reflexology, acupuncture, aromatherapy, and spiritual care may serve as complementary therapies for short-term benefits. These results highlight the important role of nurses in integrating evidence-based, non-pharmacological strategies into patient care. Further research is needed to evaluate long-term effectiveness and support wider implementation

Limitations

The literature used in this study demonstrated a high degree of variation across intervention types, durations, and methods, limiting the ability to perform comparative data synthesis. Most included studies had small sample sizes, which could reduce statistical power and the reliability of inferences. Critical appraisal revealed that most reviewed studies did not blind researchers or participants. Furthermore, there was no intention-to-treat (ITT) analysis in several articles that experienced sample dropout, potentially introducing bias. Several studies did not adequately control for confounding factors, such as comorbidities or pharmacological regimens, which could potentially influence intervention outcomes.

CONCLUSION

The findings from all studies have important clinical significance for evidence-based care practices. Various non-pharmacological interventions, such as CBT, relaxation massage, aromatherapy, acupuncture, and spiritual care, have been shown to be effective in reducing sleep disturbances, fatigue, anxiety, and depression in patients with chronic conditions. Nurses participate in integrating these approaches to improve comfort and quality of life. CBT stands out as the most effective intervention because it addresses the cognitive and behavioral root causes by addressing negative thoughts and maladaptive sleep-related beliefs, resulting in

sustained improvements in sleep behavior. This structured, evidence-based, and flexible approach can be integrated into clinical practice and self-education programs, including through telehealth services. Therefore, CBT deserves to be a top priority in implementing treatment interventions to address sleep disturbances in patients with stroke and chronic kidney disease undergoing hemodialysis. Improvements achieved by CBT are sustained for at least 6–12 months.

SUGGESTIONS

To improve mutual care for patients with chronic illnesses experiencing sleep disorders, the use of non-pharmacological therapies, particularly CBT, should be incorporated into daily care, both in person and through telehealth services. Support for further research is crucial, particularly to ensure consistent long-term effectiveness, therapeutic combinations, and their application in the context of healthcare in Indonesia, thereby strengthening the scientific basis and improving the overall quality of care.

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DECLARATION OF INTEREST

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AUTHOR CONTRIBUTION

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