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REVIEW

Acupressure for Sleep, Mental Health, and Quality of Life in Hemodialysis Patients: A Systematic Review and Meta-Analysis

Yiting Wang[1,2], Xinyue Zhang[1,2], Lei Lan[1,2], Yuzhu Qu[1–3], Yuting Wang[1,2], Jie Chen[4], Li-Wei Chou[5–7,*], Fang Zeng[1,2,*]

[1]Acupuncture and Tuina School, Chengdu University of Traditional Chinese Medicine, Chengdu, Sichuan, 611137, People's Republic of China; [2]Key Laboratory of Acupuncture for Senile Disease (Chengdu University of TCM), Ministry of Education, Chengdu, Sichuan, 611137, People's Republic of China; [3]Post-Doctoral Scientific Research Workstation of Affiliated Sport Hospital, Chengdu Sport University, Chengdu, Sichuan, 610041, People's Republic of China; [4]Chengdu Pidu District Hospital of Traditional Chinese Medicine, Chengdu, Sichuan, 611730, People's Republic of China; [5]Department of Physical Medicine and Rehabilitation, China Medical University Hospital, Taichung, Taiwan; [6]Department of Physical Therapy and Graduate Institute of Rehabilitation Science, China Medical University, Taichung, Taiwan; [7]Department of Physical Medicine and Rehabilitation, Asia University Hospital, Asia University, Taichung, Taiwan

*These authors contributed equally to this work

Correspondence: Fang Zeng, Acupuncture and Tuina School, Chengdu University of Traditional Chinese Medicine, No. 1166, Liutai Avenue, Wenjiang District, Chengdu, Sichuan, 611137, People's Republic of China, Email zengfang@cdutcm.edu.cn; Li-Wei Chou, Department of Physical Medicine and Rehabilitation, China Medical University Hospital, Taichung, 404332, Taiwan, Email chouliwe@gmail.com

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Introduction: Patients undergoing hemodialysis (HD) frequently experience sleep disturbances and mental health disorders. Given the adverse effects of relevant pharmacological treatments, acupressure has been explored as a potential alternative. This study aimed to evaluate the efficacy and safety of acupressure in improving sleep quality, mental health, and related outcomes in patients undergoing HD.

Methods: Following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, we conducted a systematic search across seven databases (PubMed, Embase, Web of Science, Cochrane Library, CNKI, WanFang, and VIP) from inception to March 2025. We included trials comparing acupressure (including auricular acupressure) with medication or waiting-list controls in patients with HD.

Results: Twenty-seven studies involving 2037 participants were included in the statistical analysis. Compared to waiting-list, moderate certainty evidence suggests that acupressure probably improves sleep quality (weighted mean difference (WMD) -3.51 points on the 21-point Pittsburgh Sleep Quality Index (PSQI) scale, 95% confidence interval (CI) −4.14 to −2.89) and quality of life (WMD 9.66 points on the 100-point SF-36 scale, 95% CI 6.65 to 12.66); low certainty evidence suggests that acupressure may have little impact on sleep duration, mental health, and social functioning. Compared to medication treatment, low to very low certainty evidence suggests that acupressure may have little impact on sleep quality, social functioning, and sleep duration. Based on very limited evidence from only one study, there may be little to no difference in adverse effects between acupressure and medication groups (risk ratios (RR) 0.21, 95% CI 0.01 to 4.27).

Conclusion: Compared to the waiting-list, acupressure likely improves sleep quality and quality of life, while having a minimal impact on mental health, sleep duration, and social functioning in HD patients. However, its benefits over those of other medications remain unclear.

Systematic Review Registration: www.crd.york.ac.uk/PROSPERO/, ID: CRD420251010657.

Keywords: acupressure, hemodialysis, sleep quality, mental health, meta-analysis

Introduction

Long-term hemodialysis (HD) is the predominant renal replacement therapy for patients with end-stage renal disease (ESRD).[1] Due to accompanying complications, the quality of life of patients remains impaired. Insomnia is prominent among HD patients,[2] while concurring anxiety and depressive disorders even worsen their mental health.[3] Meanwhile, the physical and psychological comorbidities in HD patients further reduce the health-related quality of life (HRQoL),[4,5]

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posing profound challenges such as diminished medication adherence, increased substance use disorders, and elevated mortality risk[4–6] in the HD population.

Currently, clinicians primarily rely on benzodiazepine receptor agonists (BZRAs) and dual orexin receptor antagonists (DORAs) to manage insomnia for HD patients.[7] These agents, however, would increase the risks of adverse effects, including cognitive impairment, daytime drowsiness,[8] drug tolerance, and withdrawal syndromes.[9] Similarly, first-line antidepressants (SSRIs/SNRIs) for HD patients with mental health disorders frequently induce adverse metabolic and neurological effects, ranging from appetite suppression to somnolence.[10] Furthermore, polypharmacy in HD patients elevates the risks of cardiovascular events and mortality.[11] Therefore, safe and non-pharmacological therapeutic alternatives represent the critical need for the care of HD patients.

Acupressure, a form of physical stimulation within traditional Chinese medicine, is applied to the body surface. By employing targeted pressure application (via fingers, hands, elbows, or specialized seeds) on specific dermal points to regulate qi flow and restore yin-yang balance to achieve therapeutic effects.[12,13] Characterized by cost-effectiveness, technical accessibility, and a favorable safety profile,[14,15] previous studies have reported the effectiveness and safety of acupressure in improving sleep quality in patients with cancer, knee osteoarthritis, and attention deficit hyperactivity disorder.[16–18] Simultaneously, emerging evidence also suggests its potential in alleviating psychological distress among geriatric populations and perioperative patients.[19,20]

While sleep quality and mental health closely affect each other,[21] existing meta-analyses focus either on sleep disturbances or the psychological symptoms of HD patients,[22,23] yet none of them assess the overall certainty of evidence or incorporate the latest relevant trials published after 2020. We conducted a systematic review and meta-analysis, including 15 additional trials beyond the previous review, to evaluate the effectiveness and safety of acupressure on sleep quality and mental health in patients on HD, with the aim of providing a reliable, clinically actionable therapy that addresses the gap between existing low-quality evidence and clinical decision-making needs.

Materials and Methods

This systematic review and meta-analysis adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines,[24] with a protocol registered in PROSPERO (ID: CRD420251010657).

Literature Search Strategy

A comprehensive search was conducted in PubMed, Embase, Web of Science, Cochrane Library, China National Knowledge Infrastructure (CNKI), WanFang, and VIP databases from inception to March 2025 to capture all potentially relevant studies without language limitations. The search strategy employed Medical Subject Headings (MESH) terms combined with keywords. ("Renal Insufficiency Chronic") AND ("acupressure" OR "auricular acupressure") AND ("insomnia" OR "anxiety" OR "depression"). Table S1 provides the complete search strategy for all databases.

Eligibility Criteria

Studies were selected based on the following predefined eligibility criteria: (1) enrolled adults (≥18 years) undergoing maintenance hemodialysis for ≥3 months. (2) Randomized controlled trials (RCTs) that set acupressure and auricular acupressure (AA) as a standalone or combined intervention with a minimum of a 4-week treatment period of four weeks. (3) Setting medication or waiting-list (no intervention) as control groups, and (4) reporting at least one outcome, including sleep quality, sleep duration, mental health, quality of life, social functioning, or adverse events. We excluded studies that used acupoint needling, acupoint injection, moxibustion, cupping, or acupoint application as interventions. We also excluded studies in which co-interventions were administered to the experimental group (eg, acupressure and cupping vs waiting-list treatment). Animal studies, conference abstracts, non-Chinese/English publications, and studies with incomplete data were also excluded.

Data Extraction and Risk of Bias Assessment

Each eligible trial underwent duplicate data abstraction by a pair of reviewers (Y.-W. and X.-Z.) working independently, using standardized and pilot-tested forms. In cases where discrepancies arose between the two reviewers, a third reviewer (Y.-Q.) were consulted to achieve a consensus.

We collected data on study characteristics (ie, author name, year of publication, study location, and sample size), treatment details (ie, length of follow-up and frequency of treatment), patient characteristics (ie, age, duration of insomnia, and duration of dialysis), and all patient-important outcomes, including sleep quality, mental health, sleep duration, quality of life, social functioning, and adverse events. For studies reporting outcomes at multiple time points, we employed the most frequently reported follow-up duration across eligible trials. We extracted change scores from the baseline to account for within-person variability and used end scores only when change scores were unavailable.

Two researchers independently assessed methodological quality using the Cochrane Risk of Bias 1.0 tool,[25,26] which evaluates five domains: random sequence generation, allocation concealment, blinding of personnel and participants, blinding of outcome measurements, incomplete outcome data, selective reporting, and other sources of bias. The response options for each item were scored as "definitely or probably yes" (assigned a low risk of bias) or "definitely or probably no" (assigned a high risk of bias). Disagreements between reviewers were resolved through discussion, and if necessary, by third-party adjudication.

Statistical Synthesis

Referring to previous population-based literature focusing on mental and sleep health,[27,28] PSQI and SF-36 were used as main outcome variables. Data analysis was performed using RevMan software (version 5.3; Cochrane Collaboration). Dichotomous outcomes were analyzed using risk ratios (RR) with 95% confidence interval (CI). For continuous outcomes, weighted mean difference (WMD) with 95% CI was calculated after converting all continuous outcome data to common scales on a domain-by-domain basis:[29] (1) sleep quality to the 21-point Pittsburgh Sleep Quality Index (PSQI) scale, lower scores are better; (2) mental health to the 100-point SF-36 mental health scale, higher scores are better; (3) 3 point-sleep duration on the 21-point PSQI sleep duration scale, lower scores are better; (4) quality of life on the 100-point Short Form Survey (SF-36) scale, higher scores are better; and (5) social functioning to the 100-point SF-36 social functioning scale, higher scores are better.

To optimize the interpretability of our findings, we modelled risk difference (RD) to achieve at least a minimally important difference (MID). We identified anchor-based MIDs for all continuous outcome measures in the analysis. For sleep quality, we used 2.5 points on the 21-point PSQI scale.[30] For sleep duration, we used one point (indicating 1-hour sleep duration) on the 21-point PSQI scale. For quality of life, we used 5 points on the 100-point SF-36 scale.[31,32] For mental health and social functioning, which are individual domains of the SF-36, we used 10 points as the MID.[33]

Heterogeneity was quantified using I^2 statistics, and a random-effects model was used. Sensitivity analyses employed the leave-one-out method to assess robustness if necessary. Publication bias was evaluated using funnel plot symmetry when ≥10 studies were included.

Evidence Certainty Evaluation

The Grading of Recommendation, Assessment, Development and Evaluation (GRADE) approach framework evaluated evidence quality across five domains (risk of bias, inconsistency, indirectness, imprecision, and publication bias), rated as "very low," "low," "moderate", and "high".[34] When evaluating imprecision, in addition to considering sample size, a downgrade in the evidence grade was applied if 1/2 MID for the outcome falls within the 95% CI of its pooled effect size. If both the downgrading scenarios coincide, only one downgrade is applied.

Results

Search results and Study Characteristics

A total of 843 articles were identified during the initial search. The details of the selection process are shown in Figure 1. Ultimately, 27 studies spanning from 2001 to 2024 were included in the final analysis.[35–52] Of these, two were multicenter studies,[53,54] two did not report study design details[43,44] and others were single-center studies.[25–42,45–52,55–61] The studies were conducted across China,[35–52] Pakistan,[53] and Iran.[54,57,61] Funding sources comprised government sponsorship for 5 studies[36,38,46,52] and institutional support for two studies,[53,61] whereas the remaining studies lacked funding declarations. Regarding control groups, six studies utilized medication treatment,[40,53,55,56,58,60] and the remaining employed waiting

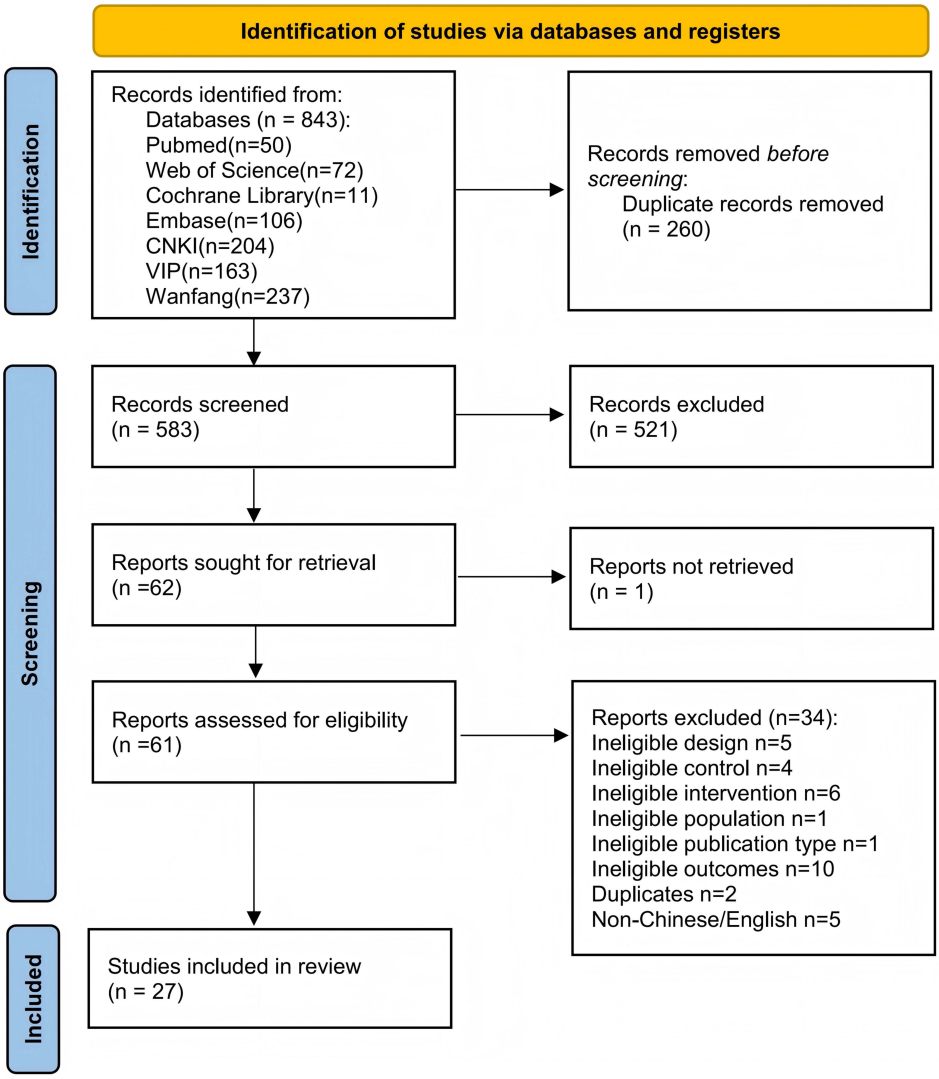

Figure 1 PRISMA Flow Diagram.
Notes: PRISMA figure adapted from Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71.[24]

list,[35–39,41–52,54,57,59,61] including a three-arm study incorporating both medication and waiting-list groups.[55] The 27 studies enrolled 2,037 participants, including 1,006 male participants, with three studies[37,57,59] not reporting sex distribution. The median of the average age is 54.02(IQR 48.6–58.9), with two studies not reporting average age,[59,61] the median of dialysis duration is 42.2(IQR 27.3–58.1), with seven studies not reporting average age.[36,37,49,50,55–59,61] Five studies reported the insomnia duration,[35–38,45,50,52] and the median is 30.0(IQR 19.2–43.2). The baseline characteristics of the included studies are summarized in Table 1.

Risk of Bias

Of the 27 eligible trials, all (100%) were at a risk of bias for at least one domain. Eighteen (67%) adequately generated their randomization sequence, three (11%) adequately concealed allocation, none (0%) blinded participants and health care providers, and two (7%) blinded outcome assessors. One of 27 trials (4%) reported missing outcome data. (Figure 2).

Table 1 Baseline Characteristics of Included Studies

Author	Country	Number of Participants (E/C)	Number of Males	Age (Mean±sd, Year)	Duration of Dialysis (Mean±sd, Month)	Duration of Insomnia (Mean ±sd, Month)	Intervention	Control	Frequency of Intervention	Length of Follow-Up (Days)	Outcomes
Arab, 2016[61]	Iran	63(32/31)	33	NR	NR	NR	Acupressure	Waiting-list	3 times a week, for 4 weeks	28	PSQI, SF-36
Chen YY,2022[35]	China	60(30/30)	28	59.8±4.85	52.8±10.92	30±10.68	Acupressure + AA	Waiting-list	Daily, for 1 month	30	PSQI, KDQOL-SF
Guo JJ, 2020[36]	China	60(30/30)	25	56.6±11.18	NR	NR	Acupressure	Waiting-list	3 times a week, for 4 weeks	28	PQSI, RPFS, BFI
He ZL, 2019[37]	China	82(41/41)	NR	46.8±4.28	NR	NR	Acupressure	Waiting-list	Daily, for 4 weeks	28	SAS, SF-36
Hong W,2024[38]	China	106(53/53)	50	48.6±7.95	67.2±18	43.2±16.32	Acupressure + AA	Waiting-list	Daily, for 4 weeks	28	PSQI, KDQOL-SF, T-AI, S-AI
Hu J, 2022[39]	China	80(40/40)	47	57.8±6.31	24±8.64	NR	Acupressure + AA	Waiting-list	Daily, for 1 month	56	PSQI, KDQOL-SF, SAS, SDS
Huo ZF, 2014[40]	China	64(32/32)	46	53.91±12.56	27.22±30.49	NR	AA	Estazolam	Daily, for 8 weeks	56	PSQI, effective rate
Li AY, 2019[41]	China	80(40/40)	36	63.2±12.8	57±49	NR	AA	Waiting-list	Daily, for 4 weeks	28	PSQI, effective rate
Lin HY, 2023[42]	China	92(46/46)	53	48.8±6.94	26.4±3.6	NR	AA + Acupoint scraping	Acupoint scraping	Daily, for 4 weeks	28	GSRS, PSQI, effective rate
Liu HM, 2020[43]	China	64(32/32)	45	55.9±14.6	30.5±28.13	NR	AA	Waiting-list	Daily, for 4 weeks	28	PSQI, SF-36, blood pressure, effective rate
Nasiri, 2011[57]	Iran	62(31/31)	NR	48.2±12.46	57.6±41.88	NR	Acupressure	Waiting-list	3 times a week, for 4 weeks	28	PSQI, effective rate
Qian XF, 2016[44]	China	60(30/30)	35	60.3±12.13	27.4±35.23	NR	Acupressure + AA	Waiting-list	Daily, for 8 weeks	56	PSQI
Rehman, 2021[53]	Pakistan	58(30/28)	49	44.6±15.41	26.4±14.1	NR	Acupressure	Zolpidem	Daily, for 8 weeks	56	PSQI,5D itch scale
Ren Z, 2024[45]	China	86(43/43)	48	68.4±3.53	50.4±7.2	19.2±3.48	Acupressure + AA	Waiting-list	Daily, for 1 month	30	PSQI, SF-36, nursing satisfaction
Shariati, 2012[54]	Iran	44(22/22)	23	54.5±11.5	42.4±30.42	NR	Acupressure	Waiting-list	3 times a week, for 4 weeks	28	PSQI
Tang QM, 2021[46]	China	120(60/60)	69	57.71±12.81	74.52±39.36	NR	AA	Waiting-list	Daily, for 4 weeks	28	PSQI, HAMA
Wang F, 2024[47]	China	90(45/45)	46	62.1±5.61	11.1±2.49	NR	Acupressure + AA	Waiting-list	Daily, for 4 weeks	28	PSQI, SF-36, HAMA, HAMD
Wang SY, 2024[48]	China	100(50/50)	42	49.9±10.05	58.6±27.04	NR	AA	Waiting-list	Daily, for 8 weeks	56	PSQI, effective rate, serum creatinine, blood urea nitrogen, potassium, TCM syndrome effective rate
Wen LL, 2023[49]	China	70(35/35)	46	64.55±13.42	NR	NR	Acupressure + AA	Waiting-list	Daily, for 30 days	30	PSQI, effective rate, TCM symptom score
Wu AQ, 2016[50]	China	86(43/43)	59	40.2±10.13	NR	2.88±1.08	Acupressure	Waiting-list	Daily, for 3 months	90	PSQI, effective rate
Xu SL, 2024[51]	China	82(41/41)	47	58.9±8.7	27.6±8.52	NR	Acupressure + AA	Waiting-list	Daily, for 1 month	30	PSQI, SF-36, SAS, SDS
Yan XX, 2020[52]	China	76(38/38)	40	47±10.16	66±18.36	48±20.4	Acupressure + AA	Waiting-list	Daily, for 4 weeks	28	PSQI, SAS, SDS, KDQOL-SF, effective rate
Ye BR, 2014[59]	China	92(46/46)	NR	NR	NR	NR	Acupressure	Waiting-list	Daily, for 1 month	30	PSQI
Zhang L, 2008[55]	China	60(20/20/20)	30	51.58±11.7	NR	NR	AA	Estazolam/waiting-list	Daily, for 8 weeks	56	PSQI, effective rate, biochemical criterion
Zhao TL, 2011[58]	China	60(30/30)	32	52.42±9.04	42±22.97	NR	AA	Estazolam	Daily, for 8 weeks	56	PSQI, effective rate
Zheng QH, 2014[60]	China	80(40/40)	48	46.3±10.36	35.6±9.49	NR	AA	Estazolam	Daily, for 8 weeks	56	PSQI, SF-36
Zhou M 2010[56]	China	60(30/30)	29	54.02±11.92	96.52±69.46	NR	AA	Estazolam	Daily, for 1 month	30	PSQI, effective rate

Abbreviations: NR, not reported; E: experimental group; C: control group; sd: standard deviation; AA: auricular acupressure; PSQI: Pittsburgh Sleep Quality Index (0–21, lower is better); SF-36: Short Form 36-item Health Survey (0–100, higher is better); KDQOL-SF: Kidney Disease Quality of Life-Short Form (0–100, higher is better); RPFS: Revised Piper Fatigue Scale (0–100, lower is better); BFI: Brief Fatigue Inventory (0–10, lower is better); SAS: Self-Rating Anxiety Scale (20–80, lower is better); SDS: Self-Rating Depression Scale (20–80, lower is better); T-AI: Trait Anxiety Inventory (20–80, lower is better); S-AI: State Anxiety Inventory (20–80, lower is better); GSRS: Gastrointestinal Symptom Rating Scale (15–105, lower is better); HAMA: Hamilton Anxiety Rating Scale (0–56, lower is better); HAMD: Hamilton Depression Rating Scale (0–52, lower is better); TCM: Traditional Chinese Medicine.

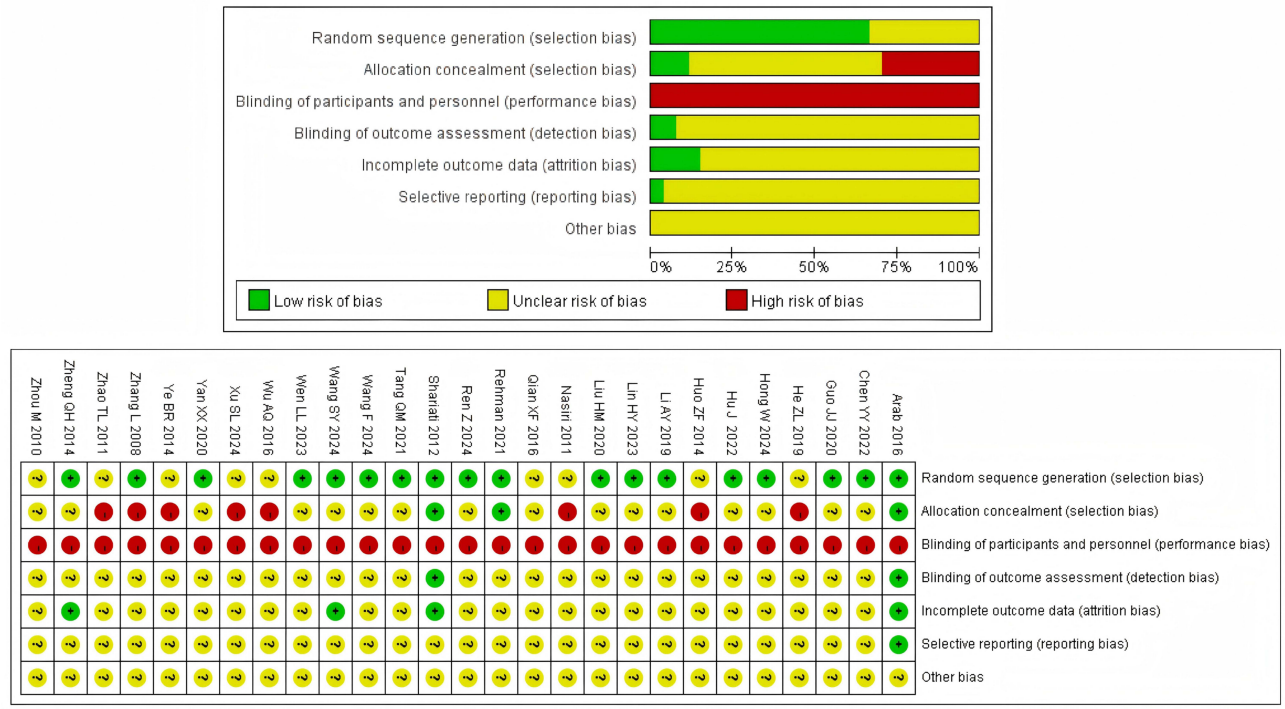

Figure 2 Risk of bias of included studies.

Acupressure Vs Waiting-List

Sleep Quality

Moderate certainty of evidence from eighteen RCTs[36,39,41–44,46–52,54,55,57,59,61] (1361 participants) suggested that, compared to waiting-list, acupressure probably provide impact on sleep quality (WMD -3.51 points on the 21-point PSQI scale, 95% CI −4.14 to −2.89, modelled RD 29% for achieving the MID of 2.5 points, 95% CI 27%-30%; Table 2; Figure 3).

We investigated the publication bias in 18 studies. The symmetric funnel plot (Figure S1) indicated no strong evidence of publication bias.

Mental Health

Low certainty of evidence from three studies[37,43,61](209 participants) suggested that, compared with the waiting-list, acupressure may have little impact on mental health (WMD 11.87 points on the 100-point SF-36 scale, 95% CI 1.92 to 21.82; modelled RD 26% for achieving MID of 10 points, 95% CI 4%-47%; Table 2; Figure 4).

Table 2 The Quality of Outcomes Evaluated by GRADE System

No. of Trials (No. of Patients)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Treatment Association (95% CI)	Certainty
Acupressure vs Waiting-list							
Sleep quality: 21-point for PSQI scale; lower is better; MID=2.5							
18(1361)	Serious[a]	Not serious[b], I^2=86%	Not serious	Not serious	Not serious	WMD −3.51(−4.14, −2.89) Modelled RD 29% (27%, 30%) Acupressure:98% Control:69%	Moderate

(*Continued*)

Table 2 (Continued).

No. of Trials (No. of Patients)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Treatment Association (95% CI)	Certainty
Mental health: 0 to 100 points SF-36 subscale; higher is better; MID=10							
3(209)	Serious[a]	Not serious[b], I^2=86%	Not serious	Serious[e]	NA	WMD 11.87(1.92, 21.82) Modelled RD 26% (4%, 47%) Acupressure:58% Control:32%	Low
Sleep duration: achieving a 1-point reduction in sleep duration score from baseline							
11(770)	Serious[a]	Not serious[b], I^2=69%	Not serious	Serious[d]	Not serious	WMD: −0.42(−0.55, −0.30) Modelled RD 26% (19%, 34%) Acupressure:67% Control:41%	Low
Life quality: 0 to 100 points SF-36 scale; higher is better; MID=5							
7(580)	Serious[a]	Not serious[b], I^2=88%	Not serious	Not serious	NA	WMD 9.66(6.65,12.66) Modelled RD 34% (27%, 38%) Acupressure:91% Control:57%	Moderate
Social functioning: 0 to 100 points SF-36 subscale; higher is better; MID=10							
3(209)	Serious[a]	Not serious, I^2=14%	Not serious	Serious[e]	NA	WMD 15.37(10.67, 20.06) Modelled RD 23% (16%, 30%) Acupressure:56% Control:33%	Low
Acupressure vs Medication treatment							
Sleep quality: 21-point for PSQI scale; lower is better; MID=2.5							
6(362)	Serious[a]	Serious[c], I^2=62%	Not serious	Serious[d]	NA	WMD −1.87(−2.83, −0.91) Modelled RD 8% (5%, 10%) Acupressure:96% Control:89%	Low
Mental health: 0 to 100 points SF-36 subscale; higher is better; MID=10							
1(80)	Serious[a]	NA	Not serious	Serious[e]	NA	WMD 8.42(−0.50, 17.34) Modelled RD 11% (−5%, 19%) Acupressure:89% Control:78%	Low
Sleep duration: achieving a 1-point reduction in sleep duration score from baseline							
2(120)	Serious[a]	Serious[c], I^2=64%	Not serious	Serious[d]	NA	WMD: −0.33(−0.77, 0.11) Modelled RD 11% (−5%, 19%) Acupressure:89% Control:78%	Very Low
Social functioning: 0 to 100 points SF-36 subscale; higher is better; MID=10							
1(80)	Serious[a]	NA	Not serious	Serious[e]	NA	WMD 10.16(1.47, 18.85) Modelled RD 21% (3%, 34%) Acupressure:74% Control:53%	Low

(*Continued*)

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Table 2 (Continued).

No. of Trials (No. of Patients)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Treatment Association (95% CI)	Certainty
Adverse effects							
1(58)	Serious[a]	NA	Not serious	Serious[e]	NA	RR 0.21(0.01,4.27)	Low

Notes: [a] High risk or unclear risk of bias in adequate allocation concealment and blinding; [b] $I^2 \geq 50\%$ but differences are between small and large beneficial effects; [c] The heterogeneity was substantial ($I^2 \geq 50\%$); [d] 1/2 MID falls within the 95% CI; [e] small sample size.
Abbreviations: No., Number; RCTs, randomized controlled trials; CI, confidence interval; MD, mean difference; GRADE, Grading of Recommendation, Assessment, Development and Evaluation; PSQI, Pittsburgh Sleep Quality Index scale (0–21, lower is better); MID, Minimally Important Difference; WMD, Weighted Mean Difference; RD, Risk Difference; SF-36, Short Form 36-item Health Survey (0–100, higher is better); NA, not available.

Sleep Duration

Low certainty of evidence from eleven RCTs[35,38,41,43–45,52,54,55,57,59] (770 participants) suggested that acupressure may have little impact on sleep duration compared to waiting-list (WMD −0.42 points on the 21-point PSQI scale, 95% CI −0.55 to −0.30; modelled RD 26% for increasing 1-hour sleep duration, 95% CI 19% to 34%; Table 2; Figure S2).

We investigated the publication bias in 11 studies. A symmetric funnel plot (Figure S3) indicated no strong evidence of publication bias.

Quality of Life

Moderate certainty of evidence from seven RCTs[35,38,39,45,47,51,52] (580 participants) suggested that, compared to waiting-list, acupressure probably provides an impact on quality of life (WMD 9.66 points on the 100-point SF-36 scale, 95% CI 6.65 to 12.66, modelled RD 34% for achieving the MID of 5 points, 95% CI 27% to 38%; Table 2; Figure S4).

Social Functioning

Low certainty of evidence from three RCTs[37,43,61] (209 participants) showed that acupressure may have little impact on social functioning (WMD 15.37 points on the 100-point SF-36 scale, 95% CI 10.67 to 20.06; modelled RD 23% for achieving MID of 10 points, 95% CI 16%-30%; Table 2; Figure S5) compared to waiting-list.

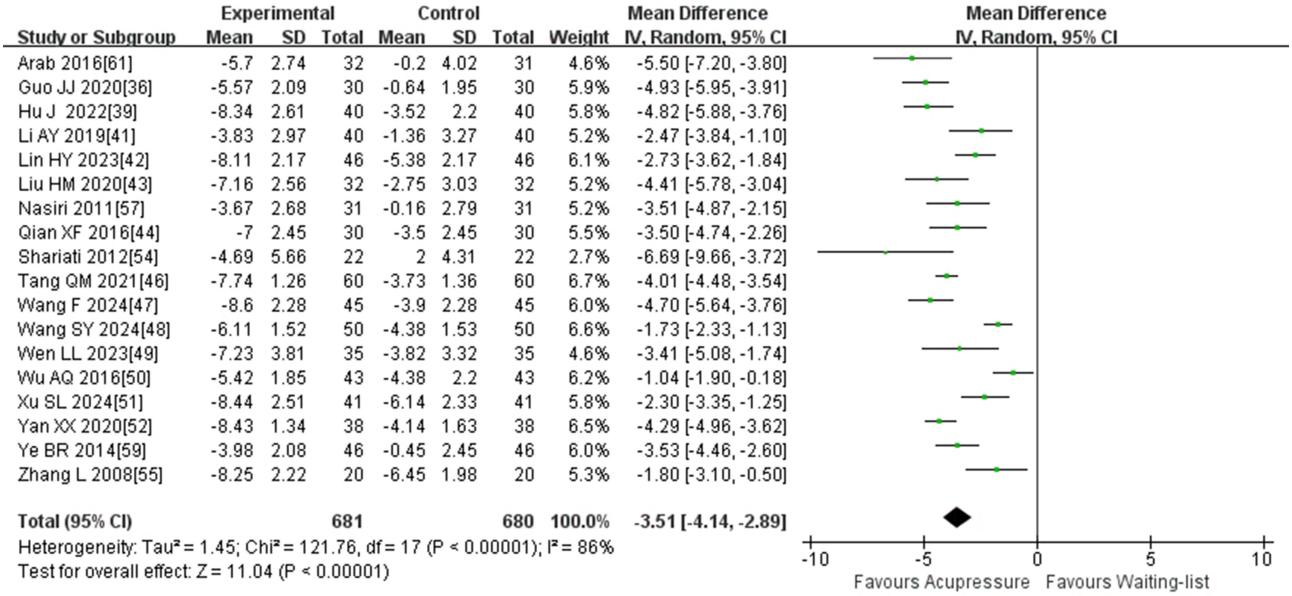

Figure 3 Forest plot comparing sleep quality between acupressure treatment and waiting-list.
Abbreviations: CI, Confidence Interval; SD, Standard deviation.

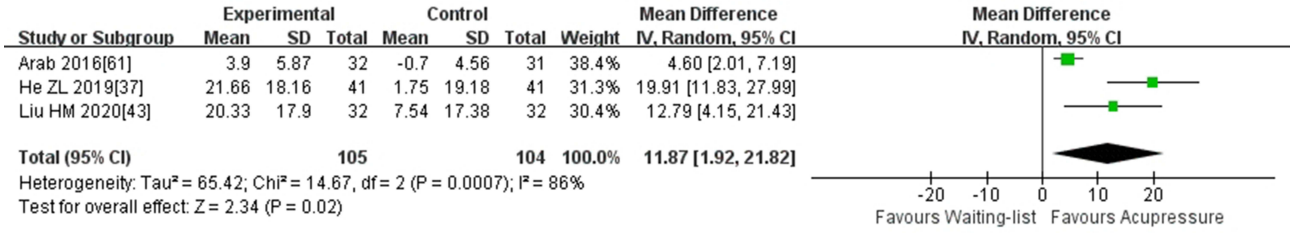

Figure 4 Forest plot comparing the mental health between acupressure treatment and waiting-list.
Abbreviations: CI, Confidence Interval; SD, Standard deviation.

Acupressure Vs Medication Treatment

Sleep Quality

Low certainty of evidence from six RCTs[40,53,55,56,60] (362 participants) suggested that, compared to medication treatment, acupressure may have little impact on sleep quality (WMD −1.87 points on the 21-point PSQI scale, 95% CI −2.83 to −0.91, modelled RD 8% for achieving the MID of 2.5 points, 95% CI 5%-10%; Table 2; Figure 5).

Mental Health

Low certainty of evidence from one trial[60] (80 participants) suggested that, compared to medication treatment, acupressure may provide little to no impact on mental health (WMD 8.42 points on the 100-point SF-36 scale, 95% CI −0.50 to 17.34; modelled RD 11% for achieving MID of 10 points, 95% CI −5%-19%; Table 2).

Sleep Duration

Low certainty evidence from two trials[55,60] (120 participants) suggested that, compared to medication treatment, acupressure may provide little to no impact on sleep duration (WMD −0.33 points on the 21-point PSQI scale, 95% CI −0.77 to 0.11; modelled RD 11% for increasing 1-hour sleep duration, 95% CI −5% to 19%; Table 2; Figure S6).

Social Functioning

Low certainty of evidence from one study[60] (80 participants) suggested that, compared to medication treatment, acupressure may have little impact on social functioning (WMD 10.16 points on the 100-point SF-36 scale, 95% CI 1.47 to 18.85; modelled RD 21% for achieving MID of 10 points, 95% CI 3%-34%; Table 2).

Adverse Events

The low certainty of evidence from one study[53] (58 participants) suggested that there may be little to no difference in adverse effects between the acupressure and medication groups (RR 0.21, 95% CI: 0.01 to 4.27); Table 2).

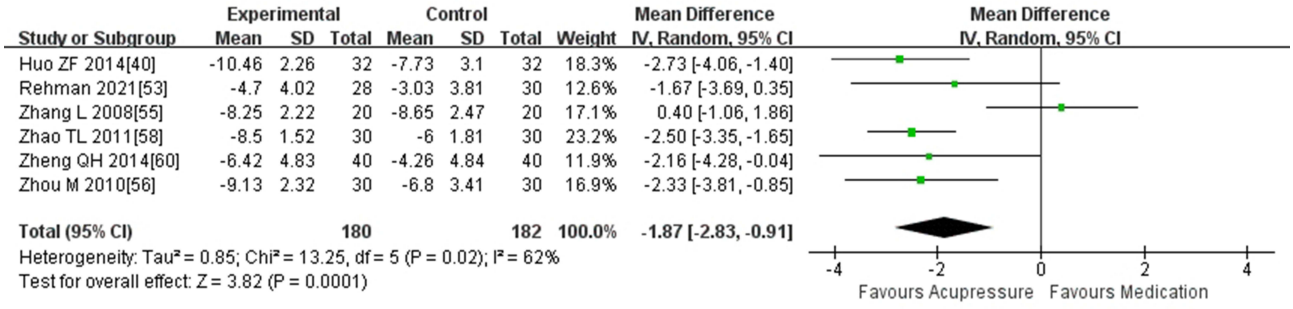

Figure 5 Forest plot comparing sleep quality between acupressure treatment and medication treatment.
Abbreviations: CI, Confidence Interval; SD, Standard deviation.

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Certainty of Evidence

The certainty of the evidence showed that acupressure probably improved sleep quality and quality of life compared to waiting list, while it may have little impact on sleep duration, mental health, and social functioning.

Compared with medication treatment, acupressure may have little impact on sleep quality and social functioning, while providing little to no impact on sleep duration, mental health, and adverse events. Detailed results are presented in Table 2.

Discussion

Overall Findings

This study aimed to evaluate the efficacy and safety of acupressure for managing sleep duration, mental health, and related outcomes among HD patients undergoing HD. Our meta-analysis synthesized data from 27 trials involving 2037 participants, assessing interventions including acupressure, AA, or combined approaches.

Compared to the waiting list, acupressure probably improves sleep quality and quality of life while having little impact on sleep duration, mental health, and social functioning. Compared to medication, acupressure may improve sleep quality and social functioning, while providing little to no impact on sleep duration, mental health, and adverse events.

Relation to Other Studies

In comparison to three existing relevant reviews,[25,26,62] we included 15 more studies than the largest of these prior reviews,[26] with eight overlapping studies[41,54–58,60,61] and 19 studies included in the reviews but excluded here (the reasons for excluding them can be found in Table S2).

We implemented the GRADE approach for evidence certainty assessment, based on different controls (waiting lists or medication treatments) for each outcome. We offered a more precise assessment of evidence quality, with evidence certainty absent in all three previous systematic reviews. Additionally, by calculating the modelled RD for outcomes, the study presented intuitive intergroup effect differences, significantly enhancing the readability of clinicians and patients.

Strengths and Limitations

Our meta-analysis specifically targeted patients undergoing long-term hemodialysis, addressing complications that significantly affect their quality of life, such as sleep disorders and mental health issues, with the aim of providing practical evidence for improving their well-being. Methodologically, this study incorporated MIDs into the GRADE approach, calculating the RR and modelled RD of outcomes in each group to present the intergroup effect differences intuitively, making the therapeutic effects more understandable and interpretable for clinicians and patients.

However, the overall methodological quality of the included trials necessitates a cautious interpretation of our findings. The high risk of bias predominantly stems from inadequate allocation concealment (in 89% of trials) and a pervasive lack of blinding. The failure to conceal allocation sequences could have introduced selection bias, potentially leading to an imbalance in prognostic factors between groups at baseline. More critically, the inability to blind participants and personnel - an inherent challenge in non-pharmacological trials like ours - poses a high risk of performance bias. For subjective, patient-reported outcomes such as sleep quality, anxiety, and depression, the knowledge of receiving an active intervention (acupressure) versus a control (medication or usual care) can significantly alter expectations and reporting, likely inflating the perceived benefits of acupressure. Although blinding of outcome assessors was also uncommon, its impact might be somewhat mitigated since the primary outcomes were self-reported. Consequently, the pooled effect sizes reported in this meta-analysis probably represent an overestimate of the true intervention effect. The conclusions regarding the efficacy of acupressure should therefore be viewed as preliminary and interpreted in the context of these methodological constraints.

Moreover, a major methodological limitation across the included trials is the inherent difficulty in blinding participants and personnel to the acupressure intervention. None of the studies employed a validated sham acupressure control, such as light touch on non-acupoints or devices designed to mimic minimal pressure. As most outcomes, including sleep

quality and mental health symptoms, were patient-reported, the lack of blinding poses a high risk of performance and detection bias, potentially leading to an overestimation of the beneficial effects of acupressure.

Implications

Compared to waiting-list, this meta-analysis demonstrates that acupressure probably improves sleep quality and quality of life, while providing little impact on sleep duration, mental health, and social functioning in HD patients.

While modern research has elucidated the mechanisms of acupressure, such as the modulation of neurotransmitter balance, promotion of neuroplasticity, suppression of inflammatory responses, and regulation of neuroendocrine system function,[63] the specific principles of acupressure require further exploration. Because of the ease of acquisition and absence of side effects, healthcare providers should teach HD patients to perform acupressure with fingers or specialized instruments on common acupoints (eg, Shenmen, Sanyinjiao) and auricular points (eg, heart, subcortical, sympathetic) to alleviate hemodialysis-related adverse symptoms and improve quality of life.

The following recommendations are proposed for subsequent research: allocation concealment should be optimized by prioritizing standardized operational procedures such as the sealed-envelope technique. Meanwhile, implementation of patient blinding should be advocated in studies to minimize performance bias. For physical manipulation such as acupressure, acupuncture, and surgery, where blinding operators are often impractical, careful consideration is required when downgrading the evidence grade because of the lack of operator blinding in the GRADE evaluation system.

Conclusion

Acupressure may improve sleep quality and quality of life, while having a minimal impact on sleep duration, mental health, and social functioning in HD patients compared to the waiting-list. Given that the benefits of acupressure over medications remain unclear, it may be considered an adjunctive option for managing hemodialysis-related sleep disturbances and improving quality of life. Priority should be given to conducting larger, longer-term randomized trials under standardized, replicable acupressure protocols with adequate blinding.

Data Sharing Statement

The datasets generated and analyzed in the present study are available from the corresponding author upon reasonable request.

Author Contributions

Y.-W. (Yiting Wang): Conceptualization, Methodology, Software, Validation, Investigation, Formal Analysis, Data Curation, Writing - Original Draft, Visualization. X.-Z. (Xinyue Zhang): Formal Analysis, Data Curation, Writing - Review & Editing. L.-L. (Lei Lan): Conceptualization, Methodology, Software, Validation, Formal Analysis, Writing - Review & Editing, Visualization, Supervision. Y.-Q. (Yuzhu Qu): Conceptualization, Writing - Review & Editing. Y.-W. (Yuting Wang) & J.-C. (Jie Chen): Conceptualization, Writing - Review & Editing, Visualization, Supervision. L.-W. C. (Li-Wei Chou) & F.-Z. (Fang Zeng): Validation, Project Administration, Data Curation, Writing - Review & Editing. All authors approved the final version of the paper, agreed to submit it to this journal, and agree take responsibility for all aspects of the work.

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Disclosure

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