



Acupuncture therapy of overactive bladder: An umbrella review and meta-analysis

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ABSTRACT

Introduction: Overactive bladder (OAB) is a common lower urinary tract symptom of bladder storage dysfunction. Numerous studies have evaluated the efficacy and safety of acupuncture therapy for overactive bladder, but clinical programs and data were largely inconsistent. Therefore, it is necessary to summarize and analyze the published clinical research data in the field. We aimed to perform an umbrella review of systematic reviews and meta-analyses (SRs/MAs) to evaluate the efficacy and safety of acupuncture therapy.

Methods: We searched PubMed, the Cochrane Library, Embase, and three China databases (CNKI, VIP, and Wanfang Data) from the establishment of each database to 1 February 2024. Evaluation tools used the AMSTAR 2 tool and the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) rating system.

Results: A total of seven SRs/MAs were included. Six reviews were rated as critically low on overall confidence and one review was low on confidence based on the AMSTAR 2 tool. The GRADE evidence quality rating demonstrated that the quality of evidence for one outcome indicator was moderate, five were low, and 28 were critically low. Twenty-three of the 34 outcome indicators exhibited a significant improvement compared to the control group. The present research results supported acupuncture as a complementary therapy for OAB patients, but the evidence should be considered carefully due to the methodological flaws identified.

Conclusion: Our study demonstrated that acupuncture, as traditional Chinese medicine, regulates bladder qi and has a good therapeutic effect in the treatment of OAB.

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KEYWORDS

Acupuncture; OAB; umbrella review; re-evaluation of systematic review

Introduction

Overactive bladder (OAB), a common urinary disorder, features clinical symptoms dominated by urgency, frequent urination, and increased nocturia. In 2016, the prevalence of OAB was 4.41% in a United States study of women >18 years of age [1]. Another study determined that the prevalence of OAB in adults ranged from 5.2% to 22% and increased with age [2]. Despite its common nature, the cause of OAB is unclear [3]. OAB affects patient health and negatively impacts their social interactions. Current therapies for OAB include behavioural therapy, medication and physiotherapy. Behavioural therapy, including pelvic floor muscle exercises and bladder retraining, is the most widely used therapy; however, its efficacy is less than ideal [4,5]. Physiotherapy, including neuromodulation and surgery, is limited by its invasiveness [6]. Pharmacological therapies mainly include oral anticholinergics, α -receptor blockers, and β -adrenergic agonists, but they feature adverse effects such as dry mouth and headache [7]. Therefore, it is important to explore other therapy options that lack side effects.

Acupuncture has been used to treat urinary incontinence since ancient times. Acupuncture in Guanyuan, Zhongji, Sanyinjiao, Qihai, Kidney Yu, and Baosao can play a role in the therapy of dysuria and urinary incontinence and has unique advantages in the therapy of urological diseases [8–10]. In fact, the efficacy and safety of acupuncture in the therapy of OAB have recently attracted considerable attention from researchers worldwide. Experimental studies reported that acupuncture can increase hyperpolarisation-activated cyclic nucleotide-gated channel 1 (Hcn1) protein and reduce Ca^{2+} concentrations within bladder epithelial cells to inhibit OAB [11]. The effect of acupuncture on OAB was also demonstrated in experimental studies. Randomised controlled trials reported that acupuncture was more effective than solifenacin, a common therapy for OAB, and lacked side effects [12]. Moreover, several systematic reviews/meta-analyses (SRs/MAs) reported that acupuncture is effective for the urinary incontinence, urinary retention and other urinary dysfunction, but there is a lack of strong evidence-based medical evidence for the therapy of

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overactive bladder [13,14]. By design, an umbrella review demonstrates the highest level of evidence synthesis available [15] and can significantly optimise clinical therapy strategies [16]. Therefore, the present study was designed to systematically evaluate the SR/MA of acupuncture for OAB using an umbrella review to assess the methodological quality and reliability of related outcome indicators and provide evidence-based support and decision-making guidance for treating OAB with acupuncture.

Materials and methods

Inclusion and exclusion criteria

Types of studies

Our umbrella review included SRs/MAs of randomized controlled trials (RCTs), no limits on publication time, and publication language limited to Chinese and English; Duplicate papers, non-Chinese or -English publication language, systematic review proposals or conference abstracts, incomplete data reports without access to raw study data were not included.

Population

Participants were diagnosed as having OAB according to any international or national diagnostic criteria. There were no limitations on sex, race, age, or education level.

Type of interventions

Experimental group used acupuncture therapy (e.g. acupuncture, electro-acupuncture, moxibustion, etc.) or acupuncture therapy combined with other therapies, while the control group used other therapies (placebo, sham acupuncture, etc.) or drug therapy (other therapies should be consistent between groups).

Outcome

Outcome measures included at least one of the following: Main outcome(s): Twenty-four-hour urinary frequency, Overactive Bladder Symptom Score(OABSS); Additional outcome(s): the volume of urine voided per micturition; quality of life questionnaire. Safety of the acupuncture will be evaluated through adverse events and withdrawals for any reason.

Data sources and search strategy

We searched the PubMed, Cochrane Library, Embase and three China databases(CNKI, VIP and Wanfang Data) from inception to 1 February 2024 using a combination of subject words and free words. The Chinese search terms included acupuncture, bladder hyperactivity disorder, meta-analysis, and systematic

evaluation, while the English search strategy was developed using the following MeSH terms and keywords: ('acupuncture' OR 'Pharmacopuncture') AND ('Overactive bladder' OR 'Overactive Urinary Bladder' OR 'Bladder, Overactive' OR 'Overactive Detrusor' OR 'Detrusor, Overactive' OR 'Overactive Detrusor Function' OR 'Detrusor Function, Overactive') AND ("systematic review" OR 'meta-analysis').

Data handling and extraction

Two researchers independently read and screened the literature according to the inclusion and exclusion criteria. After the screening, the information of the included literature was extracted into a pre-formulated Excel spreadsheet, which included the following information: first author, year of publication, information about the original study participants, Intervention, Control, Outcome, Study design(PICOS), interventions, quality assessment methods, outcome indicators, main conclusions, and funding. In cases of disagreement, a third researcher was consulted.

Methodological quality assessment

AMSTAR 2 [17] was employed to assess the methodological quality of the included studies. The tool comprises 16 items, with items 2, 4, 7, 9, 11, 13, and 15 being deemed critical. The quality level was stratified into four categories: high quality was assigned when non-compliance was less than or equal to 1 for non-critical items; moderate quality was assigned when non-compliance was more than 1 non-critical item; low quality was assigned when non-compliance was 1 critical item; and critically low quality was assigned when more than 1 critical item failed to meet the standard. The reporting quality was evaluated using PRISMA 2020 [18], which encompasses 27 items. Each item is scored on a scale of 0 to 1, with 0.5 points awarded for partial reporting and 0 points for no reporting (total score range: 0 to 27). A total score of 15 points or less is considered severely deficient, 16 to 21 points is considered slightly deficient, and 22 to 27 points is considered adequate [19]. The quality of evidence was assessed using the GRADE [20] approach, as recommended by the Cochrane Handbook. The evidence quality was categorized into four levels: high (no downward adjustment), moderate (one level of downward adjustment), low (two levels of downward adjustment), and very low (more than three levels of downward adjustment). Two investigators independently evaluated the quality of the included studies, and any discrepancies were resolved through discussion or by involving a third evaluator when necessary.

Heterogeneity among studies was classified using the I^2 [2], which ranges from 0% to 100%. Values under 25% were considered to have no heterogeneity, 25%

~50% were considered to have low heterogeneity, 50%~75% were considered to have moderate heterogeneity, and over 75% were considered to have high heterogeneity.

Results

Literature screening results

The preliminary review identified 710 relevant articles: CNKI, 410; Wanfang, 99; Embase, 69; PubMed, 80; Cochrane Library, 49; and VIP, 30. After the elimination of duplicates, 720 articles remained. The title and abstract screening eliminated 694 irrelevant studies; thus, 22 remained. The full-text review eliminated all but seven articles. The literature screening process and results are shown (Figure 1) [21–27].

Basic characteristics of included studies

Of the seven included SR/ME articles, two were published in Chinese [21,24], and five were published in English [22,23,25–27]. The included studies were published between 2011 and 2023. Each included 6–30

studies and a total of 241–4136 participants. The data extracted are shown (Table 1). All seven included studies described the quality assessment tools used, the methodological quality assessment of the included studies, and a meta-analysis of the results of the included studies.

Methodological quality assessment

The results of the AMSTAR 2 assessment showed that of the seven included studies, six were of critically low quality [21–25,27], and one was of low quality [26]. Among the critical entries, no study met the SR/MA of entry 7. Among the noncritical entries, entries 12, 14, and 16 were poorly rated, with three articles meeting entries 12 [23,26,27], one met entry 14 [21], and none met entry 16. The specific ratings for each entry are listed (Figure 2).

The article [26] with 'low' methodological quality concluded that acupuncture and moxibustion were effective in the treatment of OAB. Of the six papers with 'critically low' methodological quality, four articles [21,24,25,27] concluded that acupuncture and

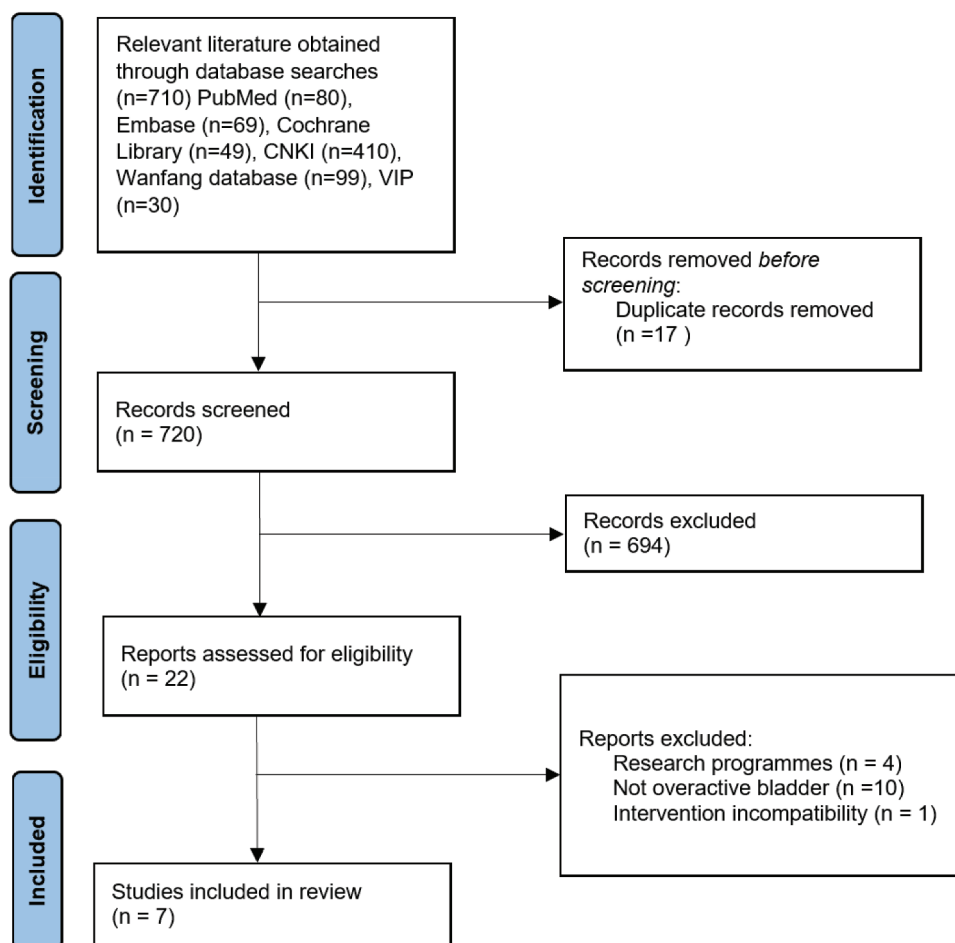


Figure 1. Literature search and screening process.

Table 1. Main characteristics of the included reviews.

Author, (year)	Types of included studies	No. of included studies (sample size/example)	intervention		Quality assessment tool	Main findings
			Treatment	control		
Hao Wang [27]	RCTs	6 (241)	acupuncture and moxibustion	other therapies	Cochrane Risk of Bias Assessment Tool	The efficacy and exact mechanism of acupuncture in the treatment of OAB need further study.
Wen Li [26]	RCTs	8 (762)	acupuncture and moxibustion	Western medicine	Cochrane Risk of Bias Assessment Tool	Acupuncture is equivalent to oral Western medicine in improving urinary symptoms in people with OAB and has a high safety rating.
Jung-Ju Lee [25]	RCTs	30 (4136)	acupuncture	other therapies	Cochrane Risk of Bias Assessment Tool	Acupuncture was better than sham acupuncture at reducing OAB symptoms. Acupuncture is comparable to conventional medication in improving OAB symptoms, and acupuncture combined with medication is more effective than medication alone. However, more rigorous trials are needed to increase the level of evidence.
Heyang Wang [24]	RCTs	16 (1337)	acupuncture and moxibustion/ acupuncture and moxibustion+other therapies	other therapies	Cochrane Risk of Bias Assessment Tool	The efficacy and safety of acupuncture or electroacupuncture in the treatment of OAB is favourable and superior to tolterodine medication, with no significant adverse effects reported, and remains to be confirmed by further studies in high-quality RCTs.
Tony C Mak [23]	RCTs	7 (695)	acupuncture and moxibustion	other therapies	Cochrane Risk of Bias Assessment Tool	There was no significant difference in efficacy or effectiveness between acupuncture and drug or sham acupuncture. Further high-quality research is needed.
Yuwei Zhao [22]	RCTs	10 (794)	acupuncture and moxibustion	other therapies	Cochrane Risk of Bias Assessment Tool	Acupuncture may reduce the number of voiding episodes, the number of incontinence episodes and the number of nocturia episodes. However, there is not enough evidence to prove the effectiveness of acupuncture alone or in combination with medication in treating OAB.
Hairong Xu [21]	RCTs	7 (518)	acupuncture and moxibustion	other therapies	Quality evaluation criteria of randomized controlled trials	Acupuncture therapy is more effective than the control group in improving the efficiency of daily urinary frequency grade, lower urinary tract symptom impact score and urinary incontinence questionnaire score in patients with overactive bladder. However, more research is needed to clarify the effectiveness of acupuncture on other indicators of overactive bladder.

Item	Q1	Q2*	Q3	Q4*	Q5	Q6	Q7*	Q8	Q9*	Q10	Q11*	Q12	Q13*	Q14	Q15*	Q16	Methodological quality
Hairong Xu, 2011 ²¹	Green	Red	Green	Yellow	Green	Green	Red	Green	Green	Green	Red	Red	Red	Green	Red	Red	critically low
Yuwei Zhao, 2018 ²²	Green	Green	Green	Yellow	Green	Green	Red	Green	Green	Green	Red	Red	Red	Red	Red	Red	critically low
Tony C Mak, 2019 ²³	Green	Red	Green	Yellow	Green	Green	Red	Green	Green	Red	Red	Green	Red	Red	Red	Red	critically low
Heyang Wang, 2023 ²⁴	Green	Red	Green	Yellow	Green	Green	Red	Green	Green	Green	Red	Red	Red	Red	Red	Red	critically low
Jung-Ju Lee, 2023 ²⁵	Green	Green	Green	Yellow	Green	Green	Red	Green	Green	Green	Yellow	Green	Green	Red	Green	Red	low
Wen LI, 2023 ²⁶	Green	Red	Green	Yellow	Red	Green	Red	Green	Green	Green	Red	Red	Red	Red	Yellow	Red	critically low
Hao Wang, 2023 ²⁷	Green	Red	Red	Yellow	Green	Green	Red	Green	Red	Green	Red	Green	Green	Red	Red	Red	critically low

Note: Q1: Did the research questions and inclusion criteria for the review include the components of PICO? Q2: Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol? Q3: Did the review authors explain their selection of the study designs for inclusion in the review? Q4: Did the review authors use a comprehensive literature search strategy? Q5: Did the review authors perform study selection in duplicate? Q6: Did the review authors perform data extraction in duplicate? Q7: Did the review authors provide a list of excluded studies and justify the exclusions? Q8: Did the review authors describe the included studies in adequate detail? Q9: Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review? Q10: Did the review authors report on the sources of funding for the studies included in the review? Q11: If meta-analysis was performed, did the review authors use appropriate methods for statistical combination of results? Q12: If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis? Q13: Did the review authors account for RoB in primary studies when interpreting/discussing the results of the review? Q14: Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review? Q15: If they performed quantitative synthesis, did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review? Q16: Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review? PICO, Patients, Intervention, Comparison, Outcomes; *: critical entry; Green: yes; Yellow: partial yes; Red: no; CL, critically low; L, low; H, high. https://amstar.ca/Amstar_Checklist.php

Figure 2. Results of the AMSTAR 2 assessments.

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Score	Quality
Hairong Xu, 2011 ²¹	Green	Yellow	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Yellow	Green	Yellow	Red	Red	Green	Green	Red	Green	Yellow	Yellow	Green	Yellow	Red	Yellow	Red	Red	16.5	somewhat deficient
Yuwei Zhao, 2018 ²²	Green	Yellow	Green	Green	Green	Green	Red	Yellow	Green	Red	Green	Yellow	Red	Red	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Red	Yellow	Red	Red	Red	17.0	somewhat deficient
Tony C Mak, 2019 ²³	Green	Yellow	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Green	Green	Green	Red	Red	Green	Green	Green	Green	Green	Green	Green	Yellow	Red	Green	Green	Green	22.0	relatively complete
Heyang Wang, 2023 ²⁴	Green	Yellow	Green	Green	Green	Green	Yellow	Green	Green	Red	Green	Yellow	Green	Red	Yellow	Green	Green	Green	Yellow	Green	Green	Yellow	Red	Yellow	Yellow	Red	Red	18.5	somewhat deficient
Jung-Ju Lee, 2023 ²⁵	Green	Yellow	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Yellow	Green	Yellow	Green	Yellow	Green	Green	Green	Yellow	Yellow	Green	Yellow	Red	Green	Green	Green	Green	22.0	relatively complete
Wen LI, 2023 ²⁶	Green	Yellow	Green	Green	Green	Green	Yellow	Green	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	Red	Red	Red	Yellow	Yellow	Yellow	Yellow	Red	Red	17.5	somewhat deficient
Hao Wang, 2023 ²⁷	Green	Yellow	Green	Green	Yellow	Green	Green	Green	Green	Yellow	Green	Red	Red	Red	Red	Yellow	Green	Green	Red	Red	Red	Yellow	Yellow	Yellow	Yellow	Green	Green	15.0	somewhat deficient

Note: Green: 1 score, Yellow: 0.5 score, Red: 0 score.

Figure 3. Results of the reporting quality evaluation of preferred reporting items for systematic reviews and meta-analyses (PRISMA).

moxibustion were effective in the treatment of OAB, one articles [22] concluded that acupuncture and moxibustion were probably effective in the treatment of OAB, and one article [23] concluded that the available evidence was not sufficient to demonstrate the benefits of acupuncture and moxibustion in the treatment of OAB.

Reporting quality appraisal

The reporting quality of the systematic reviews was assessed using the PRISMA 2020. 7 articles scored from 15.0 to 22. 5 articles [21,22,24,26,27] scoring 15–21 were considered to be ‘somewhat deficient’; 2 article [23,25] scoring more than 21 was considered to be ‘relatively complete’. Items 14 (reporting bias assessment), 15 (certainty assessment), 24 (registration and protocol), and 27 (others) were not fully reported. The details are shown in Figure 3.

GRADE quality grading of evidence

The GRADE scale was used to assess the quality of evidence for 34 outcome indicators and seven bodies of evidence related to 24-hour urinary frequency, Overactive Bladder Symptom Score (OABSS), quality of life, and adverse effects in seven studies (Table 2). It showed that one indicator had moderate-quality evidence, five had low-quality evidence, and 28 had critically-low-quality evidence; none had advanced-quality evidence.

Heterogeneity assessment

8 outcomes had no heterogeneity ($I^2 < 25\%$); 2 had low heterogeneity ($25\% < I^2 < 50\%$); 7 had moderate heterogeneity ($50\% < I^2 < 75\%$); and 12 had high heterogeneity ($I^2 > 75\%$). The meta-analyses with high heterogeneity used the outcome variables of 24 h urinary frequency, 24 h urinary urgency frequency, 24 h nocturia frequency, single

Table 2. GRADE quality of evidence ratings for key outcome indicators for the included literature.

Inclusion of studies	Outcome indicators (number of studies)	limitations	inconsistency	indirectness	precision	publication bias	Inclusion of studies
Hao Wang [27]	24-hour voiding diary (4)	-1①	-1③	0	0	-1④	critically low
	OABSS(2)	-1①	-1③	0	-1②	-1④	critically low
	IIQ-7(2)	-1①	-1③	0	-1②	-1④	critically low
	UDI-6(2)	-1①	-1③	0	-1②	-1④	critically low
Wen Li [26]	24 h urinary frequency (5)	-1①	-1③	0	0	0	critically low
	24 h urinary urgency frequency (4)	-1①	-1③	0	0	0	low level
	24 h nocturia frequency(3)	-1①	0	0	-1②	0	low level
	24 h urgent incontinence frequency (2)	-1①	-1③	0	-1②	0	critically low
	single voiding volume(5)	-1①	0	0	0	0	moderate
	OABSS(3)	-1①	-1③	0	-1②	0	critically low
Jung-Ju Lee [25]	AEs(3)	-1①	-1③	0	-1②	0	critically low
	OABSS(17)	-1①	-1③	0	0	-1④	critically low
	Frequency(21)	-1①	-1③	0	0	-1④	critically low
	Incontinence(11)	-1①	-1③	0	0	-1④	critically low
	Response rate(16)	-1①	-1③	0	0	-1④	critically low
	AEs(15)	-1①	0	0	0	-1④	low level
Heyang Wang [24]	OABSS(4)	-1①	-1③	0	0	-1④	critically low
	Nocturia episodes (2)	-1①	0	0	-1②	-1④	critically low
	Frequency/24 h(2)	-1①	0	0	-1②	-1④	critically low
	Urgency eplsodes/24 h (3)	-1①	0	0	-1②	-1④	critically low
	Urgency Incontinence eplsodes/24 h (4)	-1①	0	0	0	-1④	low level
	Voided volume (3)	-1①	-1③	0	-1②	-1④	critically low
Tony C Mak [23]	MCBC(3)	-1①	-1③	0	-1②	-1④	critically low
	24-hour frequency(3)	-1①	-1③	0	-1②	-1④	critically low
	Voided volume(3)	-1①	0	0	-1②	-1④	critically low
	OABSS (3)	-1①	-1③	0	-1②	-1④	critically low
Yuwei Zhao [22]	AEs(4)	-1①	0	0	0	-1④	low level
	24-hour micturition episodes(7)	-1①	-1③	0	0	-1④	critically low
	24-hour incontinence episodes(4)	-1①	-1③	0	0	-1④	critically low
	QOL(2)	-1①	0	0	-1②	-1④	critically low
Hairong Xu [21]	MCC(2)	-1①	-1③	0	-1②	-1④	critically low
	Urination diary (6)	-1①	-1③	0	0	-1④	critically low
	Urodynamic tests (3)	-1①	0	0	-1②	-1④	critically low
	Quality of life questionnaire (2)	-1①	0	0	-1②	-1④	critically low

Note: '0': not downgraded, '-1': downgraded one level. ① The original study was flawed in terms of randomisation, concealment, and blinding; ② the sample size was small and the confidence interval was wide; ③ the heterogeneity of the included studies was large; ④ the funnel plot suggests the possibility of publication bias.

voiding volume, OABSS, MCBC, MCC, and Urination diary.

Main outcome indicators

Twenty-four-hour urinary frequency

Seven papers analysed the effect of acupuncture therapy for OAB on the number of 24-h urinations. Of them, three showed that acupuncture therapy was significantly better than Western medicine at reducing the number of 24-h urinations [24–26]. Three others reported that acupuncture therapy was comparable to oral Western medicine at reducing the number of 24-h urinations [21–23]. Two papers showed that acupuncture therapy was more effective than sham acupuncture at reducing the number of 24-h urinations [22,25]. Seven papers consistently confirmed the significant effect of acupuncture

Overactive bladder symptom score

Five articles used the OABSS to evaluate the effectiveness of acupuncture for treating OAB [23–27]; All showed similar efficacies of acupuncture and drug

therapy at reducing OABSS. One of them reported that acupuncture combined with drug therapy could significantly reduce OABSS compared to monotherapy [25].

Secondary outcome indicators

Of the seven included papers, three reported the effect of acupuncture therapy on the volume of urine voided per micturition [23,24,26], while two assessed the effects of acupuncture on OAB using a quality of life questionnaire [21,22]. Five papers [21–24,27] totally indicate that acupuncture will have a positive impact on OAB patients.

Adverse events

The vast majority of studies reported no adverse effects of acupuncture therapy, while two reported on the occurrence of adverse events [23,26]. One paper reported that acupuncture therapy can cause bleeding [23], ecchymosis, mild discomfort or headache in OAB patients, but all patients thought that these adverse reactions were insignificant, and no patients withdrew. Another article did not report the

adverse events in detail [26], but clearly showed that acupuncture + moxibustion produced a significantly lower adverse reaction rate than oral western medicine therapy. Thus, it can be assumed that acupuncture therapy has a high level of safety.

Discussion

Quality of evidence

Level of evidence evaluation

The quality of the evidence was low in all cases, with five of the 34 trials being of low quality and 28 of very low quality. First, because acupuncture is more formally distinct from other therapies, most studies did not blind investigators and subjects and did not have specific allocation concealment protocols. In fact, only a few conducted intention-to-treat analyses but did not account for reasons for lost visits; therefore, they were downgraded for limitations in allocation concealment, blinding, and selective reporting. Second, differences in OAB symptom severity in the included studies, greater heterogeneity, and other issues were also the main factors that affected the quality of evidence rating. Future studies could make more use of randomised controlled trials and allocation concealment and try to blind investigators and subjects to improve the methodological quality.

Quality of reporting evaluation

This umbrella review used the AMSTAR 2 scale to assess the quality of reporting in the literature and found that only two studies had a systematic pre-evaluation programme and provided a registration number; of the relevant literature references [22,26], one did not report the financial support provided for the original study [23]; others also reflected the lack of training factors for the intervention, such as lack of study sites and follow-up periods.

Summary of findings

In recent years, the incidence of OAB has been increasing with age; however, its pathogenesis remains unclear, and no specific drug for OAB seriously impacts patients' health and quality of life. Acupuncture, as a traditional Chinese medicine, tonifies kidney qi, regulates bladder qi, and has a good therapeutic effect in the therapy of OAB [28–30]. In this study, the re-evaluation of relevant SRs/MAs found that acupuncture has the ability to reduce the number of 24-h urinations, 24-h urinary incontinence, the incidence of adverse effects, improve the OABSS, Incontinence Impact Questionnaire, Short Form and Urinary Distress Inventory, Short Form scores, and the clinical effectiveness of OAB therapy, the evidence quality is generally

low, and the guidance for clinical diagnosis and therapy is limited. The therapeutic mechanism of acupuncture is related to its ability to reduce Ca^{2+} ion concentrations in the interstitial cells of Cajal or regulate nerve growth factor or inhibit C-fibres to regulate bladder function or other pathways to improve the core OAB symptoms [31–34].

Study limitations

This review showed the relationship between acupuncture intervention and outcome indicators such as 24-h urinary frequency and summarised the controversial indicators that acupuncture can significantly improve, which is important for exploring research into therapies that reduce clinical symptoms of OAB. However, this review has some limitations. First, regarding acupuncture intervention trials, most studies did not report details of the acupuncture therapy protocol, such as acupuncture site and duration, so it was not possible to compare degree of symptom relief by acupuncture site and duration in more detail. Second, some of the outcomes in the studies included in this review were measured using questionnaires; therefore, they were somewhat subjective, which may have increased the risk of bias. The low quality and small number of included studies did not include studies not published in Chinese or English, which may have introduced publication bias.

Research outlook

Future randomised trials of acupuncture for OAB should clearly define and accurately report adverse events to better describe the efficacy of acupuncture therapy in patients with OAB. Second, most of the included studies were small randomised controlled trials of relatively moderate quality, with low or very low methodological quality and quality of evidence; therefore, our results should be interpreted with caution in the context of patients' specific conditions. Future studies should be conducted in accordance with the acupuncture clinical trial intervention reporting standard' for higher-quality [35], large-sample randomised controlled trials. Systematic reviews should be based on the Cochrane Handbook for Systematic Reviews of Interventions Standardised Production Study [36]. Third, to better assess trial design quality, information on allocation concealment, blinding of outcome assessors, outcomes data, and therapy course should be provided before participants are enrolled in the trial. Fourth, given that very few studies have provided data on adherence to acupuncture therapy, future studies should report this information, as it not only significantly impacts the outcome, but it also determines whether subjects are able to adhere to therapy

regimens in the long term, which is key to the benefits of an acupuncture therapy protocol. The safety and adherence to acupuncture therapy will be enhanced by a design that considers the subjects' initial clinical symptoms, therapy goals, and willingness to be treated through rationalisation of the therapy protocol, regular follow-up, and timely adjustment of acupuncture duration and site.

Conclusion

Acupuncture features high safety and a low incidence of adverse effects, has a moderate to large effect on improving the clinical symptoms of patients with OAB, and can significantly improve the quality of life and well-being of affected patients. Acupuncture may be the best alternative for patients with OAB who respond poorly to oral Western medications or who experience severe side effects. However, a standardised acupuncture therapy protocol for patients with OAB is lacking. Future studies should adopt a more standardised study design when applying it to acupuncture therapy and investigate the long-term effects of an effective acupuncture therapy protocol on reducing clinical symptoms, lowering OABSS, and improving quality of life.

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