



Reporting quality of acupuncture overviews: A methodological investigation based on the PRIOR statement

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ARTICLE INFO

Keywords:

Acupuncture
Overviews
PRIOR statement
Reporting quality
Systematic reviews

ABSTRACT

Objective: Acupuncture overviews are increasing rapidly; however, their reporting quality is yet unclear. We aimed to investigate the reporting quality of relevant overviews according to the preferred reporting items for overviews of reviews (PRIOR) statement.

Methods: We systematically searched PubMed from inception to August 16, 2022 for overviews on acupuncture therapies. Reporting quality of included overviews was evaluated using the PRIOR statement, and the results were cross-checked. Multiple linear regression analysis was used to assess the predictors of the reporting completeness. GraphPad 9.4 was utilized to generate an evidence map, Excel 2019 was used to extract and manage data, and R 4.2.3 was used for data analysis.

Results: A total of 49 overviews published from 2006 to 2022 were included, of which China ranked first with 38 overviews. The most frequently searched database was PubMed/ Medline (n = 48, 98%), and commonly used methodological quality assessment tool was AMSTAR-2 (n = 14, 29%). The overarching themes centered on acupuncture for obstetrics, gynecology, reproductive diseases, as well as depression, anxiety, and insomnia. Reporting quality needs to be improved involving the definition of systematic reviews (SRs), overlap of primary studies and SRs, methods for managing discrepant data across SRs, risk of bias in primary studies, heterogeneity, and sensitivity analysis of synthesized results, reporting bias assessment, and registration and protocol. Moreover, publication in recent years and receiving funding support were significantly associated with higher overall reporting quality score ($P < 0.05$).

Conclusion: Based on the PRIOR statement, this methodological study indicates that the reporting quality of the included acupuncture overviews is poor. In the future, authors of overviews are encouraged to use the PRIOR statement for standardized reporting. Furthermore, it is recommended that journal editors mandate the inclusion of this statement in authors' reports and require a complete PRIOR checklist.

1. Introduction

Acupuncture is a form of traditional and complementary medicine that originated 3000 years ago from China.¹ In this treatment modality, acupuncture is to insert needles into specific acupoints on the human meridians (paths through which the vital energy known as “qi” flows) to correct disruptions in harmony.² According to the World Health Organization (WHO) Global Report 2019, acupuncture has been widely used

worldwide.³ The United Kingdom (UK)'s National Health System (NHS) recommends acupuncture for headache, migraine, back pain, arthritis, etc.⁴ The National Institutes of Health (NIH) reported that physicians provide acupuncture therapy for 3 to 6 million patients annually in the United States (US).⁵ In 2015, the World Federation of Acupuncture-moxibustion Societies (WFAS) found that 39 countries included acupuncture in their medical insurance, and 31 encouraged or permitted its use.⁶ In China, acupuncture is a key focus of the national

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research agenda; in 2016, the State Council issued a national strategy supporting universal access to acupuncture by 2020.⁷

A systematic review (SR) is a popular evidence synthesis method that focuses on a specific question and uses a clear, prespecified scientific methods to identify, select, evaluate, and summarize the results of similar but independent studies.⁸ The results of SRs and meta-analyses (MAs) are usually used to underpin guidelines and inform health decisions to improve clinical practice and public health.⁹ In a recent investigation, Lu et al. identified 2471 SRs of acupuncture therapies in Web of Science and noted that the number of SRs increased annually between 2000 and 2020.¹⁰ However, it is a difficult task to identify and interpret evidence from a growing number of redundant, misleading, or conflicting SRs.¹¹ To address these difficulties, a new form of evidence synthesis named overview of reviews, also known as umbrella review, was developed, which focused on collecting, evaluating and synthesizing evidence on specific topics from multiple SRs.¹² However, the number of overviews has also grown exponentially over the past two decades.¹² For instance, a bibliographic analysis included 1558 overviews published in English from 2000 to 2020, of which more than 50% overviews were published from 2017 to 2020.¹³ Therefore, overviews are facing an embarrassing situation similar to SRs. The reporting quality of the research can be defined as “how well the methodology and results of a research were reported”.^{14,15} Incomplete reporting can reduce the transparency and credibility of research, as well as its clinical applicability, leading to a waste of research resources.^{14,16,17} A large number of acupuncture-related overviews have been published in recent years, but their reporting quality is unclear.

The BMJ recently published the reporting guidelines for overviews.¹² The preferred reporting items for overviews of reviews (PRIOR) statement focus on overviews that examine the efficacy, effectiveness, and safety of healthcare interventions and present descriptive summaries and the results of SRs.¹² The primary purpose of developing reporting guidelines is to help researchers improve the integrity and transparency of their research reports.¹⁸ Many reporting guidelines such as PRISMA and CONSORT have been widely used to evaluate the reporting quality of SRs and clinical trials.^{19,20} Therefore, we conducted this study to comprehensively investigate the reporting quality based on PRIOR assessment and use evidence mapping to display publication features of overviews.^{17,21} In addition, multiple linear regression analysis was used to explore the predictors of reporting quality of the included acupuncture overviews.

2. Methods

The study was reported in accordance with the PRISMA 2020 (**Appendix 1**).²² The present study was not prospectively registered, because PROSPERO does not accept the registration of methodological studies.

2.1. Search Strategy

The PubMed database was systematically searched from inception to August 16, 2022, for overviews investigating acupuncture therapies using the following main search terms: “acupuncture,” “electroacupuncture,” “acupuncture therapy,” “overview of reviews,” “overview of systematic reviews,” and “umbrella review.” We also checked the reference lists of included overviews to find potential eligible studies. The detailed search strategy is provided in **Appendix 2**.

2.2. Inclusion and exclusion criteria

The inclusion criteria were as follows: (1) Participants: human subjects; (2) Interventions: acupuncture (e.g., electroacupuncture, auricular acupuncture) and acupuncture-based therapies (e.g., acupoint injection); (3) Comparison and outcomes: no restrictions; (4) Study design: overviews of SRs/MAs; and (5) Language: English. Studies were

excluded if they met the following criteria: acupuncture combined Chinese herbal, moxibustion and cupping therapy, repeated publications, dissertations, letters, editorials, comments, protocols, conference abstracts, and full text unavailable for overview.

2.3. Study selection and data extraction

All records were imported into EndNote X9 (Clarivate Analytics). Two researchers independently screened studies by reading the title and abstract, and then read the full text to find eligible studies. Data were extracted from each included study by two researchers including the following information: first author, year of publication, country of first author, type of diseases, journal and its impact factor (IF) of 2021, registration information, databases searched, number of reviews included in overviews, whether reanalyze the data using MAs, quality assessment tools of SRs, use of Grading of Recommendations Assessment, Development, and Evaluation (GRADE), funding source, and conflict of interest declaration. In this process, any discrepancies were resolved by consensus with a third researcher.

2.4. Quality assessment

The PRIOR statement consists of 46 (sub)items covering all steps and considerations involved in planning and conducting an overview of healthcare interventions.¹² Two independent researchers assessed the reporting quality of overviews based on the completeness of PRIOR statement items reported in the included overviews. We refer to the methods previously used in a methodological study,²¹ each (sub)item was evaluated with three options: “Yes,” “Partial Yes,” or “No,” in which were marked with 1, 0.5, or 0 points, respectively. Any disagreements were consulted with a third researcher.

2.5. Data analysis

Descriptive analyses were used to summarize general characteristics of included overviews. We calculated the percentage of the option of each item with a 95% confidence interval (CI).²³ We also performed multiple linear regression analysis to evaluate whether publication year, IF, number of reviews, and funding support were the predictors of the reporting completeness.²⁴ When the variance inflation factor (VIF) was less than 10, indicating that the multicollinearity was insignificant.²⁵ GraphPad 9.4 (GraphPad Software, USA) was used to generate an evidence map and visualized the overall reporting quality of the included overviews.²³ In the map, the X-axis represented the year of publication, and the Y-axis represented the overall reporting quality score, and each bubble represented an overview; the size of the bubble represented the number of included SRs/MAs, and its color indicated the countries of the first author. Excel 2019 (Microsoft Corporation, Redmond, WA, USA) was used to extract and manage data, and R 4.2.3 (R Project for Statistical Computing) was used to analyze the data. In the results, $P < 0.05$ was considered statistically significant.

3. Results

3.1. Results of study selection

A total of 131 records were identified, of which 128 were identified through database search and 3 through supplementary search. No duplicate records were identified, 60 records were excluded after reading the title and abstract. Subsequently, 71 full texts were selected for further screening, 49 overviews (**Appendix 3**) were eventually included in this methodological study. The flowchart of study selection is shown in **Fig. 1**.

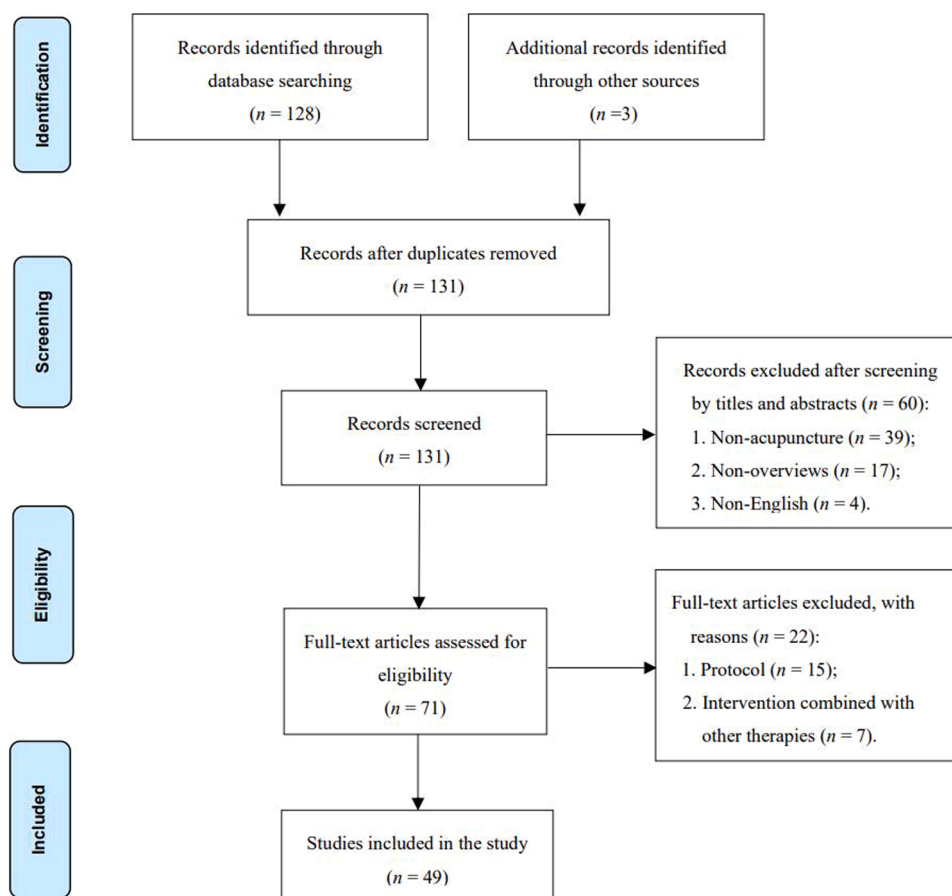


Fig. 1. Flowchart of study selection.

3.2. Characteristics of included overviews

The included overviews were published between 2006 and 2022, of which 37 (76%) were published after 2016. Regarding the authors' countries, China ranked first with 38 (78%) overviews. The majority of overviews ($n = 23$; 47%) were published in journals with IF less than 3, 16 (33%) were published in journals with IF 3 and 5, and 10 (20%) were published in journals with IF greater than 5. Most overviews ($n = 35$; 71%) were not registered, or their registration information was not reported, while 14 overviews (29%) were registered on the PROSPERO. Forty-eight overviews (98%) searched PubMed/ Medline, 47 searched the Cochrane Library, and 43 searched Embase. The themes of overviews mainly focused on acupuncture for obstetrics, gynecology, reproductive diseases, depression, anxiety, or insomnia, accounting for 32%.

Regarding certainty of evidence, 29 overviews (59%) used GRADE. Thirteen overviews (27%) included less than 10 SRs, 25 (51%) included between 10 and 20, and 11 (22%) included more than 20 SRs. Eleven overviews (22%) reanalyzed the data using MAs. Forty-eight overviews (98%) used quality assessment tool, of which 14 (29%) exclusively utilized AMSTAR-2, and 10 (20%) employed both AMSTAR-2 and PRISMA 2009. Thirty-four (69%) overviews received funding support, whereas 15 (30%) declared no funding support or did not report it. Forty-six overviews (94%) declared no conflicts of interest. The characteristics of the included overviews are summarized in Table 1.

3.3. Reporting quality of included overviews

The PRIOR assessment results are presented in Figs. 2 and 3. For item 1 (Title), 45 overviews (91.84%, 95% CI 80.81% to 96.78%) were evaluated as "Y" and four (8.16%, 95% CI 3.22% to 19.19%) as "N". For

item 2 (Abstract), 37 overviews (75.51%, 95% CI 61.91% to 85.40%) were evaluated as "Y" and 12 (24.49%, 95% CI 14.60% to 38.09%) as "PY". For item 3 (Rationale), 44 overviews (89.80%, 95% CI 78.24% to 95.56%) provided a rationale for conducting overviews rating as "Y", while the other five (10.20%, 95% CI 4.44% to 21.76%) were evaluated as "PY". For item 4 (Objectives), 47 overviews (95.92%, 95% CI 86.29% to 98.87%) provided an explicit objective rating as "Y", the other two (4.08%, 95% CI 1.13% to 13.71%) were evaluated as "PY". Item 5 (Eligibility criteria) consists of two sub-items (5a-b). For item 5a, 42 overviews (85.71%, 95% CI 73.33% to 92.90%) specified inclusion and exclusion criteria rating as "Y", and seven (14.29%, 95% CI 7.10% to 26.67%) were evaluated as "PY". For item 5b, only four overviews (8.16%) defined "SR" rating as "Y", whereas 45 (91.84%) were evaluated as "N".

For item 6 (Information sources), 28 overviews (57.14%, 95% CI 43.27% to 69.98%) were rated as "Y" and 21 (42.86%, 95% CI 30.02% to 56.73%) as "PY". For item 7 (Search strategy), only 18 overviews (36.73%, 95% CI 24.67% to 50.73%) were rated as "Y", 21 (42.86%) as "PY", and 10 (20.41%, 95% CI 11.48% to 33.63%) as "N". Item 8 (Selection process) consists of two sub-items (8a-b). For item 8a, 32 overviews (65.31%, 95% CI 51.31% to 77.08%) described literature selection methods rating as "Y", 15 (30.61%, 95% CI 19.52% to 44.53%) were evaluated as "N", the other two (4.08%) as "PY". For item 8b, none of the overviews described the overlap of SRs.

Item 9 (Data collection process) consists of three sub-items (9a-c). For item 9a, 33 overviews (67.35%, 95% CI 53.38% to 78.79%) described data collection methods rating as "Y", while 13 (26.53%, 95% CI 16.21% to 40.26%) were evaluated as "PY" and three (6.12%, 95% CI 2.10% to 16.52%) as "N". For item 9b, only three overviews (6.12%) described the overlap of primary study across SRs rating as "Y", whereas remaining (93.88%, 95% CI 83.48% to 97.90%) were evaluated as "N". For item 9c,

Table 1
Characteristics of the included overviews.

Basic characteristics	N	Percentage
Publication year		
2006-2015	12	24%
2016-2020	20	41%
2021-2022	17	35%
Country of the first author		
China	38	78%
UK	5	10%
Other	6	12%
Impact factor		
< 3	23	47%
3-5	16	33%
> 5	10	20%
Registration		
Yes	14	29%
No/not reported	35	71%
Number of reviews		
< 10	13	27%
10-20	25	51%
> 20	11	22%
Reanalyze the data using meta-analysis		
Yes	11	22%
No	38	78%
Database searched		
PubMed/ Medline	48	98%
Cochrane Library	47	96%
Embase	43	88%
CNKI	38	78%
CBM	36	73%
Wan Fang	33	67%
VIP	31	63%
Web of Science	23	47%
Use of GRADE		
Yes	29	59%
No	20	41%
Quality assessment of reviews		
Yes	48	98%
No	1	2%
Tool for quality assessment of reviews		
OQAQ	7	14%
AMSTAR	5	10%
AMSTAR-2	14	29%
PRISMA 2009	1	2%
AMSTAR-2 + ROBIS	3	6%
PRISMA 2009 + ROBIS	1	2%
AMSTAR + PRISMA 2009	1	2%
AMSTAR-2 + PRISMA 2009	10	20%
AMSTAR-2 + ROBIS + PRISMA-A	4	8%
AMSTAR-2 + ROBIS + PRISMA 2009	2	4%
Type of diseases		
Obstetrics, gynecology, or reproductive diseases	8	16%
Depression, anxiety, or insomnia	8	16%
Cognitive impairment, or Parkinson's disease	5	10%
Hypertension, stroke, or cardiac diseases	5	10%
Knee osteoarthritis or rheumatic conditions	4	8%
Headache	4	8%
Functional dyspepsia or constipation	2	4%
Unstated/Other	13	26%
Funding support		
Yes	34	69%
No	7	14%
Not reported	8	16%
Conflict of interest		
No	46	94%
Not reported	3	6%

Note: UK, United Kingdom; CNKI, China National Knowledge Infrastructure; CBM, Chinese Biomedical Databases; VIP, China Science and Technology Journal Databases; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; OQAQ, Overview Quality Assessment Questionnaire; AMSTAR, A Measurement Tool to Assess Systematic Reviews; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; PRISMA-A, Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Acupuncture; ROBIS, Risk of Bias in Systematic Review.

all included overviews did not describe the methods for handling discrepant data across SRs and were rated as "N". For item 10 (*Data items*), only six overviews (12.24%, 95% CI 5.73% to 24.24%) described and defined all variables and outcomes rating as "Y", whereas 33 (67.35%) were evaluated as "PY" and 10 (20.41%) as "N". Item 11 (*Risk of bias assessment*) comprises three sub-items (11a-c). For item 11a, 45 overviews (91.84%) assessed risk of bias or methodological quality of SRs rating as "Y", two (4.08%) were evaluated as "PY" and two (4.08%) as "N". For item 11b, only three overviews (6.12%) assessed the risk of bias of the primary studies and were rated as "Y", whereas 46 (93.88%) were evaluated as "N". For item 11c, none of the overviews assessed the risk of bias of supplemental primary studies and were rated as "N". Item 12 (*Synthesis methods*) consists of three sub-items (12a-c). For item 12a, 22 overviews (44.90%, 95% CI 31.85% to 58.68%) described the method of summarizing or synthesizing the results rating as "Y", 27 (55.10%, 95% CI 41.32% to 68.15%) were evaluated as "N". For item 12b, only six overviews (12.24%) described the method used to explore heterogeneity among results and were rated as "Y", whereas 43 (87.76%, 95% CI 75.76% to 94.27%) were evaluated as "N". For item 12c, only two overviews (4.08%) described the method of sensitivity analyses rating as "Y", whereas remaining 47 (95.92%) were evaluated as "N". For item 13 (*Reporting bias assessment*), six overviews (12.24%) were evaluated as "PY" and 43 (87.76%) as "N". For item 14 (*Certainty assessment*), 29 overviews (59.18%, 95% CI 45.25% to 71.78%) evaluated evidence certainty for an outcome and were rated as "Y", 20 (40.82%, 95% CI 28.22% to 54.75%) were evaluated as "N".

In terms of item 15 (*Systematic review and supplemental primary study selection*), which consists of two sub-items (15a-b). For item 15a, 48 overviews (97.96%, 95% CI 89.31% to 99.64%) described the results of the search and selection process and were rated as "Y", whereas one (2.04%, 95% CI 0.36% to 10.69%) was evaluated as "PY". For item 15b, only 18 overviews (36.73%) provided a list of included studies and the reason for exclusion and were rated as "Y", while 27 (55.10%) were evaluated as "PY" and four (8.16%) as "N". For item 16 (*Characteristics of systematic reviews and supplemental primary studies*), only three overviews (6.12%) were rated as "Y" and 46 (93.88%) as "PY". For item 17 (*Primary study overlap*), none of the overviews described the result of the overlap of primary study rating as "N". Item 18 (*Risk of bias in systematic reviews, primary studies, and supplemental primary studies*) consists of three sub-items (18a-c). For item 18a, 42 overviews (85.71%) provided the result of the risk of bias assessments or methodological quality for included SRs and were rated as "Y", whereas six (12.24%) were evaluated as "PY" and one (2.04%) as "N". For item 18b, only four overviews (8.16%) provided the result of the risk of bias assessments for the primary studies included SRs rating as "Y", whereas 45 (91.84%) were evaluated as "N". For item 18c, none of the overviews presented the result of the risk of bias assessments for supplemental primary studies, which was assessed as "N". Item 19 (*Summary or synthesis of results*) consists of three sub-items (19a-c). For item 19a, 33 overviews (67.35%) summarized the result from the SRs and were rated as "Y", while nine (18.37%, 95% CI 9.98% to 31.36%) were evaluated as "PY" and seven (14.29%) as "N". For item 19b, only seven overviews (14.29%) conducted MAs and presented the result of heterogeneity and were rated as "Y", whereas 42 (85.71%) were evaluated as "N". For item 19c, only three overviews (6.12%) conducted MAs and presented the result of sensitivity analyses and were rated as "Y", the remaining 46 (93.88%) were evaluated as "N". For item 20 (*Reporting biases*), 29 overviews (59.18%) presented reporting biases rating as "Y", 20 (40.82%) were evaluated as "N".

For item 21 (*Certainty of evidence*), 29 overviews (59.18%) were rated as "Y" and 20 (40.82%) as "N". Item 22 (*Discussion*) consists of four sub-items (22a-d). For item 22a, all overviews summarized the main findings of the included SRs rating as "Y". For item 22b, 45 overviews (91.84%) provided a general interpretation of the results and were rated as "Y", whereas four (8.16%) were evaluated as "N". For item 22c, 46 overviews (93.88%) discussed the limitations of the evidence from SRs and were

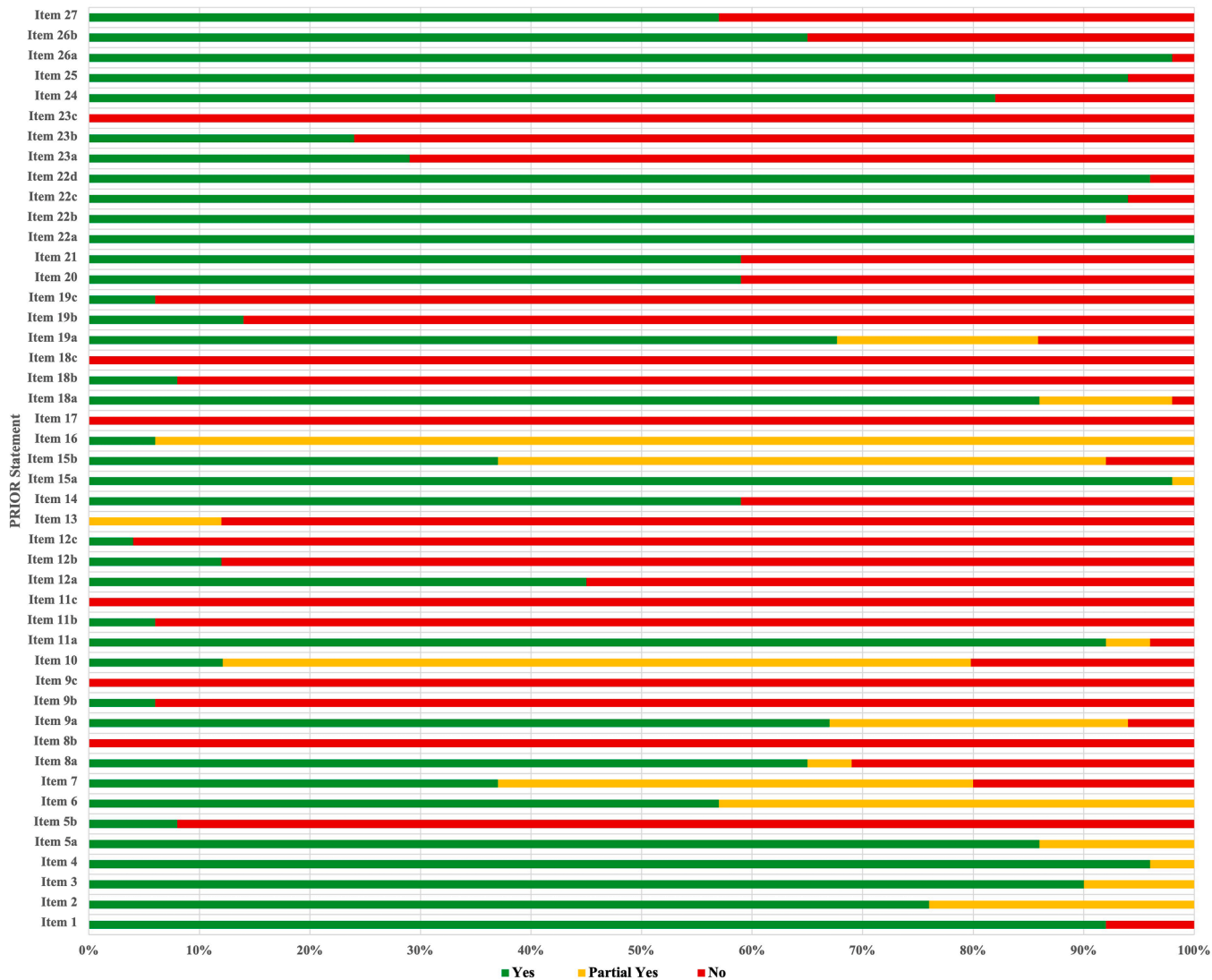


Fig. 2. Reporting quality of the included overviews.

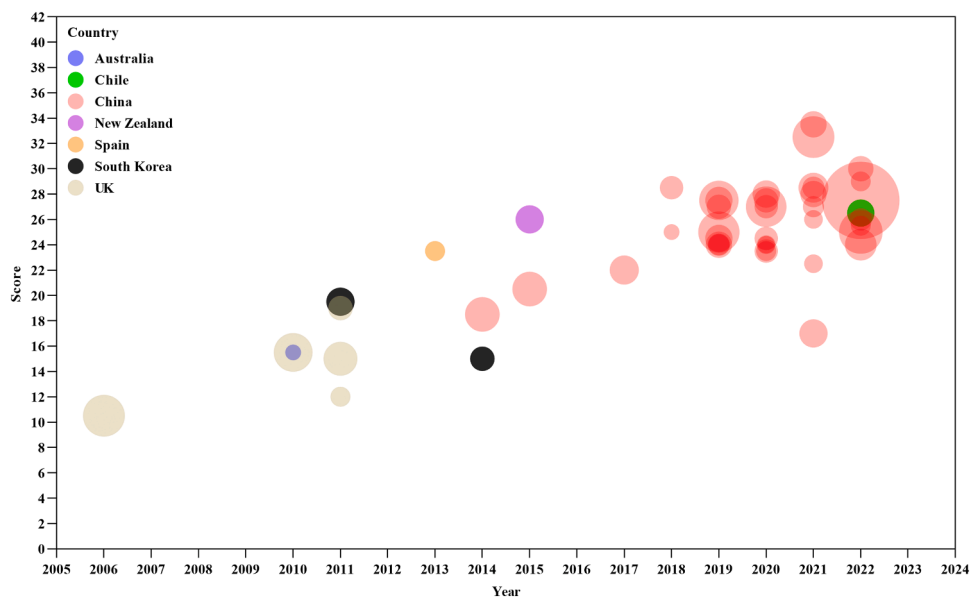


Fig. 3. Evidence mapping of reporting quality.

rated as “Y”, while three (6.12%) were evaluated as “N”. For item 22d, 47 overviews (95.92%) discussed the implications for practice, policy, and future research and were rated as “Y”, whereas two (4.08%) were evaluated as “N”. In terms of item 23 (*Registration and protocol*), which consists of three-sub items (23a-c). For item 23a, only 14 overviews (28.57%, 95% CI 17.85% to 42.41%) provided registration information for the overviews and were determined as “Y”, the remaining 35 (71.43%, 95% CI 57.59% to 82.15%) were evaluated as “N”. For item 23b, only 12 overviews (24.49%) provided a protocol for the overviews and were rated as “Y”, while 37 (75.51%) were evaluated as “N”. For item 23c, none of the overviews described amendments information of registration or protocol rating as “N”. For item 24 (*Support*), 40 overviews (81.63%, 95% CI 68.64% to 90.02%) provided the information of financial support for the overviews and were rated “Y”, whereas nine (18.37%) were evaluated as “N”. For item 25 (*Competing interests*), 46 overviews (93.88%) were marked as “Y” and three (6.12%) as “N”. Item 26 (*Author information*) consists of two sub-items (26a-b). For item 26a, 48 overviews (97.96%) provided contact information (i.e., Email) for the corresponding author rating as “Y”, one (2.04%) was evaluated as

“N”. For item 26b, 32 overviews (65.31%) described the contributions of individual authors for the overviews and were rated as “Y”, and 17 (34.69%, 95% CI 22.92% to 48.69%) as “N”. For item 27 (*Availability of data and other materials*), 28 overviews (57.14%) were marked as “Y”, and 21 (42.86%) as “N”. Detailed assessment results are provided in **Appendix 4**.

3.4. Predictors of the reporting quality

In the methodological study, we used multiple linear regression to explore the predictors of the overall reporting quality. Findings from the regression analysis showed that the recent publication year and receiving funding support were associated with higher overall reporting quality ($P < 0.05$). However, IF and number of reviews were not significantly associated with reporting quality ($P > 0.05$). According to the prespecified criteria, $VIF_{max} = 2.06$, indicating insignificant collinearity. The detailed results are shown in **Fig. 4**.

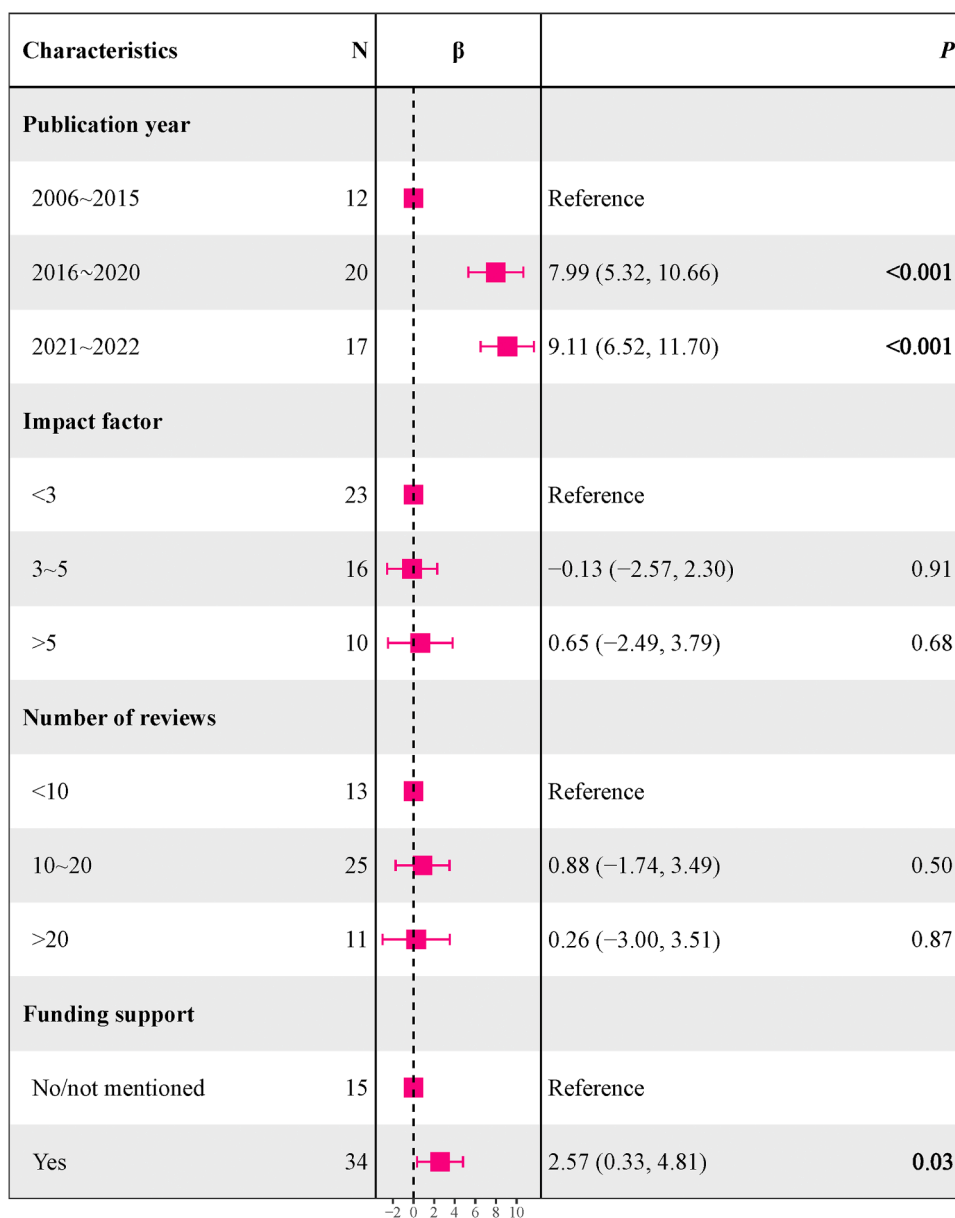


Fig. 4. Results of multiple linear regression analysis.

4. Discussion

In this methodological study, we systematically searched PubMed to obtain studies concerning acupuncture overviews published in English. A total of 49 overviews published between 2006 and 2022 were identified, their reporting quality was investigated, and predictors were explored. China contributed to the largest number of publications, accounting for 78% of the included overviews, followed by UK. The majority of journals that published these overviews had IFs below five. The studies concerning acupuncture overviews were mainly searched in English databases, and the search frequency of Chinese databases was relatively insufficient. The themes included in the overviews mostly focused on acupuncture in treating obstetrics, gynecology, reproductive diseases, depression, anxiety, and insomnia, etc. A couple of studies also found that acupuncture was often used to treat obstetrics, gynecology, musculoskeletal and connective tissue diseases, and neurological disorders, etc.^{26,27}

The PRIOR statement is a rigorously designed, systematic, and transparent reporting guideline for overviews. We used it to investigate the reporting quality of acupuncture relevant overviews comprehensively. The reporting quality of included overviews needed to be improved particularly in items 5b, 6, 7, 8b, 9b-c, 10, 11b-c, 12a-c, 13, 15b, 16, 17, 18b-c, 19b-c, 23a-c, and 27, the percentages were all less than 60% for “Y”.²¹ SRs or overviews need to be clearly defined to ensure the similarities of all included studies. However, we found that only four overviews explicitly defined the included SRs. A study included 111 overviews and found that only 8 overviews explicitly reported the definition of SRs, consistent with our results.²⁸ In addition, although many researches stated as ‘SRs’, those were not performed following systematic methods.²⁹ Therefore, the author of future overviews should clearly define a SR. A detailed search strategy can improve transparency and allow readers to assess the comprehensiveness and completeness of the study.²² In our study, only 18 overviews provided detailed search strategies. If the primary study is counted multiple times in data processing projects, its sample size and the number of events can be inflated.³⁰ It also hindered the reader’s ability to interpret the overview results. Several methods have been used to deal with overlap, such as corrected covered area.³¹ However, we found that 49 overviews did not describe the methods used to identify the overlap of SRs, and the results of primary studies overlap across the included SRs. A previous study found that only 32 out of 60 included overviews mentioned overlap.³² As incorrect data can affect the reliability of SRs results, authors should clearly provide the procedures used to identify discrepancies and correct data. However, our results found that none of the overviews described the methods used to manage discrepant data across SRs during data collection. This result is analogous to another study, in which only three overviews were found to report methods for handling discrepant data.³⁰

Listing and defining all variables and outcomes help readers assess the relevance of included SRs to their needs, as well as the scope and nature of primary studies.¹² We found only three overviews that listed and defined all variables and outcomes of included SRs. To improve research transparency and credibility, authors should clearly describe methods for assessing the risk of bias in primary studies and dealing with missing or inconsistent data.²² However, we found that only three overviews described the methods for assessing the risk of bias, and four overviews provided results of risk of bias assessments for primary studies included SRs. These results are similar to a previous publication that investigated 50 overviews and found that 72% of overviews did not provide any information about the risk of bias in the primary studies.³⁰ Selective non-publication or selective non-reporting of results may lead to a risk of bias caused by missing results.²² We found that only six overviews described the methods used to assess the risk of bias due to missing results. It is recommended that authors should compare the registration protocol, protocol, or planned statistical analysis method with the results of study reported. It is important to explore the

heterogeneity of SRs results, which can help judge the findings’ reliability.¹⁹ Various methods such as meta-regression and subgroup analysis have been used to explore it. However, our results found that only six overviews described the methods used to explore the source of heterogeneity of SRs, and seven overviews presented the results of possible causes of heterogeneity. Sensitivity analyses can verify the robustness of SRs results and help authors and readers better understand how these decisions may affect study outcomes.³³ We found that only two overviews conducted sensitivity analyses and described measures taken to assess the robustness of the included SRs, and three overviews presented the results of sensitivity analyses. Previous studies have revealed widespread inconsistencies between protocols and published primary studies and SRs.³⁴ However, few authors reported protocol deviations in published SRs,³⁵ consistent with our results that none of the overviews provided any amendments information at registration or in the protocol. Authors should clearly document and provide reasons for research protocol modifications so that readers can more easily judge the impact of protocol deviations.

Therefore, the items mentioned above need to be significantly improved through the PRIOR statement. There is growing evidence that the use of reporting guidelines is associated with improved reporting quality of health research and an indirect positive impact on how researchers design and conduct research.^{9,18} However, we did not find the applicability of similar topics in the assessment process. The PRIOR statement may need an extension for overviews that answer different types of questions (e.g., qualitative, prognostic, and diagnostic accuracy).¹² Some scholars also put forward a similar view and proposed to develop an extension for acupuncture or traditional Chinese medicine.³⁶

In addition to assessing reporting quality, we also explored the predictors of the overall reporting quality. The recent publication year and receiving funding support exhibited an association with higher reporting quality score. But there was no significant relevance in IF and the number of reviews. A cross-sectional study investigating 529 dose-response MAs using PRISMA found that more recent reporting was associated with higher reporting quality score.³⁷ However, Fleming et al. evaluated the methodological quality of 327 SRs published in core clinical journals with high and low IF. They found that increasing journal IF was significantly associated with higher methodological quality.³⁸ Journals’ IFs may be influenced by industry funding, large studies, and group authorship associated with higher citation numbers.³⁸ We found that acupuncture overviews receiving funding support were associated with higher reporting quality score. Similarly, a recent study also found that dose-response MAs receiving funding support was associated with higher methodological quality score.³⁹

To our knowledge, this is the first study using the PRIOR statement to assess the reporting quality of acupuncture therapies-related overviews. Evidence mapping was used to visualize the results of reporting quality assessment, and percentages and 95% CI were calculated for each option. Moreover, multiple linear regression was used to explore the predictors influencing the reporting quality. However, our study also has several limitations. We only searched the PubMed database and included overviews published in English. This may restrict the generalizability of the results. However, studies derived from a single PubMed database are often used to conduct methodological studies.^{40,41}

5. Conclusion

In conclusion, based on the PRIOR statement, the reporting quality of the included overviews on acupuncture is poor. The methodological study suggests that improvements are needed in the definition of SRs, the overlap of primary studies and SRs, methods for managing discrepant data across SRs, risk of bias in primary studies, the heterogeneity and sensitivity analysis of synthesized results, reporting bias assessment, and registration and protocol. In the future, when reporting overviews, researchers are encouraged to adhere to the PRIOR

statement. Furthermore, journal editors should require authors to incorporate the statement in their reports, provide a complete PRIOR checklist.

Funding

This research was funded by Gansu Provincial Youth Science and Technology Fund Program (No. 22JR5RA706) and Gansu Provincial Excellent Doctor Fund Program (No. 22JR5RA649).

CRediT authorship contribution statement

Tingting Lu: Writing – original draft, Data curation, Writing – review & editing. **Bin Liu:** Writing – original draft, Data curation, Writing – review & editing. **Cuncun Lu:** Conceptualization, Methodology, Formal analysis, Writing – review & editing. **Zouxi Du:** Methodology, Writing – review & editing. **Kehu Yang:** Methodology, Writing – review & editing. **Long Ge:** Project administration, Formal analysis, Data curation, Writing – review & editing.

Declaration of Competing Interest

Authors declare none.

Acknowledgements

None.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.ctim.2024.103034](https://doi.org/10.1016/j.ctim.2024.103034).

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