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Original Article

An evidence map on traditional medicine across health outcomes

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ABSTRACT

Background: Traditional medicine (TM) plays a significant role in healthcare either as part of the primary health-care system or as an adjunct to conventional medicine. This study aimed to map systematic reviews (SRs) of TM modalities across health conditions and identify gaps in the research literature to facilitate priority setting in future TM research.

Methods: We searched 17 databases from January 2018 to December 2022. Reviewers in pairs independently performed the database search, screened each record for inclusion, extracted data, and performed quality assessments using the AMSTAR 2 - A Measurement Tool to Assess systematic Reviews. To be included in this evidence

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map, the studies had to be SRs of clinical studies that evaluated the effectiveness of a TM modalities. The included SRs were analyzed according to TM modality, ICD-11 disease classification, and health outcomes, and visualized using graphical plots.

Results: We retrieved 241,509 records. After excluding duplicate records, 181,616 titles and abstracts were screened and 20,856 records were selected for full-text assessment, of which 18,137 records were further excluded. The final 2719 included SRs were primarily in adults (2591) with only 128 SRs in the pediatric population. The most commonly evaluated health conditions were diseases of the digestive system, circulatory system, and genitourinary system, with herbal medicine (n = 1867) and acupuncture (n = 471) being the most investigated TM modalities in treating these illnesses. Based on AMSTAR 2 criteria, the methodology quality of the included SRs is considerably low.

Conclusion: This evidence map provides a comprehensive overview of the extent and nature of the available research onTM modalities across health conditions. It provides an initial step towards characterizing the global evidence base and outlining gaps in the existing evidence. We regard this study as laying the basis for future research of TM modalities.

Registration: The protocol of this map is registered in PROSPERO (CRD42023416355).

1. Introduction

Traditional medicine (TM) is widely used by a significant number of people worldwide. According to the World Health Organization (WHO), around 88 % of WHO Member States (170 of the 194) reported on their populations' use of TM for healthcare needs.[1, 2] In the United States (US), people spend 30.2 billion US dollars yearly on complementary and alternative medicine.[3] TM encompasses a wide range of systems and the extent of TM usage varies across different regions and countries. In many countries, TM plays a crucial role in public health, especially in rural areas where access to conventional healthcare may be limited[2] and patients' knowledge of TM plays a role in self-prescribing.

WHO defines traditional and complementary medicine distinctly, where TM is defined as "sum total of the knowledge, skill, and practices based on the theories, beliefs, and experiences indigenous to different cultures" and complementary medicine or alternative medicine is defined as "a broad set of health care practices that are not part of that country's own tradition or conventional medicine and are not fully integrated into the dominant health-care system."[4] However, in some countries, the term TM is sometimes used interchangeably with complementary medicine or alternative medicine.[4] According to the United States National Center for Complementary and Integrative Health (NCCIH), complementary medicine includes natural products (medicinal plants and relevant products), nutritional products, dietary supplements, mind and body practices, psychological therapies, acupuncture, stimulation therapies, as well as manual therapies.[5]

While TM has a long history of use, the scientific community has increasingly focused on conducting research to evaluate its safety, effectiveness, and mechanisms of action. Some TM practices have been studied extensively and have a substantial body of scientific evidence supporting their effectiveness and safety.[6, 7] For example, the effects of acupuncture have been studied and assessed to provide a body of evidence to support incorporation into international or disease-specific guidelines.[8-11] However, it is important to note that not all TM practices have the same level of scientific evidence. Some practices may have limited scientific studies or insufficient evidence to support their claims regarding effectiveness and safety due to the complexity of the TM as individualized medicine.[12, 13]

To bridge the gap between TM and evidence-based medicine, many countries and organizations have established regulatory frameworks to ensure the safety, quality, and effectiveness of TM products and practices.[14] Furthermore, this often involves conducting clinical trials and other types of research to generate scientific evidence for TM in line with current and well-established scientific research methodology. Overall, the evidence available for TM is continually evolving, and it is necessary to identify available evidence to aid informed decisions about the use of TM for specific diseases.

In evidence-based medicine (EBM) systematic reviews (SRs) employing robust methods for synthesizing the evidence of efficacy and safety of a specific intervention for a specific condition, are regarded as the gold standard.[15] The EBM principle has profoundly changed clinical practices in numerous disciplines and also guided healthcare providers, instructors, and policymakers in the healthcare sector. Since SRs are considered to indicate and represent the collection of knowledge within a field, supporting the production of high-quality SRs is crucial to determining the best evidence currently available and supporting decisions regarding healthcare. Systematic evidence mapping is a methodology that enables the grouping and visualization of the evidence synthesized in SRs, describing the size and distribution of evidence and helping identify research gaps in a specific field.[16, 17] The interest in evidence mapping appears to have been increasing as the number of mapping-related publications is rising.

The number of published SRs for certain TM modalities has increased in recent years.[18, 19] With the available SRs on TM, evidence mapping is a logical first step to determine the extent and nature of TM SRs, and to help identify potential knowledge and evidence gaps. Due to the need to strengthen the global evidence base on TM to promote safe and effective use of TM for people's health and well-being needs, this study was commissioned by the World Health Organization Global Traditional Medicine Centre (WHO GTMC) as an initial step towards a better understanding of the research landscape.

TM encompasses a wide range of complete medical systems (traditional Chinese medicine, traditional Korean medicine, Kampo, Ayurveda, etc.) as well as standalone modalities (acupuncture, yoga, herbs, etc.) which are included in those systems. Due to the complexity of medical systems and overlap of modalities, in this study the evidence map will focus on TM modalities rather than whole medical systems. This study aimed to develop an evidence map of recent SRs in the field of TM, with the objectives of identifying the extent, key characteristics, and quality of recent SRs, and their distribution across different health diseases and outcomes, and identifying the evidence gaps in various TM modalities.

2. Methods

This is an evidence map and the protocol of this map is registered in PROSPERO– the International Prospective Register of Systematic Reviews, under the registration number: CRD42023416355, and previously published.[20] The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist is used to navigate the reporting of this study. Definitions of the terms used in this study are defined in Supplement 1.

2.1. Eligibility criteria

For pragmatic reasons, we focused on a limited and narrow scope of eligible studies in this evidence map. To be included in this evidence

map, the studies had to meet the following inclusion and exclusion criteria.

2.1.1. Type of studies

SRs had to be published between January 2018 to December 2022, a recent 5-year time frame, in order to make sure that the evidence is current and reliable. We considered completed SRs of clinical studies that evaluated the effectiveness of a TM modality. According to the Cochrane Handbook for Systematic Reviews of Interventions, SRs should (1) perform a comprehensive search in at least two core medical databases; (2) describe a detailed methodology, including search strategies and eligibility criteria; and (3) use a validated tool to assess the quality of the included primary studies. We did not have any restrictions on the type of primary studies included in the SRs or whether the SRs performed a meta-analysis. The primary studies included in the SRs could be randomized controlled trials (RCTs), non-RCTs, case-control studies, cross-sectional studies, cohorts, case series, and case reports.

We excluded (1) protocols of SRs; (2) SRs published only as an abstract, thesis, or dissertation; and (3) non-intervention SRs such as SRs addressing diagnostic methods, animal studies, pre-clinical studies, pharmacovigilance studies, and pharmacokinetic or pharmacodynamic trials; (4) overviews, scoping reviews, integrative reviews, narrative reviews; and (5) mixed methods reviews that include a variety of types of studies (i.e. reviews that include both quantitative and qualitative methods). There were no restrictions on the language used for the publication of SRs.

2.1.2. Type of participants

SRs including all types of participants were eligible for inclusion in the evidence map. We included SRs that studied participants with a health condition that can be classified under the International Classification of Diseases 11th Revision (ICD-11). SRs involving only healthy participants were not eligible. There were no restrictions with regard to participants' age and gender. According to United States National Institute of Health, we consider 18 years or older as adults, 65 years or more as older people, and 18 years or younger as pediatric cases.[21]

2.1.3. Type of intervention

Considering the broad scope of TM included in this evidence map, a pre-specified set of TM modalities was selected based on the prevalence of TM usage[22-26] which was reviewed by experts on the WHO advisory boards. SRs of whole system TM modalities, applied within the modalities of herbal medicine, acupuncture, moxibustion, cupping, manual therapies, mind-body therapies, or aromatherapy, were eligible. The inclusion of these intervention modalities was defined as follows:

(1) Herbal medicine: SRs of any type of orally administered herbal medicine, such as herbal decoction and herbal patent medicine of any traditional medicine systems (e.g. African traditional medicine, traditional Arab and Islamic medicine, Ayurveda, traditional Chinese Medicine, traditional Korean medicine, Kampo, etc.), were eligible. SRs of herbal injections or topical medications were not included.
(2) Acupuncture: SRs of acupuncture using needles with any type of stimulation, such as electroacupuncture, laser acupuncture, warm acupuncture, and fire-needling acupuncture, were eligible. Studies on other acupuncture types such as pharmacopuncture, acupotomy, auricular acupuncture, dry needling, and thread-embedding acupuncture were excluded.
(3) Moxibustion: SRs of any form of moxibustion, direct or indirect, were eligible.
(4) Cupping: SRs of any form of cupping, wet or dry cupping, were eligible.
(5) Manual therapies: SRs of therapies that include manual manipulation, such as chiropractic, and those involving TM meridians and points such as Tuina/Chuna, and acupressure, were eligible.
(6) Mind-body therapies: SRs of TM-related mind-body therapies such as yoga, *Tai Chi*, and *Qi Gong* were eligible.
(7) Aromatherapy: SRs of any form of aromatherapy administered by inhalation, topical use, or massage were eligible.

2.1.4. Type of comparator

SRs that compared TM modalities with active or inactive comparators, including no treatment, placebo, conventional medical treatment, standard care, other active therapy, and waitlist control, were eligible. Comparator groups that involve different types of TM modalities (e.g., acupuncture vs herbal medicine) or TM modalities of the same type were not eligible (e.g., herbal medicine vs herbal medicine, etc.)

2.1.5. Outcome

SRs that reported on at least one health-related outcome (such as mortality, morbidity, well-being, quality of life, etc.) after an intervention were eligible. We excluded SRs that reported only on non-health-related outcomes such as the prevalence of disease, cost-effectiveness, intervention characteristics, or safety or adverse events.

2.1.6. Timing and setting

SRs of any TM intervention duration and any follow-up timepoint were eligible. All SRs in healthcare-related settings were eligible.

2.2. Information sources

For this evidence map, we searched 17 electronic databases and database platforms (English, Chinese, Korean, Japanese, and Latin American databases) including PubMed, Embase-OVID, Cochrane Database of Systematic Reviews (CDSR), Allied and Complementary Medicine Database (AMED)-OVID, Virtual Health Library (VHL), Web of Science Core Collection, Scopus, China National Knowledge Infrastructure (CNKI), Wanfang database, Chinese Scientific Journal Database (VIP), Research Information Sharing Service (RISS), KoreaMed, Korean Studies Information Service System (KISS), Oriental Medicine Advanced Searching Integrated System (OASIS), Ichushi Web, Latin American and Caribbean Health Sciences Literature (LILACS), and Epistemonikos database.

Database of Abstracts of Reviews of Effects (DARE), an index of systematic review, was not searched as this database has not been updated since March 2015. Due to the high likelihood of duplication, the small likelihood of identifying additional studies, and time constraints, we did not perform exhaustive searching using citation indexes such as Google Scholar, and grey literature databases.

2.3. Search strategy

Subject headings, keywords, index terms, and free-text words that describe TM modalities were used to develop the initial search strategy for the PubMed database. The search strategy for PubMed was adopted and translated for other databases by changing the vocabulary, search field descriptor, and topic focus as necessary. All databases were searched in February 2023. The detailed search strategy for all databases is provided in Supplement 2.

2.4. Selection process

We merged the search results from multiple databases of the same language using Endnote reference management software and removed the duplicates. Reviewers in pairs independently and in duplicate screened the titles and abstracts to identify relevant studies for full-text review. The reviewers in pairs independently screened full texts for final inclusion. Disagreements were resolved by consensus among reviewers through discussion with a third reviewer. The number of studies identified, screened, included and excluded were reported in a flowchart in accordance with the PRISMA guideline.[16]

2.5. Data extraction process

Reviewers in pairs independently extracted data from each SR in a piloted data extraction form. The data extraction form was developed, reviewed by experts on the advisory boards, and piloted by all reviewers on five SRs, which were selected to reflect different characteristics of SRs, before being applied. Data extracted included first author's name, TM modality category, study design, country of publication, conditions/diseases, sample size, number and study design of included primary studies, population, intervention type, classification of disease according to ICD-11, age category, gender, methods used for risk of bias assessment, and primary outcomes measured, among others. Data on outcomes were only extracted if the included SR stated that there was a primary outcome. To reduce bias and ensure data integrity, the SRs retrieved were distributed among the reviewers so that each study was assessed by at least two reviewers, and all the reviewers who were involved in the data extraction went through a calibration process to ensure accuracy and reduce the diversity in judgment. Discrepancies in the data extracted were resolved by discussion and reaching a consensus among the different reviewers with a third reviewer, when necessary. When possible, the author of the study was also contacted via email to request the missing data. Data extracted from all the SRs were collected in a standardized Excel spreadsheet.

2.6. Quality assessment

Reviewers in pairs independently assessed each included SR using the AMSTAR 2 tool.[27] This 16-item tool assesses the methodological quality of SRs with 7 critical domains that could impact the SRs' validity. The seven domains suggested by AMSTAR 2 authors included protocol pre-registration, adequacy of the search, justification of excluded studies, risk of bias, meta-analytical methods, considering bias when interpreting results, and assessment of publication bias. Based on the AMSTAR 2 assessment, the overall confidence in the SR was graded as high, moderate, low, or critically low. The rating of the overall confidence in the SR was based on the 7 critical domains in the methodology of the SR; for instance, if the SR has more than one critical flaw with or without non-critical weaknesses, it will be rated as critically low. Any disagreements in the ratings were resolved by discussion and reaching a consensus among the reviewers with a third reviewer. To reduce the diversity in judgment, the quality assessments between pairs of reviewers were first calibrated through the assessment of five included SRs, and discrepancies in the assessment were discussed before assessing the rest of the included studies. When needed, we contacted the study authors to obtain missing data or to clarify discordant data.

2.7. Synthesis methods

All findings were descriptively summarized and reported as a narrative analysis. Data synthesis was performed using simple frequency counts of characteristics. The evidence mapping process resulted in a visual depiction of the evidence for the seven most studied TM modalities, accompanied by a narrative of descriptive analysis of frequencies. A bubble plot format was used to present a visual overview of each SR in five dimensions: literature size (y-axis), health categories according to ICD-11 coding (x-axis), sample size (bubble size), TM modalities (bubble color), and health conditions (bubble label). The bubble plots can only present limited information given the large number of SRs included and the broad scope of this evidence mapping. All the bubble plots were drawn using R Statistical Software.[28]

3. Results

3.1. Results of the search

The literature searches identified 241,509 records. After excluding duplicate records, reviewers in pairs screened the titles and abstracts of 181,616 records and selected 20,856 records for full-text assessment. After the full-text screening, 18,137 records were excluded, mainly because they were not focused on TM modalities, included inappropriate comparators, reviewed on health conditions not listed in ICD-11, or did not perform risk of bias/quality assessment using a validated tool. Of these, 2719 SRs (2591 SRs for the adult population and 128 SRs for the pediatric population) met the inclusion criteria and were included in this evidence map (Fig. 1).

3.2. General characteristics of the SRs

The number of published SRs for the adult population increased consistently by 100 publications each year with a peak in 2021. Similarly, the pediatric population showed an increasing trend in SR publications despite the huge difference in the number of published SRs, as compared to the adult population. Looking at trends over time, we can see that the total numbers of publications of TM-related SRs in general increased steadily from 2018 to 2021 and remained at about the same level in 2022. The number of SR publications by year is shown in Fig. 2 below.

The first authors of the 2719 SRs were based in 36 different countries, where 88 % of the publication originated from China (n = 2395, 88.1 %), followed by South Korea (135/2719, 5.0 %), Iran (39/2719, 1.4 %), Australia (28/2719, 1.0 %), United States (18/2719, 0.7 %), India (16/2719, 0.6 %) and others.

In terms of study design, most of the SRs (2603/2719, 95.7 %) included only RCTs as primary studies whereas a small percentage of SRs (116/2719, 4.3 %) included both RCTs and non-randomized studies of intervention (NRSI). Additionally, 96.7 % of the SRs (2628/2719) performed meta-analysis as their statistical analysis. Of the identified SRs, most SRs were of herbal medicine (1867/2719), followed by acupuncture, moxibustion, and mind-body therapies. Relatively, there were fewer SRs published on aromatherapy, manual therapies, and cupping. The distribution of the TM modalities is shown in Table 1.

The most studied herbal medicines were multiple herbal interventions (669/1965, 34.0 %), followed by *Xuefu Zhuyu* decoction (22/1965, 1.1 %), and *Shufeng Jiedu* capsule (20/1965, 1.0 %). The term 'Multiple herbal interventions' implied two or more herbal prescriptions were combined and studied in a single study. For acupuncture, the most studied acupuncture type was manual acupuncture (190/492, 38.6 %), followed by electroacupuncture (132/492, 26.8 %), and warm acupuncture (86/492, 17.5 %). For moxibustion, more than half of the SRs studied moxibustion without specifying the type (60/118, 50.8 %), followed by acupoint application (39/118, 33.1 %). For mind-body therapies, the most studied therapy was yoga (34/96, 35.4 %), followed by *Tai Chi* (27/96, 28.1 %), and *Qigong-Baduanjin* (10/96, 10.4 %). For aromatherapy, the most studied essential oil was lavender essential oil (7/24, 29.2 %), followed by multiple essential oil (6/24, 25.0 %), and evening-primrose oil (2/24, 8.3 %). For manual therapies, the most studied therapy was *Tuina/Chuna* (16/18, 88.9 %), followed by acupressure (2/18, 11.1 %).

3.3. Populations, health conditions, and health outcomes

Most SRs (2541/2719, 93.5 %) either only described that included populations should be adults above age 18 or did not define any inclusion criteria aside from health conditions or disease classification criteria. The remaining studies focused on older populations (53/2179, 2.4 %) and pediatric populations (128/2179, 5.9 %). In adults, the health conditions reviewed were mainly depression (76/1998, 3.8 %), insomnia (67/1998, 3.4 %), diabetes mellitus (64/1998, 3.2 %), heart failure (62/1998, 3.1 %), stroke (61/1998, 3.1 %), nephropathy (59/1998, 3.0 %), COVID-19 (56/1998, 2.8 %), chronic obstructive pulmonary disease (53/1998, 2.7 %), essential hypertension (52/1998, 2.6 %) among others. In the elderly, the health conditions examined were primarily dementia (8/53, 15.1 %), mild cognitive impairment

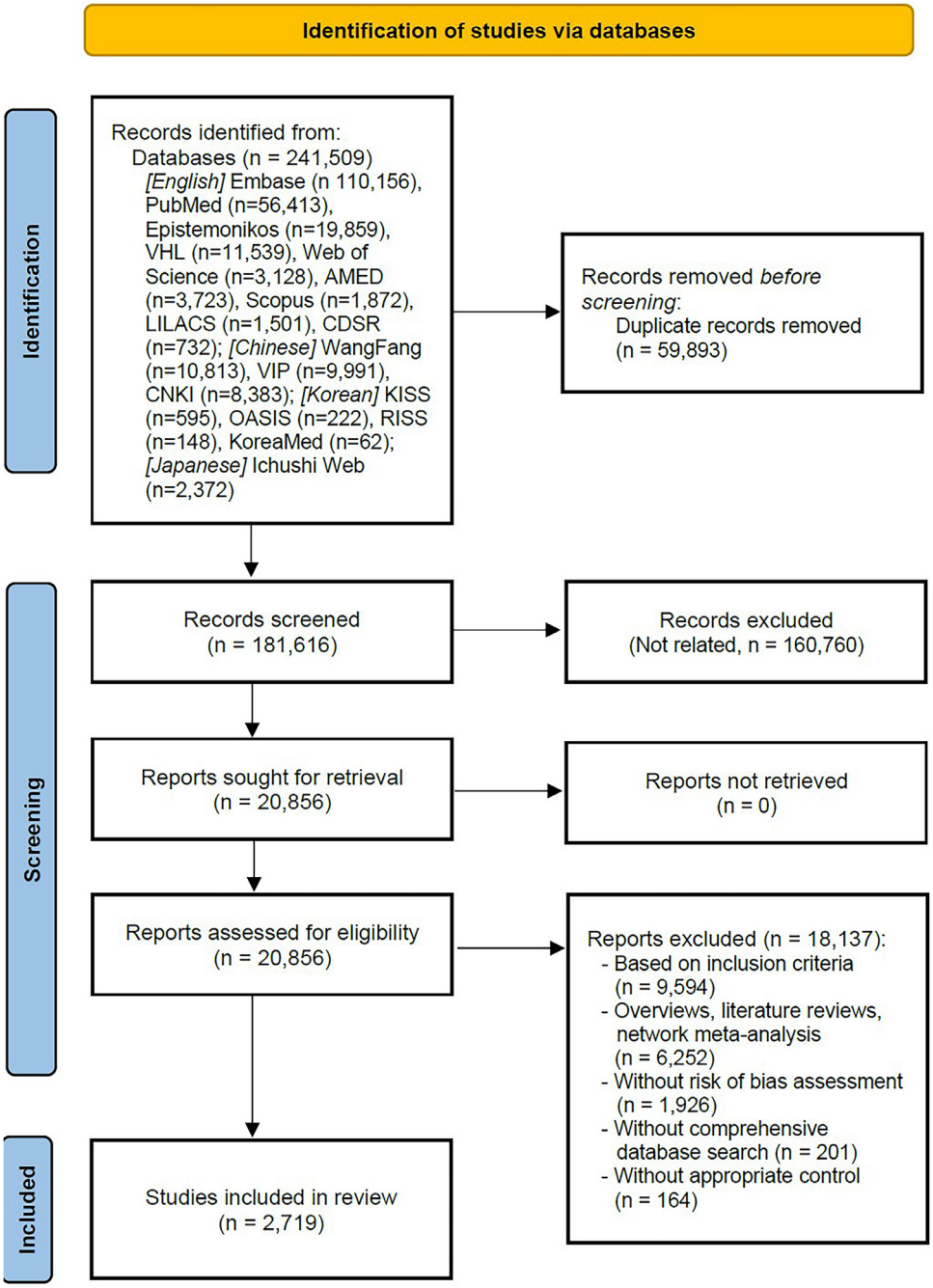

Fig. 1. Flow diagram of the study selection process.

(6/53, 11.3 %), functional constipation (4/53, 7.6 %) and chronic obstructive pulmonary disease (4/53, 7.6 %) among others. In children, the health conditions studied were mainly respiratory tract infections (21/128, 16.4 %), neonatal jaundice (9/128, 7.0 %), cough variant asthma (8/128, 6.3 %) nephrotic syndrome (7/128, 5.5 %), irritable bowel syndrome (6/128, 4.7 %), or hand, foot and mouth disease (6/128, 4.7 %), among others.

The majority of the SRs were also not specific to women or men, except for a small percentage of SRs assessing diseases specific to women or men – diseases specific to women (276/2719, 10.2 %) and diseases specific to men (28/2719, 1.0 %). For women, the conditions of interest were polycystic ovary syndrome (28/276, 10.1 %), dysmenorrhea (27/276, 9.8 %), infertility (25/276, 9.1 %), menopausal disorders (17/276, 6.2 %), or breast cancer (15/276, 5.4 %), among others. For men, the conditions assessed were infertility (7/28, 25.0 %), erectile dysfunction (6/28, 21.4 %), prostatic hyperplasia (6/28, 21.4 %), and chronic prostatitis (4/28, 14.3 %), among others. Overall, we identified 312 diseases in the adult and elderly population, whereas we found only 41 pediatric-related diseases. The full list of diseases identified is provided in Supplement 3.

Of the identified 2719 SRs, 1442 (53.0 %) SRs did not specify their primary and secondary outcome measures. A total of 4582 primary outcomes were extracted in the remaining 1277 SRs that specified their primary outcomes. After categorizing the primary outcomes, we identified 949 unique outcomes. The primary outcomes found were classified into nine health outcome groups, that is (1) cure or effectiveness rate (253/949, 26.7 %), (2) non-pain symptoms-related outcomes (213/949, 22.4 %), (3) adverse events (89/949, 9.4 %), (4) laboratory indicators

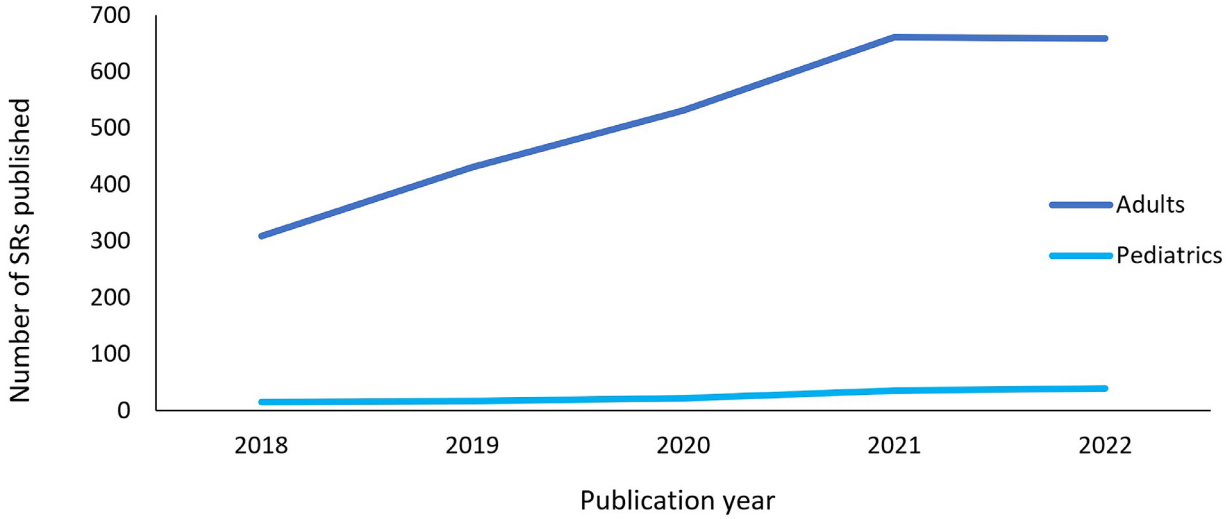

Fig. 2. Systematic reviews on TM published from January 2018 to December 2022.

Table 1
Systematic reviews published across TM intervention modalities 2018- 2022.

Intervention types	Years (n)					Total (n)
	2018	2019	2020	2021	2022	
Adult SRs						
Herbal medicine	221	285	380	497	484	1867
Acupuncture	55	93	100	110	113	471
Moxibustion	16	27	23	23	29	118
Mind-body therapies	12	18	19	22	24	95
Aromatherapy	3	5	5	7	4	24
Manual therapies	1	2	2	2	3	10
Cupping	1	1	2	0	2	6
Pediatric SRs						
Herbal medicine	10	14	18	28	28	98
Acupuncture	4	2	4	2	9	21
Manual therapies	1	1	0	4	2	8
Mind-body therapies	0	0	0	1	0	1
Total	324	448	553	696	698	2719

(66/949, 7.0 %), (5) health-related quality of life (56/949, 5.9 %), (6) pain-related outcomes (51/949, 5.4 %), (7) all-cause mortality (26/949, 2.7 %), (8) recurrence rate (20/949, 2.1 %), and (9) fertility and pregnancy outcomes (8/949, 0.8 %).

3.4. Research volume by health categories

Of the identified priority health areas for all ages, most SRs published were related to the diseases of the digestive system (341/2719, 12.5 %), circulatory system (337/2719, 12.4 %), and the genitourinary system (n = 324, 11.9 %), followed by diseases of the nervous system (257/2719, 9.5 %), musculoskeletal system or connective tissue (251/2719, 9.2 %), respiratory system (219/2719, 8.1 %), and endocrine, nutritional, or metabolic diseases (205/2719, 7.5 %), as shown in Fig. 3. A large number of SRs were classified as relevant to mental, behavioral, or neurodevelopmental disorders (191/2719, 7.0 %), certain infectious or parasitic diseases (163/2719, 6.0 %), and neoplasms (139/2719, 5.1 %). The fewest SRs were identified for the diseases of ear or mastoid process (6/2719, 0.2 %).

3.5. AMSTAR 2 assessment

Of the 2719 SRs included, the overall confidence of most SRs is low. Only 16 SRs (0.9 %) were rated high in overall confidence. Thirty-one SRs (1.1 %) were moderate, 119 SRs (4.4 %) were low, and 2553 SRs (93.9 %) were critically low in overall confidence. As shown in Table 2, most SRs included components of PICO (population, intervention, comparator, and outcome), performed study selection and data extraction in duplicate, and reported potential conflicts of interest. More than half of the SRs used a satisfactory technique for assessing the risk of bias in primary studies, discussed observed heterogeneities, and investigated publication bias. The least often met criterion was item 4 (using a comprehensive search strategy), item 7 (providing a list of excluded studies with justification), and item 8 (describing included studies in detail). Table 2 shows how the included SRs scored on the AMSTAR 2 items.

3.6. Map visualization

The results for the evidence mapping of TM across health outcomes are presented in the bubble plots below. The bubble plots summarize the results of 2719 SRs for seven distinct TM modalities relevant to ICD-11 health categories. In the bubble plot, the bubble label represents the health conditions identified in the SRs. The bubble size denotes the sample size/population of the included SRs. The bubble color depicts the TM modalities examined by each SR. Each bubble was plotted according to the health categories of ICD-11 (x-axis) and the literature size/number of SRs identified (y-axis).

3.6.1. Adult population

As shown in the bubble plot, a large number of SRs have addressed the TM modalities of herbal medicine (n = 1867), followed by acupuncture (n = 471). Relatively, only a small number of SRs were identified on moxibustion (n = 118), mind-body therapies (n = 95), aromatherapy (n = 24), manual therapies (n = 10), and cupping (n = 6). From the plot, the bubbles of herbal medicine and acupuncture are scattered across the health outcomes of ICD-11, indicating the wide application of these two TM modalities in various health conditions (Fig. 4, Supplement 4).

3.6.2. Pediatric population

The results for TM modalities for the pediatric population are presented in Fig. 5 (Supplement 5). This bubble plot represents 128 SRs summarizing the evidence for TM modalities relevant to pediatric health conditions (Figure 6). Of the 128 SRs, only four TM modalities were identified, that is herbal medicine (n = 98), acupuncture (n = 21), manual therapies (n = 8), and mind-body therapies (n = 1). Similar to the adult population, herbal medicine is the commonest intervention used, followed by acupuncture, indicating that the investigated intervention modalities for adults and pediatrics are similar when it comes to TM.

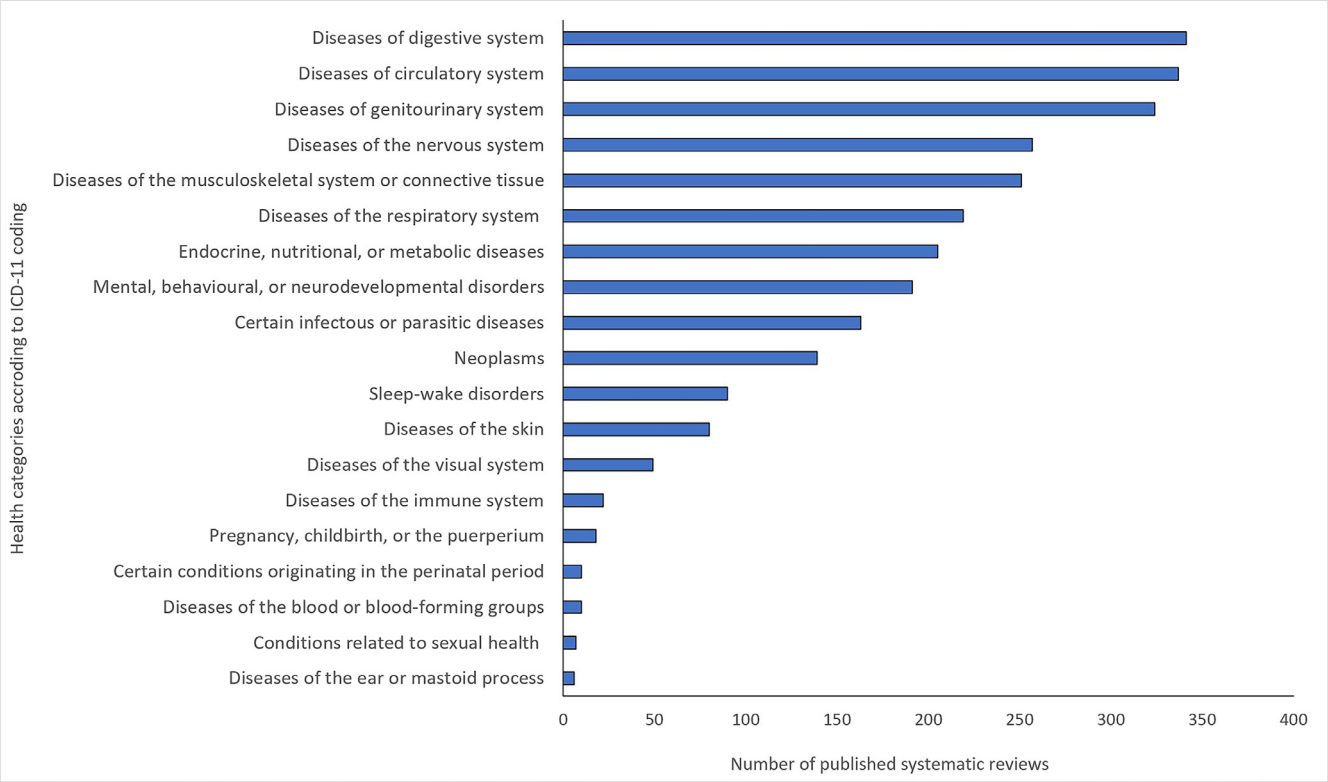

Fig. 3. Systematic reviews published according to ICD-11 health categories for all ages.

Table 2
Systematic reviews scoring for AMSTAR 2 items.

No.	AMSTAR 2 items	Yes, n (%)	No, n (%)	Partial yes, n (%)
1	Included PICO	2607 (95.88)	112 (4.12)	–
2*	Review methods were established prior to the conduct of the review	285 (10.48)	2242 (82.46)	192 (7.06)
3	Explain selection of the study designs	2300 (84.59)	419 (15.41)	–
4*	Use a comprehensive search strategy	70 (2.57)	1219 (44.83)	1430 (52.59)
5	Perform study selection in duplicate	2189 (80.51)	530 (19.49)	–
6	Perform data extraction in duplicate	2168 (79.74)	551 (20.26)	–
7*	Provide a list of excluded studies with justification	120 (4.41)	2504 (92.09)	95 (3.49)
8	Describe the included studies in detail	183 (6.73)	418 (15.37)	2118 (77.90)
9*	Use a satisfactory technique for assessing the RoB	1833 (67.41)	119 (4.38)	767 (28.21)
10	Report on the sources of funding in primary studies	319 (11.73)	2400 (88.27)	–
11*	Use appropriate methods for pooling results	1026 (37.73)	1693 (62.27)	–
12	Assess the potential impact of RoB in meta-analysis results/other evidence synthesis	393 (14.45)	2326 (85.55)	–
13*	Account for RoB in individual studies when interpreting/discussing results	1241 (45.64)	1478 (54.36)	–
14	Discussion of any heterogeneity observed in the results	1391 (51.16)	1328 (48.84)	–
15*	Investigation of publication bias	1698 (62.45)	1021 (37.55)	–
16	Report conflict of interest/funding	2205 (81.10)	514 (18.90)	–

PICO, population, intervention, comparator, and outcome; RoB, risk of bias; *, critical domain.

4. Discussion

This evidence-mapping study presents the characteristics of 2719 SRs across seven TM modalities, along with a quality assessment of these included SRs. The analysis described in this manuscript mainly included:

(1) An overview of the characteristics and distribution of evidence syntheses of TM across health conditions and outcomes.
(2) Results of the AMSTAR 2 quality assessment of the included SRs.

4.1. Overview of the characteristics and distribution of evidence syntheses of TM across health conditions and outcomes

In the TM investigated, China had led the majority of SRs (88 %). The majority of SRs were for the adult population, with only 128 SRs for the pediatric population. This is a trend that is also apparent in biomedical SRs, where the pediatric population is underrepresented in clinical trials.[29] The most studied TM modalities in this evidence mapping were herbal medicine, followed by acupuncture, moxibustion, mind-body therapies, aromatherapy, manual therapies, and cupping. However, the number of SRs for each TM modality may be underreported due to the narrow definition and more restriction of inclusion-exclusion criteria applied in this study.

The most common health conditions addressed in the SRs for adults were diseases of the digestive system, circulatory system, and genitourinary system, with herbal medicine and acupuncture being the most used TM modalities in treating these illnesses. Yet, there are many SRs on the same health conditions that require further investigation to provide more solid evidence on specific TM modalities across each disease. Furthermore, a detailed evaluation according to health conditions may

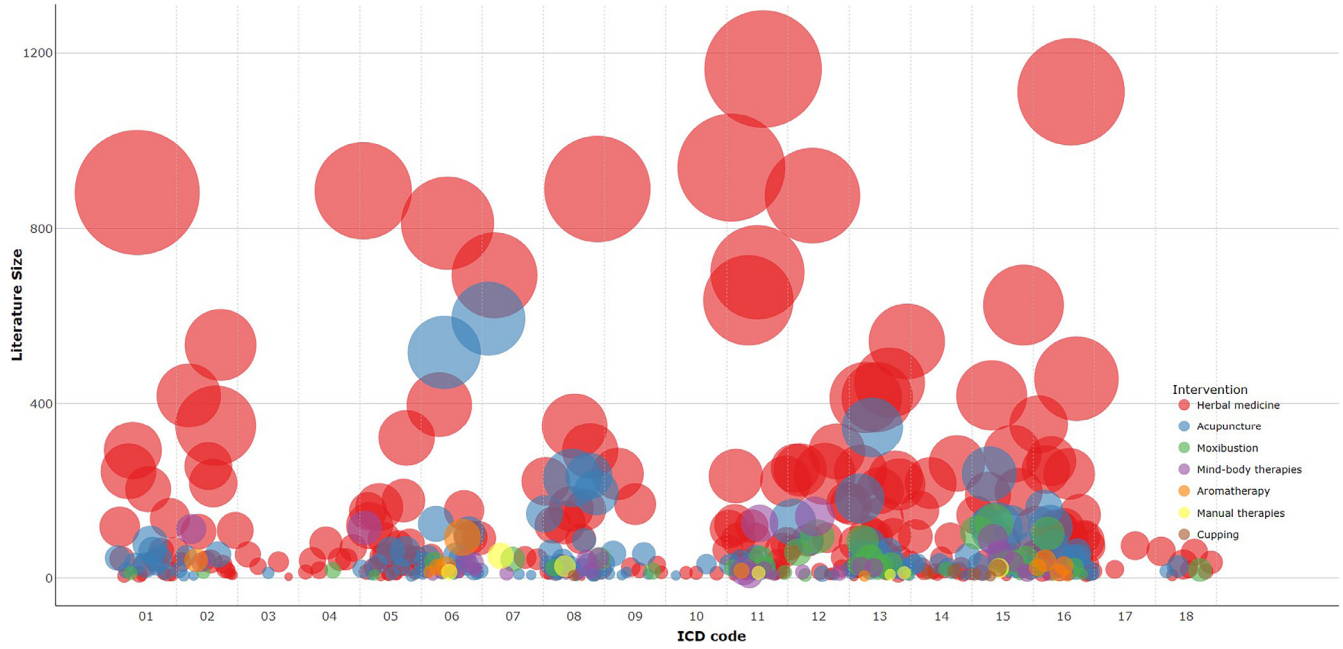

Fig. 4. Evidence mapping of TM modalities for ICD-11 health categories in the adult population.

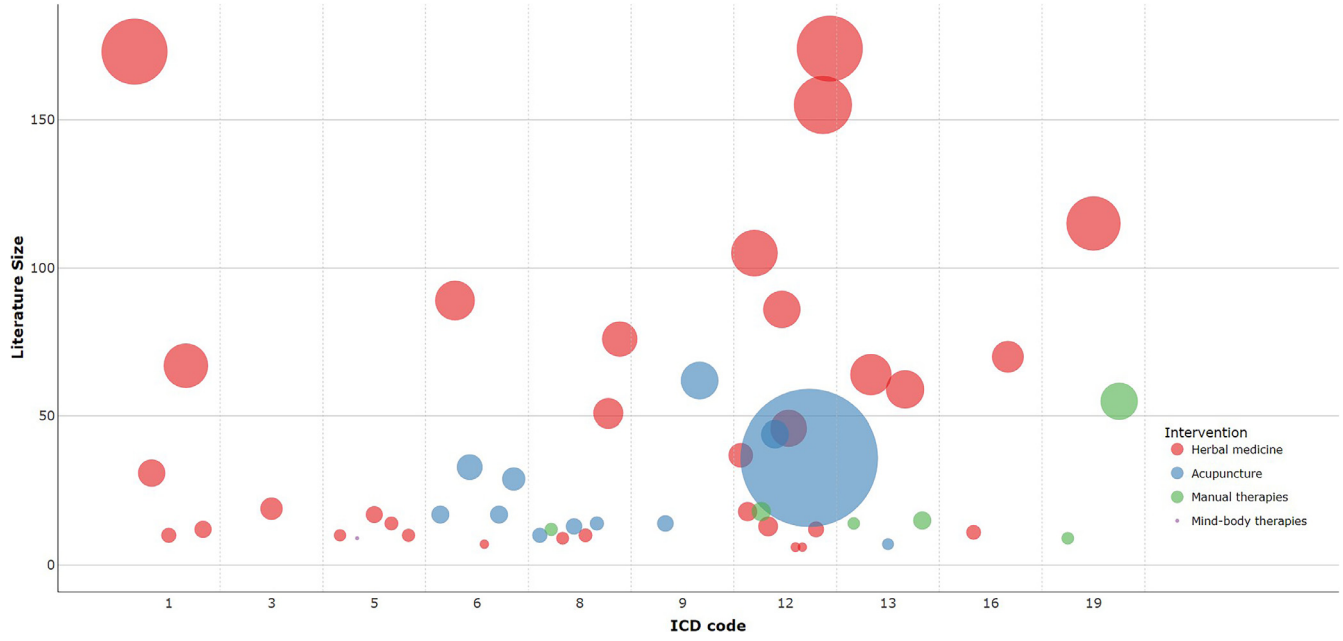

Fig. 5. Evidence mapping of TM modalities for ICD-11 health categories in the pediatric populations.

provide further insights into the gaps of common health problems not being addressed and investigated in TM, as well as their effectiveness and safety.

4.2. Quality assessment: specific items of the AMSTAR assessment

Our findings of TM-related SRs are consistent with other overviews of SRs in the conventional medicine field, where many publications reported high numbers of SRs with low or critically low quality.[30-36] AMSTAR 2 has 16 items evaluating each step of the conduct of SRs and meta-analysis. This raises a question of whether AMSTAR 2 assessment is impractical in general; whether there were actual critical flaws in these SRs; or whether the information was available but that authors were just poorly reporting certain items assessed in AMSTAR 2 since certain critical domains can be easily met such as item 2 and 7 while many failed to do so. Commonly unmet items reflecting serious concerns may involve improper conduct of SRs or inappropriate methodology. This could be due to many SRs with inadequate methodology being published.

Furthermore, the 7 critical domains in AMSTAR 2 are substantial in the overall rating of SRs, leading to a high percentage of SRs being rated as low quality since failing one critical domain results in an overall low quality. Our findings of SR quality are based on AMSTAR 2 items but it reflect problems with reporting rather than the conduct of the SR. Notably, the two most common problems were both reporting issues (Item 7 and 10) where 92.09 % of studies did not report the excluded study's citation details along with the reason for exclusion (Item 7) and 88.27 % did not report the sources of funding in primary studies (Item 10). However, Item 7 was only added to the PRISMA reporting

standards in 2020, and Item 10 is not a PRISMA 2020 reporting requirement. Therefore, the overall quality of SRs in the TM field should not be concluded as critically low quality purely based on AMSTAR 2 assessment. Further analyses and discussions are necessary to gain insight into how these findings are comparable to those found in evidence maps of conventional medicine modalities.To address the above mentioned issues, systematic reviewers are recommended to consider both AMSTAR 2 and PRISMA 2020 when they conduct and report SRs, and journal editors are to refer to both guidelines to ensure the quality of SRs being published.

4.3. Areas of major gaps in findings and recommendations for future research

There was a lack of SRs in other included TM modalities besides herbal medicine and acupuncture. Despite the abundance of herbal medicine and acupuncture studies, the evidence and quality of those included TM modalities still need to be assessed in more detail before they can be considered sufficient. As our evidence mapping study did not deal with overlap and duplication of studies within the SR, the evidence gaps in TM research need to be further addressed by managing overlap of primary studies. As breadth of gap analysis can be challenging and resource intensive, SRs that were classified as low quality could be excluded before analyzing, quantifying, and resolving the overlap of primary studies across the SRs. An analysis that maps burden of disease on the quantity and quality of the available TM evidence should also be considered.

Significant gaps were seen in the study population, particularly the pediatric population. This could be due to the unique challenges of undertaking TM research in such a vulnerable population. Study investigators could consider embedding lower-risk and less complex TM research to answer fundamental clinical questions that have not been addressed in children. More research funding could also be diverted to research involving pediatric population for research equity.

There was a research gap in relation to the study methodology. Over 50 % of SRs on TM did not specify a primary outcome and 'cure or effectiveness rate' was found to be the main primary outcome group for the remaining studies. 'Cure or effectiveness rate' outcome is mostly used by RCTs conducted in China and it should be noted that the use of 'cure or effectiveness rate' as an outcome measure is fairly subjective depending on the definition of individual studies. To improve the study quality, internationally validated, standardized, and reliable outcome measures should be used.

The geographic distribution of TM-related SRs showed gaps, with limited SRs available for Africa and Europe. TM research seems to be concentrated in a few countries that receive more attention in TM modalities among their populations, where TM is more commonly used and more funding is provided. In general, there is a lack of geographical and diverse TM system representation. Exhaustive research collaboration would expand the research areas of TM studies and diversity in TM resources would be a major step forward in allowing findings from different countries to be compared, collated, and utilized in the policy-making process.

This evidence mapping on TM only estimated the research volume and indicated in which areas research has been conducted. It was not designed to inform policies regarding the use of TM or precluding TM for specific conditions. Therefore, more detailed and definitive recommendations can only be obtained by carrying out high-quality individual systematic reviews or evidence synthesis for each TM modality where assessment of multiple factors such as clinical efficacy, cost-effectiveness, clinical indicator, and safety compared to standard treatment can be taken into account.

4.4. Limitations

There are some limitations to the current study. First, as the search strategies were developed to identify SRs of TM modalities based on the prevalence of TM usage, this evidence map does not provide insight into other TM modalities such as nutritional supplements, homeopathy, naturopathy, reflexology, osteopathy, and art-based interventions. Another limitation of our searches was that there is a possibility that some relevant SRs were not retrieved due to different indexing or text terms that are beyond our knowledge, despite the wide coverage of databases and the use of robust search strategies. Additionally, there may be language bias, as the search terms and databases were limited to English, Chinese, Korean and Japanese languages. The number of SRs for each TM modality may also be underreported due to the narrow definition of TM modalities and more restriction of inclusion-exclusion criteria applied in this study. We did not investigate the degree of overlapping primary studies included in the SRs due to time constraints and limited resources. Therefore, we could not accurately quantify the population sizes that have been studied for each TM modality or priority health outcome.

4.5. Conclusion

This manuscript gives a first overview of the main findings of an evidence mapping of the evidence for select TM modalities. We have outlined the scope of SRs on this topic and described the characteristics of the evidence. However, the findings of this study can only be referred to for policy and research purposes, and not integrated into the health system due to the limitations and quality of evidence. Nevertheless, this study, focusing on mapping SRs based mainly on clinical trials, is an initial step towards characterizing the global evidence base. We regard this study as laying the basis for future research on TM modalities.

CRediT authorship contribution statement

Lin Ang: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing – original draft. **Eunhye Song:** Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing – original draft. **Miek C Jong:** Investigation, Writing – review & editing, Supervision. **Terje Alræk:** Investigation, Writing – review & editing. **Barbara Wider:** Investigation, Writing – review & editing. **Tae-Young Choi:** Methodology, Investigation. **Ji Hee Jun:** Methodology, Investigation. **Boram Lee:** Methodology, Investigation. **Yujin Choi:** Methodology, Investigation. **Hye Won Lee:** Methodology, Investigation. **Changsop Yang:** Methodology, Investigation. **Mi Hong Yim:** Formal analysis, Visualization. **Hitoshi Yamashita:** Investigation, Resources. **Zhaochen Ji:** Investigation. **Haiyin Hu:** Investigation. **Junhua Zhang:** Resources. **Jianping Liu:** Investigation. **Yaolong Chen:** Resources. **Yishan Qin:** Investigation. **Liming Lu:** Investigation. **Fan Qu:** Investigation. **Odd-Magne Hansen:** Investigation, Writing – review & editing. **Chan-Young Kwon:** Investigation. **Jungtae Leem:** Investigation. **Hyangsook Lee:** Investigation. **Tae-Hun Kim:** Investigation. **Kun Hyung Kim:** Investigation. **Sunju Park:** Investigation. **Ye-Seul Lee:** Investigation. **Soobin Jang:** Investigation. **Jiyoon Won:** Investigation. **Jiae Choi:** Investigation. **Juah Lee:** Investigation. **Song-Yi Kim:** Investigation. **Myeong Soo Lee:** Conceptualization, Methodology, Investigation, Resources, Supervision, Project administration, Funding acquisition.

Declaration of competing interest

The authors have no conflict of interest to declare involving this study.

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Ethical statement

As this is an evidence-mapping study, there are no patients being involved in this study.

Data availability

The map and bibliography of its included SRs is available on the WHO website: (https://terrance.who.int/internet/tmc/gap_map_traditional_medicine.html).

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.imr.2024.101070.

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