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Traditional Chinese Medicine for Depression in the 21st Century: A Comprehensive Bibliometric and Visual Analysis Using CiteSpace and VOSviewer

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ABSTRACT

Depression has long been a major topic of global academic interest, yet its study within traditional Chinese medicine (TCM) has historically been underexplored. Only after entering the 21st century did TCM-related depression research accelerate, with a steady rise in publications across mainstream journals. A major gap in the field is the absence of a comprehensive overview describing how this research area has evolved and what core issues have been examined. Thus, this work set out to summarise the development trajectory, identify research patterns, and point to future directions for investigators in this domain. Studies published between January 1, 2000 and April 20, 2024 were retrieved from the Web of Science Core Collection. Indicators such as authorship, affiliations, keyword patterns, national contributions, references, citation counts, and co-citation networks were extracted and assessed. CiteSpace and VOSviewer were used to perform quantitative evaluations, generate visual maps, and offer scientific insights.

A total of 921 articles were identified. Publication output rose sharply from 2017 to 2021, stabilising at over 140 papers during 2022–2023, which together represented 31.38% of all documents. The Journal of Ethnopharmacology led in publication volume (97 articles), total citations (2067), and co-citations (1369). China stood out with 847 publications and 13256 citations, while Beijing University of Chinese Medicine (90 publications, 1232 citations) and researcher Qin Xuemei (30 publications, 759 citations) were the most productive institution and author, respectively. Keyword clustering revealed nine coherent thematic groups, dominated by randomised controlled trials, TCM studies, and hippocampal neurogenesis. Timeline results showed that from 2000–2010, focus centred on hippocampal mechanisms and forced swimming test models; during 2010–2020, emphasis shifted to controlled trials and neurogenesis; after 2020, network pharmacology became central. Burst keyword analysis showed early surges (before 2010) in terms such as forced swimming test, Tail Suspension Test, Chronic Cold Stress, neural repair, and Banxia Houpu Decoction, while post-2020 bursts highlighted network pharmacology and molecular docking. This investigation systematically reviewed and synthesised research themes and trends in this domain from a 21st-century bibliometric perspective. The visual outputs provide a clear overview of research trajectories, leading teams, institutional networks, and emerging focal points for future inquiry.

Keywords: Bibliometric, CiteSpace, VOSviewer, Traditional Chinese medicine, Depression

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Introduction

Depression is a widespread psychological disorder marked by persistent low mood and often accompanied by cognitive and behavioural disturbances. It ranks as the second leading contributor to disability in China, causing substantial losses in healthy life years [1]. The World Health Organization predicts that depression will become the largest contributor to global disease burden by 2030 [2]. Since the start of the 21st century, depression has attracted sustained scholarly attention, branching into areas such as major depression [3], adolescent depression [4], depression in older adults [5], maternal depression [6], and post-stroke depression [7]. Advancing knowledge of its biological mechanisms—including inflammation [8], gut flora alterations [9], synaptic changes [10],

monoaminergic pathways [11], and neuroimmune interactions [12]—has expanded therapeutic approaches, such as mindfulness-based therapy [13] and pharmacological interventions [14].

Traditional Chinese Medicine, an essential component of medical practice in China, has a long tradition of treating depressive disorders [15]. Its benefits include multitarget effects and comparatively mild adverse reactions [16]. As a result, TCM has increasingly been adopted as an adjunctive or primary option for depression therapy, becoming a significant point of interest [17]. Over the past two decades, more rigorous TCM-related depression studies have appeared in the Web of Science database, and the influence of TCM in this field has gained broader recognition. Nevertheless, several unresolved issues remain:

(1) What patterns and publication trends have emerged in this research area since the beginning of the 21st century?

(2) How many journal articles and citations exist on TCM-related depression, and which authors, studies, institutions, and countries exert major influence?

(3) Do authors, institutions, and countries collaborate extensively, and have stable cooperation networks or leading research hubs already formed?

(4) What research pathways, major topics, and cutting-edge developments characterise this field, and what future directions are likely to unfold?

Bibliometric analysis first appeared in the early 20th century and was formally recognised as its own discipline in 1969 [18]. Because it enables large-scale examination of publication data—such as authors, journals, nations, institutions, keywords, and reference patterns—at both broad and detailed levels, bibliometrics has become widely adopted for quantitative literature assessment [19, 20]. These methods can also clarify research trajectories, ongoing developments, and future thematic directions within a given field. In parallel, the medical sciences have increasingly applied bibliometric approaches, and this sector is often viewed as a leader in the advancement of bibliometric research frameworks [21]. As bibliometric tools have matured, experts have emphasised the benefits of visual analytics, which provide clear, intuitive illustrations of data relationships and assist researchers in uncovering deeper structural links within the literature [22]. Consequently, VOSviewer and CiteSpace have become two of the most frequently utilised platforms for generating bibliometric maps and conducting scientific knowledge visualisation [23, 24].

A growing body of work has attempted to apply bibliometric techniques to depression research. For instance, Wang used these methods to present in detail the major themes, emerging areas, and limitations in depression studies from 2004 to 2019 [25]. Mechanistic research has likewise been examined using bibliometrics, including studies focused on depression-related epigenetics [26], NMDA receptor signalling [27], macrophage involvement [28], and biomarker exploration [29]. In clinical imaging research, Fu conducted a bibliometric review of resting-state functional MRI, outlining its development, present state, and anticipated trends in severe depression [30]. More recently, CiteSpace has also been used to explore decision-making research in adolescent depression [31], as well as to map the literature on psychological treatment strategies [32], virtual reality-based interventions [33], pharmacotherapy [34], repetitive transcranial magnetic stimulation [35], and artificial intelligence applications [36]. Regarding TCM interventions, previous analyses have covered acupuncture [37] and auricular acupuncture [38] within the context of depression. However, despite numerous bibliometric investigations touching different aspects of depression—including individual TCM modalities such as acupuncture or moxibustion—no comprehensive bibliometric study has yet examined TCM and depression jointly as the central theme. Thus, the research gaps described in this article remain unresolved.

To address these unmet needs, we carried out a bibliometric study employing VOSviewer and CiteSpace, assessing publication patterns and scientific development related to TCM-based depression research from 2000 to 2024. The intention was to provide foundational insights and highlight potential avenues for future clinical and academic work.

Materials and Methods

Database selection and retrieval strategy

TCM constitutes a distinctive segment of China's medical resources. Although various TCM-related findings appear in national platforms such as the China National Knowledge Infrastructure, Wanfang Data Knowledge Service Platform, and the China Science and Technology Journal Database, these sources have limitations, including inconsistent publication quality, lower authority, and limited international visibility. In contrast, the

Web of Science (WOS) is an internationally recognised, authoritative database covering diverse scientific areas—including natural and biomedical fields—and indexing high-impact journals and scholarly works. Its citation outputs are fully compatible with CiteSpace and VOSviewer, making it a common choice for bibliometric studies [39]. Additionally, prior methodological evaluations emphasise that bibliometric research should clearly specify which WOS subcollections are used to ensure transparency and reproducibility [40]. Accordingly, our literature retrieval strategy for April 21, 2024 was established as follows:

(1) The search was conducted within the Science Citation Index Expanded and Social Sciences Citation Index subsets of the WOS Core Collection.

(2) A topic search was executed using the query:

"Chinese medicine" OR "Chinese herb" OR "Chinese formula" OR "Chinese materia medica" OR "decoction" (Topic) AND "depress*" (Topic).

(3) Eligible records were limited to Articles and Reviews, published in English, within the timeframe 2000.1.1–2024.4.20.

(4) Data were exported as plain text, with the content format specified as “complete record and cited references”.

Data analysis and processes

Because the initial dataset contained overlapping entries, inconsistent keywords, and repeated material, we first eliminated duplicate records from the 1691 retrieved documents using author names, institutional data, and keyword fields. The remaining papers were then examined through their titles, topic terms, abstracts, and full content to remove studies unrelated to depression. After this screening, VOSviewer 1.6.20 was employed to process the files exported from the WOS database, extracting bibliographic indicators such as contributing authors, research institutions, nations, keywords, cited works, citation counts, and co-citations, and to generate visual network maps. Keyword co-occurrence patterns and clustering outcomes were further analysed using CiteSpace 6.3.R1, which was also used to construct keyword timelines and identify burst terms. A schematic of the workflow is presented in **Figure 1**.

VOSviewer and CiteSpace are widely applied instruments for conducting bibliometric evaluations, enabling performance assessment and scientific visual mapping [23]. VOSviewer—created by van Eck and Waltman—can directly process WOS files and output author, country, journal, institutional, and co-citation datasets aligned with user objectives. It also generates bibliometric networks such as co-authorship and co-citation structures. Its major strength lies in its ability to represent networks clearly and intuitively [41]. In VOSviewer visualisations, larger nodes and labels signify greater relevance, node colours represent cluster categories, and connecting lines denote relational strength, with thicker lines reflecting stronger associations.

CiteSpace, developed by Professor Chen Chaomei, is designed to graphically display and qualitatively analyse keyword co-occurrence, cluster patterns, and temporal shifts in research hotspots [42]. In CiteSpace-generated keyword timelines, each node corresponds to a term, while node size and font magnitude increase with frequency. A keyword’s position along a cluster track marks when it first appeared, and the colour gradient indicates the time period, with warmer colours representing more recent years. Because this study did not involve comparative hypothesis testing, statistical tests such as p-value calculations were unnecessary. Finally, the visual output from both software programs was refined to enhance clarity and interpretability.

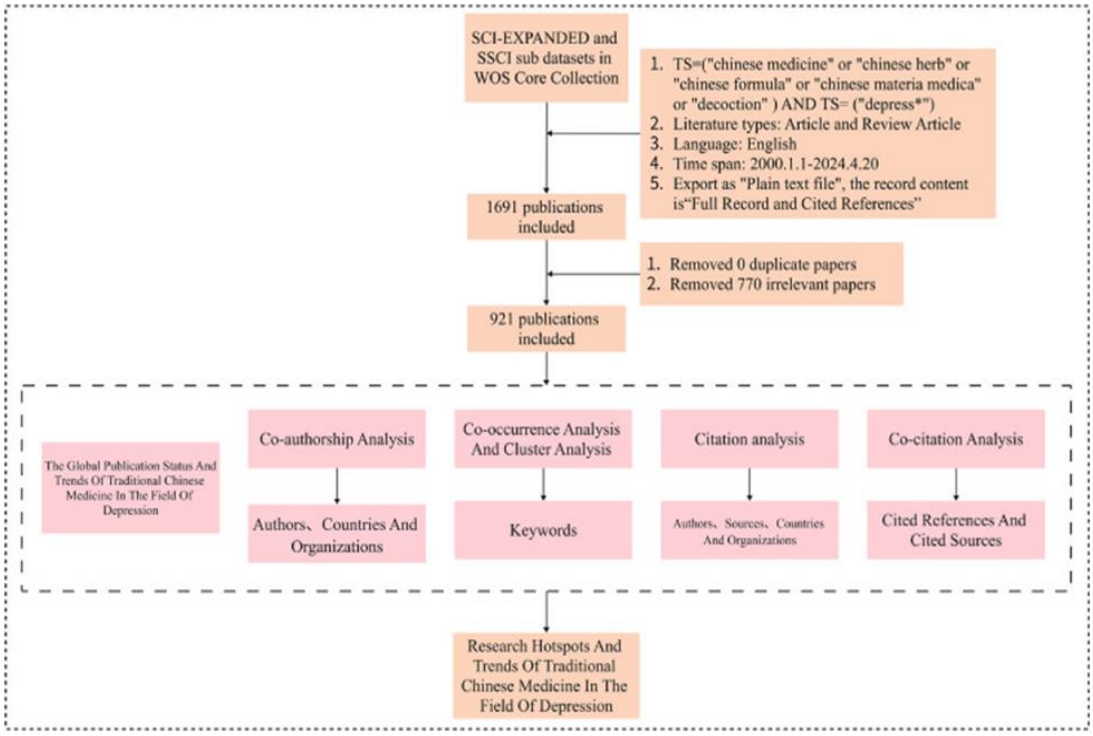

Figure 1. Overview of the research process.

Research ethics

All data analysed in this study were sourced from publicly accessible WOS records and did not involve direct human or animal research. Therefore, ethical approval was not required. Citations for the software used are provided to acknowledge the developers.

Results and Discussion

Global publication status and trends of the use of TCM in the field of depression

The WOS search produced 1691 records, of which 921 satisfied the inclusion criteria. These publications originated from 4898 authors affiliated with 894 institutions across 37 countries and contained 3779 distinct keywords. Altogether, 36682 external documents from 7464 journals were referenced, citing 25570 authors. Annual publication output is shown in **Figure 2**. Between 2002 and 2011, the number of TCM-related depression studies remained relatively low, indicating an embryonic phase of development. After 2017, output rose markedly, surpassing 140 papers annually in 2022 and 2023, with these two years accounting for 31.38% of all papers. This pattern reflects growing scholarly interest in TCM's relevance to depression research.

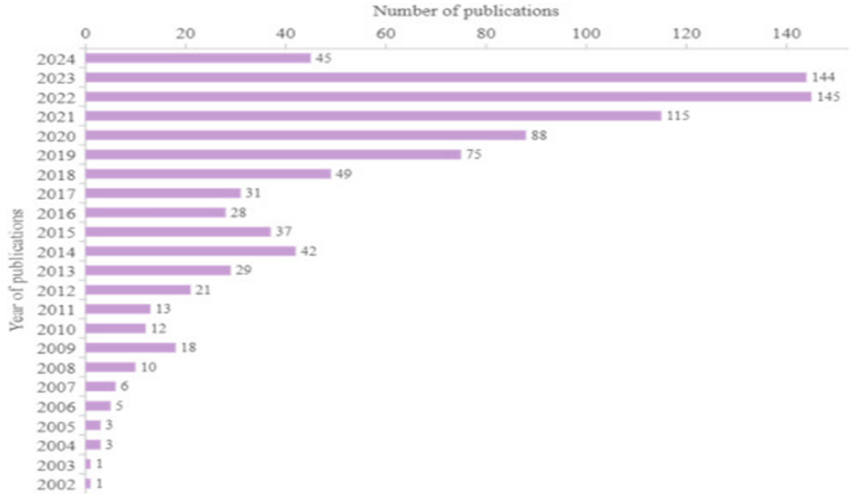

Figure 2. The annual publication trend of papers.

Visualisation analysis of authors and co-authorship

Author-level examination was conducted to identify leading contributors and central research teams in TCM-related depression research. The 921 documents were produced by 4898 authors, averaging six authors per article. According to Price's observation, a thematic research field typically shows that half of all publications come from a group sized at the square root of the total participants, with a minimum core output equal to 0.749 times the highest author output [43]. In this dataset, the most prolific author produced 30 articles, and the corresponding lowest threshold for core authors was 4. Therefore, individuals with more than five papers were designated as core contributors, resulting in 98 authors collectively responsible for 728 papers—representing 79.04% of total publications. Among them, Qin Xuemei had the greatest number of works (30) with 759 citations (mean 25.3 citations per article), while Du Guanhua held the highest citation average (37.4). **Table 1** lists the top six authors by output.

We used VOSviewer to map collaborative patterns among the core authors, with results displayed in **Figure 3**. The co-authorship network not only illustrates collaborative pathways among major contributors but also highlights active research groups and potential partners, facilitating future academic cooperation. The visualisation comprises nine clusters, each marked by a different colour, centred around core authors such as Qin Xuemei, Zhang Yi, Zhang Zhangjin, Chen Gang, Li Yunfeng, Zhu Yue, Kong Lingdong, Li Yan, and Zou Zhongmei.

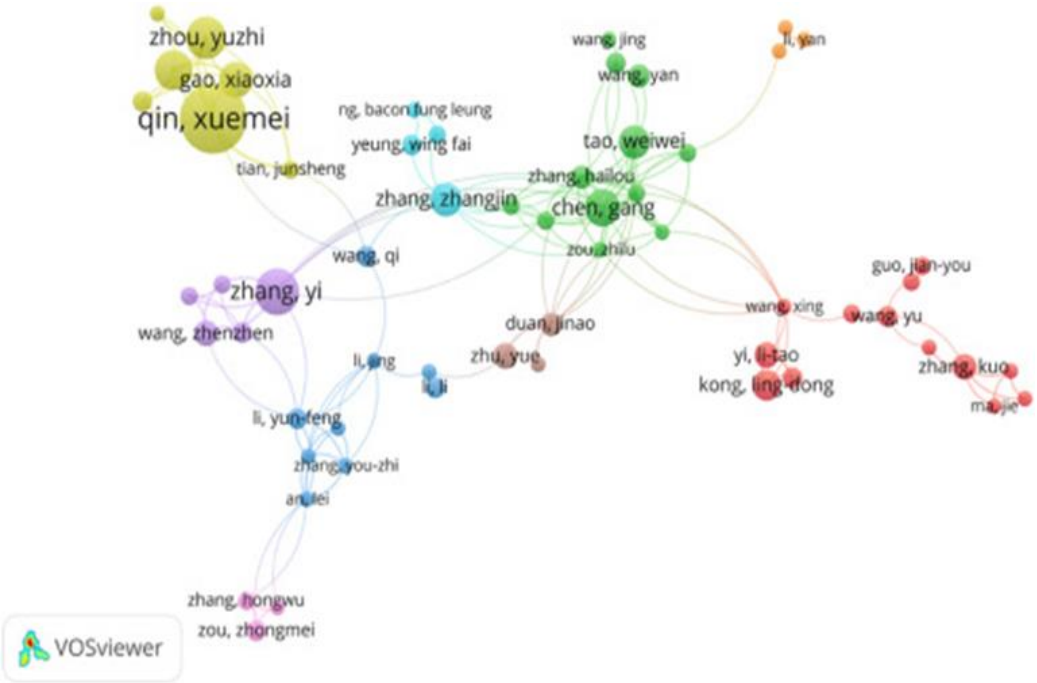

Figure 3. The co-authorship network of authors.

Table 1. The top 6 authors with the most published papers.

Rank	Author	Number of Documents	Total Citations	Average Citations per Publication
1	Qin, Xuemei	30	759	25.3
2	Zhang, Yi	18	247	13.72
3	Zhou, Yuzhi	16	552	34.5
4	Du, Guanhua	15	561	37.4
5	Liu, Ping	15	206	13.73
6	Ma, Qingyu	15	364	24.27

Journal and citation analysis

A review of the publication outlets and citation patterns showed that the research appeared across 269 journals. **Table 2** lists the ten journals contributing the greatest number of papers. Collectively, these ten venues produced

35.72% (329/921) of all documents. The three most active outlets were the Journal of Ethnopharmacology (97 papers), Frontiers in Pharmacy (68), and Evidence-Based Comprehensive and Alternative Medicine (63). When examining citation performance, the Journal of Ethnopharmacology (21.31 citations/article) and Biomedicine & Pharmacotherapy (20.91 citations/article) ranked highest, suggesting that work appearing in these journals has been particularly influential.

Table 2. Top 10 journals with the most published papers.

Rank	Journal/Source	Number of Publications	Total Citations	Average Citations per Publication
1	Journal of Ethnopharmacology	97	2067	21.31
2	Frontiers in Pharmacology	68	742	10.91
3	Evidence-Based Complementary and Alternative Medicine	63	771	12.24
4	Medicine	35	84	2.40
5	Phytomedicine	24	361	15.04
6	Biomedicine & Pharmacotherapy	23	481	20.91
7	Frontiers in Psychiatry	19	184	9.68
8	Chinese Journal of Integrative Medicine	19	150	7.89
9	Neural Regeneration Research	18	166	9.22
10	Journal of Traditional Chinese Medicine	16	172	10.75

Distribution and co-authorship of countries and organisations

To clarify how different nations and institutions contribute to TCM-related depression studies, data from 37 countries and 894 organisations were evaluated. **Tables 3 and 4** list the five most productive countries and institutions. Understanding these geographic patterns can guide future international collaboration. As shown in **Table 3**, China—the origin of TCM—produced the overwhelming majority of publications (847/921), followed by the USA (54/921) and Australia (17/921). China's output alone represented 91.97% of all work in the field, underscoring the need for broader global engagement. Using VOSviewer and Scimago Graphica [44], the co-authorship relations among countries were mapped **(Figure 4)**. Larger nodes represent greater publication counts, while links mark collaborative ties. Node colour reflects average citation levels, with darker red indicating higher values. In this network, China and the United States function as the primary hubs. However, despite high publication numbers, the average citation impact of these two countries remains modest. Notably, Poland, although contributing only three papers, had exceptionally high citation performance—up to 372 citations, with an average of 124—attracting substantial global attention.

Analysis of institutional output **(Table 4)** further revealed that the five most prolific organisations were Chinese universities. Among them, Beijing University of Chinese Medicine, Nanjing University of Chinese Medicine, and Shandong University of Traditional Chinese Medicine formed the central research groups in this area. Their inter-institutional network, visualised for the top 50 organisations using VOSviewer **(Figure 5)**, consisted of seven major clusters. Beijing University of Chinese Medicine and Nanjing University of Chinese Medicine exhibited the strongest connectivity, indicating substantial influence within the field. Additional key contributors included Shandong University of Traditional Chinese Medicine, the China Academy of Chinese Medical Sciences, Guangzhou University of Chinese Medicine, and the University of Hong Kong, all of whom conduct substantial local research.

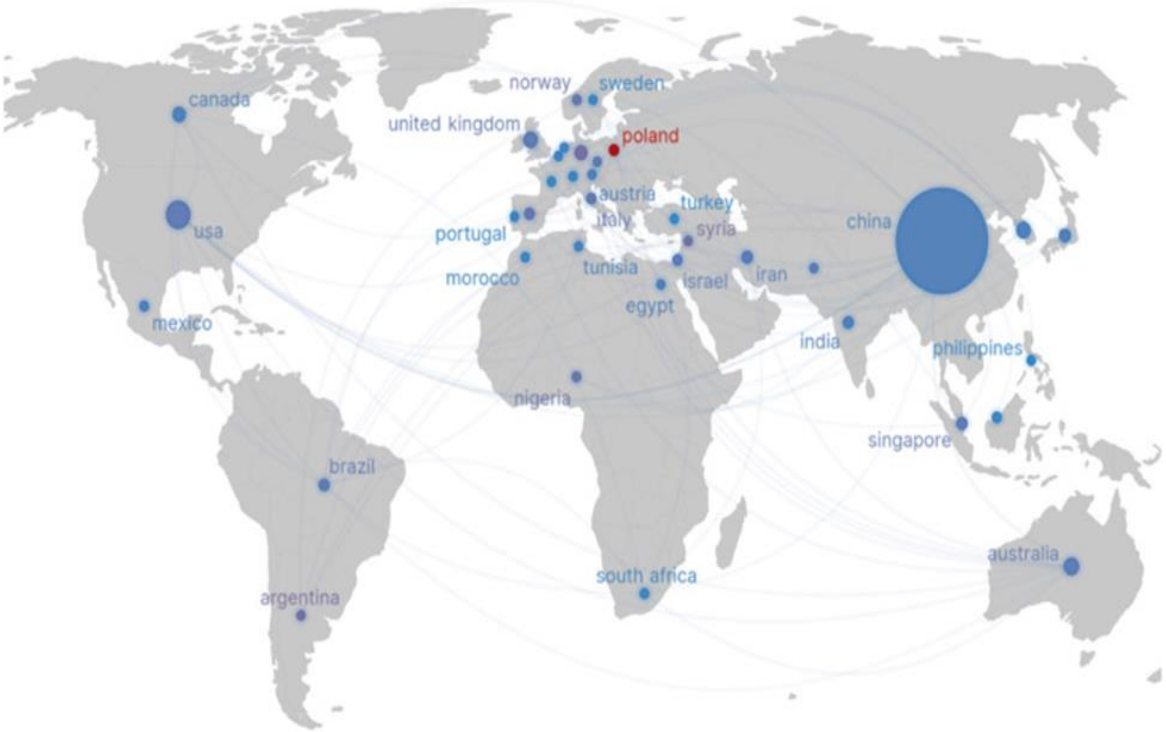

Figure 4. The co-authorship network of countries.

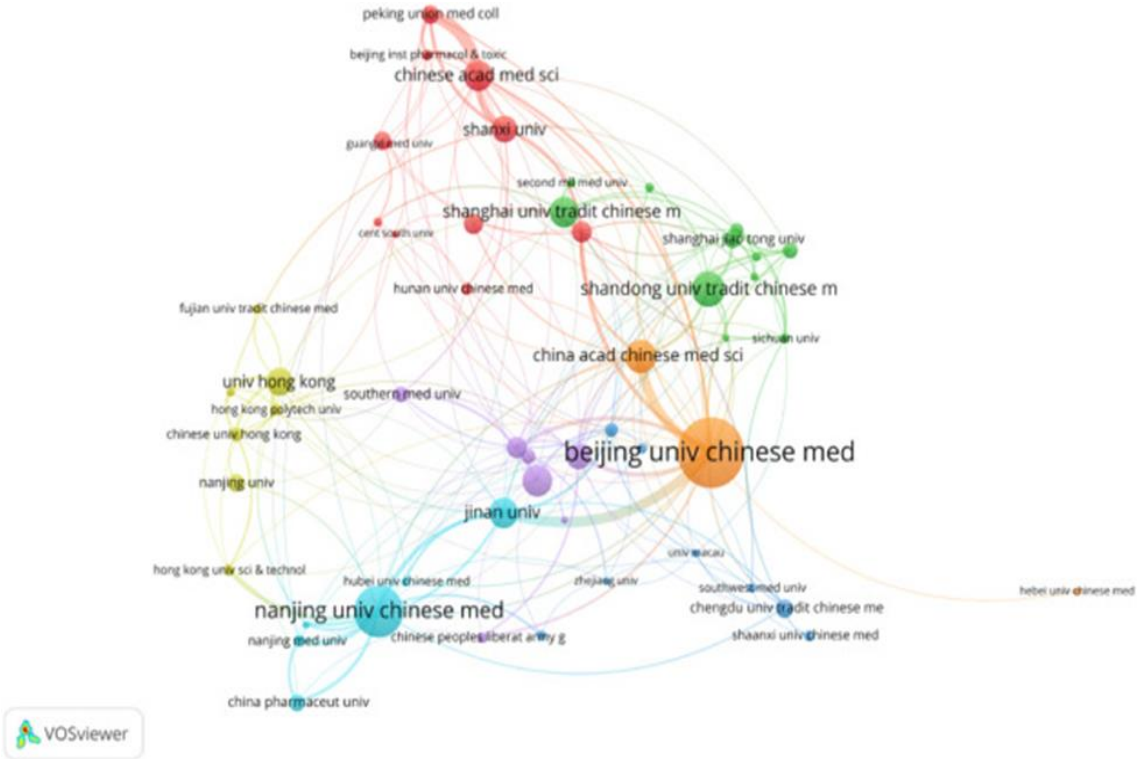

Figure 5. The co-authorship network of organisations.

Table 3. The top 5 countries with the most published papers.

Rank	Country	Number of Publications	Total Citations	Average Citations per Publication
1	China	847	13,256	15.65
2	United States of America	54	1,339	24.80
3	Australia	17	381	22.41

4	United Kingdom	14	362	25.86
5	South Korea	14	185	13.21

Table 4. Top 5 organisations with the most published papers.

Rank	Institution	Number of Publications	Total Citations	Average Citations per Publication
1	Beijing University of Chinese Medicine	90	1,232	13.69
2	Nanjing University of Chinese Medicine	64	994	15.53
3	Shandong University of Traditional Chinese Medicine	41	436	10.63
4	China Academy of Chinese Medical Sciences	39	479	12.28
5	Guangzhou University of Chinese Medicine	37	423	11.43

Keyword analysis

Keywords offer insight into the conceptual focus and evolving research priorities of a discipline. From 921 papers, a total of 3779 keywords were extracted using VOSviewer. **Table 5** highlights the 10 most frequently used terms. A co-occurrence map of the top 50 keywords **(Figure 6)** shows that node size corresponds to frequency. Words appearing most often included depression, Traditional Chinese medicine, anxiety, stress, and antidepressants.

A further clustering of keyword co-occurrences was carried out in CiteSpace (two-year slicing, g-index K = 17), generating a network with N = 294, E = 1025, and a density of 0.0238 **(Figure 7)**. Nine coherent keyword clusters emerged. Lower cluster numbers denote higher centrality and greater relevance to major research themes, indicating the likelihood that such clusters correspond to primary hotspots within this field.

To illustrate how keywords interact across different time periods and to reveal how research priorities have evolved in stages, a keyword timeline was generated in CiteSpace and is displayed in **Figure 8**. In this timeline, terms are arranged into nine thematic clusters. Each keyword's position marks when it was first used, node size indicates how often it appeared, and node colour corresponds to its citation timing. Together, these features outline the thematic focus of each period. Broadly, three temporal stages can be recognised: 2000–2010, 2010–2020, and post-2020, with major terms linked to traditional Chinese medicine, the forced swimming test, hippocampal mechanisms, randomised trials, and network-based pharmacology. A noticeable rise in citation frequency occurred after 2020, likely tied to increased publication volume during that time, reflecting heightened scholarly interest in TCM-related depression research.

To pinpoint sudden shifts in research emphasis, a CiteSpace burst-detection analysis was applied to identify the top 10 keywords with the strongest citation bursts, shown in **Figure 9**. Burst terms were concentrated in two periods: before 2010 and after 2020. Before 2010, early bursts included the core topic "depression," followed by "complexity," which reflects TCM's role as a complementary intervention. Several animal-experiment-related terms also showed strong bursts, such as "mice," "forced swimming test," "tail suspension test," "chronic cold stress," and the mechanism-related term "neural regeneration." One notable burst keyword was "banxia houpu prescription," the only formula-related term to exhibit a burst, beginning in 2005 and persisting until 2015. After 2020, the emergence of "network pharmacology" and "molecular docking" indicated new research directions. These temporal shifts in burst keywords reflect changes in methodological focus and may guide future investigations within TCM-oriented depression studies.

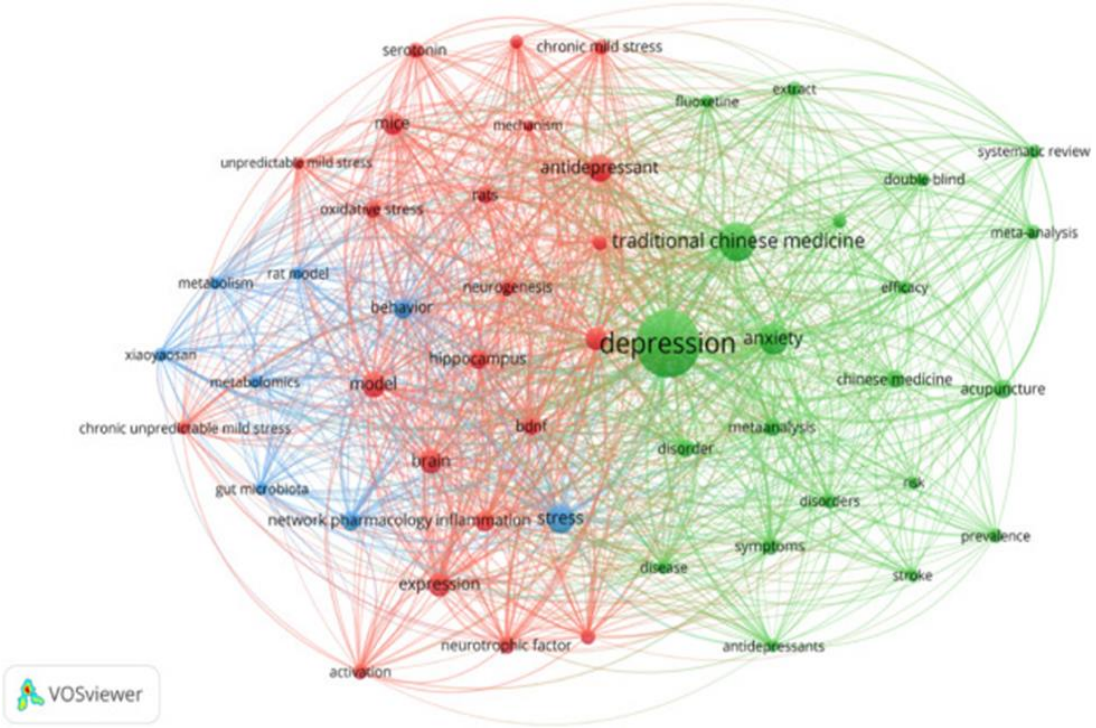

Figure 6. Co-occurrence network of keywords.

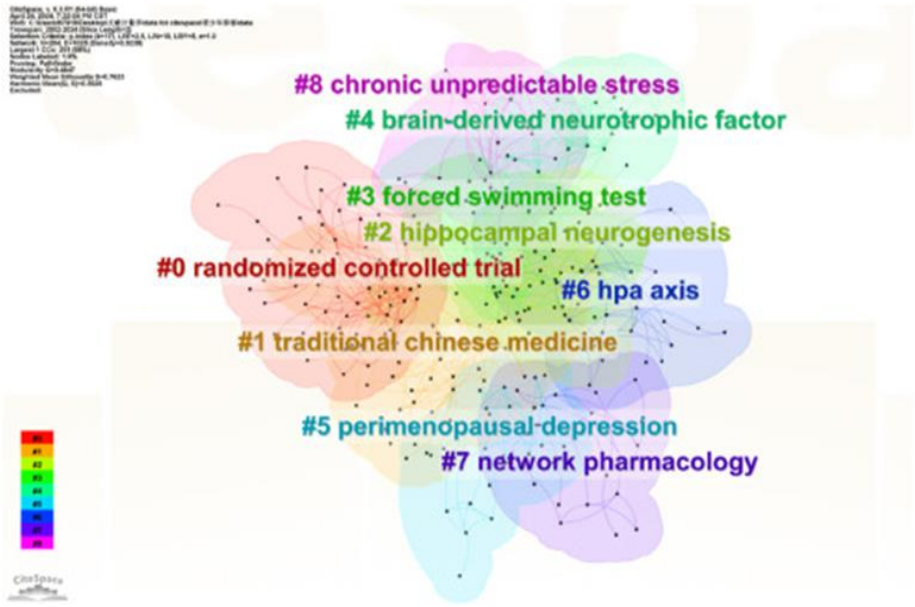

Figure 7. Co-occurrence clustering of keywords.

Table 5. List of the high-frequency keywords.

Rank	Keyword	Occurrences	Total Link Strength
1	Depression	466	508
2	Traditional Chinese medicine	188	246
3	Anxiety	131	184
4	Stress	112	179
5	Antidepressant	101	158
6	Model	91	148
7	Expression	84	159

8	Brain	82	127
9	Major depression	80	142
10	Mice	77	133

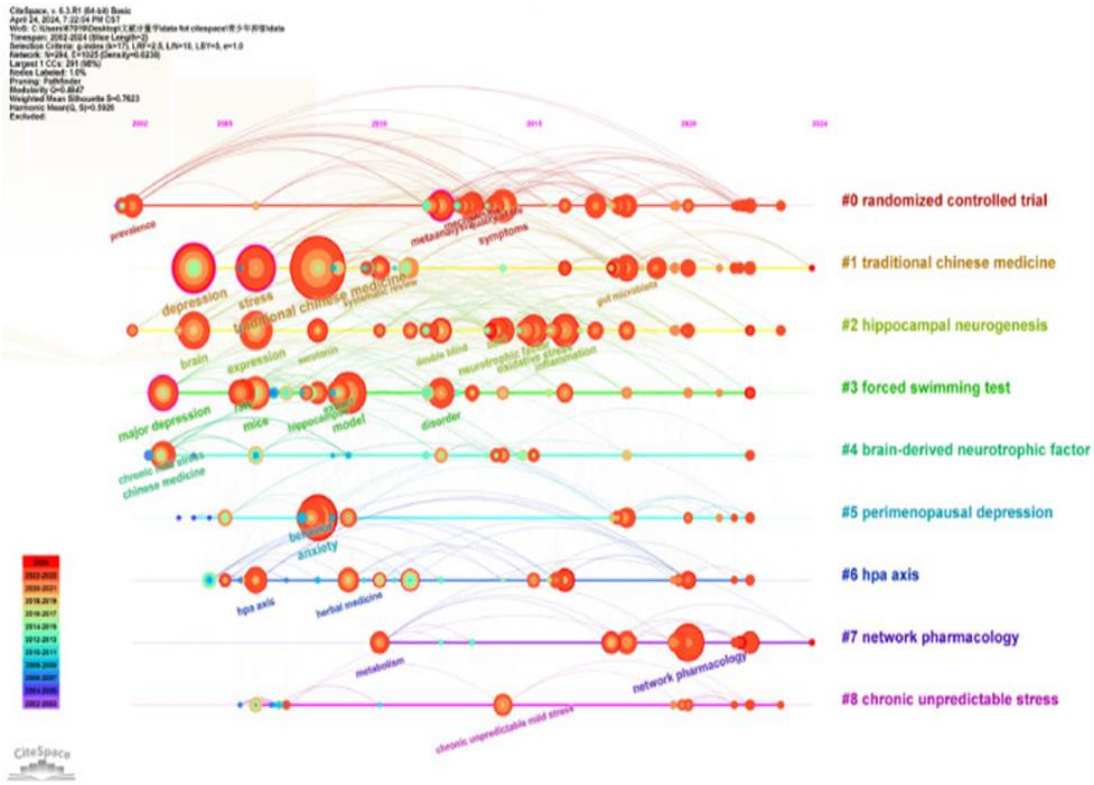

Figure 8. Co-occurrence timeline of keywords.

Top 10 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2002 - 2024
depression	2004	9.41	**2004**	2015	
complementary	2005	6.63	**2005**	2015	
banxia houpu decoction	2005	6.09	**2005**	2015	
forced swimming test	2007	7.58	**2007**	2013	
mice	2006	6.52	**2006**	2015	
tail suspension test	2008	8.73	**2008**	2017	
chronic mild stress	2003	4.91	**2008**	2017	
neural regeneration	2010	6.21	**2010**	2013	
network pharmacology	2020	5.76	**2020**	2024	
molecular docking	2022	4.96	**2022**	2024	

Figure 9. Explosive keywords.

Co-citation analysis of journals and references

The 921 included papers cited 36,682 references across 7,464 journals. To determine which journals and papers shape this research area, a journal co-citation network was produced using VOSviewer. The top 10 most frequently co-cited journals appear in **Table 6**, and a visualisation of the top 100 is provided in **Figure 10**. As indicated in **Table 6**, the journals receiving the highest co-citation counts were the Journal of Ethnopharmacology, Evidence-Based Comprehensive and Alternative Medicine, and the Journal of Affective Disorders. The network in **Figure**

10 comprises four colour-coded clusters, representing fields such as neuropsychology, pharmacology, and Chinese medical research. These journals collectively contribute foundational reviews and analyses relevant to current research themes.

Citation patterns of individual articles were also examined. The top 5 most cited references are listed in **Table 7**, while **Figure 11** illustrates a network of 34 articles that were each cited more than 20 times. Among the five highly cited papers, one is a review published in The Lancet, one outlines database resources for network pharmacology, two evaluate animal models of depression, and one focuses on behavioural testing approaches. The network in **Figure 11** separates into four clusters, aligned with the colours of the nodes: red (13 papers), green (9), blue (8), and yellow (4). These frequently cited articles provide the conceptual and methodological foundations on which much of the current work is built.

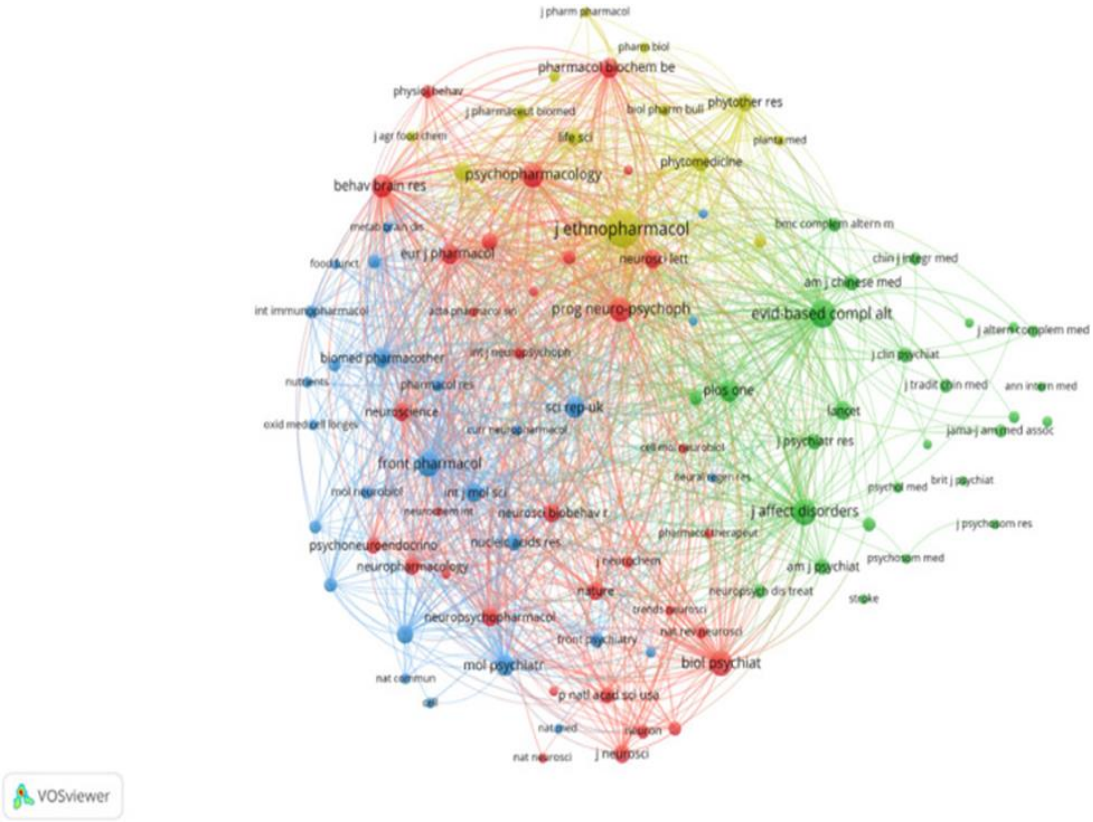

Figure 10. Co-citation analysis of journals.

Table 6. List of the high-frequency cited journals.

Rank	Journal/Source	Citations (Co-citation)	Total Link Strength
1	Journal of Ethnopharmacology	1,369	54,054
2	Evidence-Based Complementary and Alternative Medicine	707	22,883
3	Journal of Affective Disorders	604	17,842
4	Frontiers in Pharmacology	569	22,673
5	Biological Psychiatry	556	19,527
6	Progress in Neuro-Psychopharmacology & Biological Psychiatry	518	21,389
7	Psychopharmacology	505	19,521
8	Behavioural Brain Research	460	22,572
9	PLOS ONE	434	14,157
10	Molecular Psychiatry	393	15,580

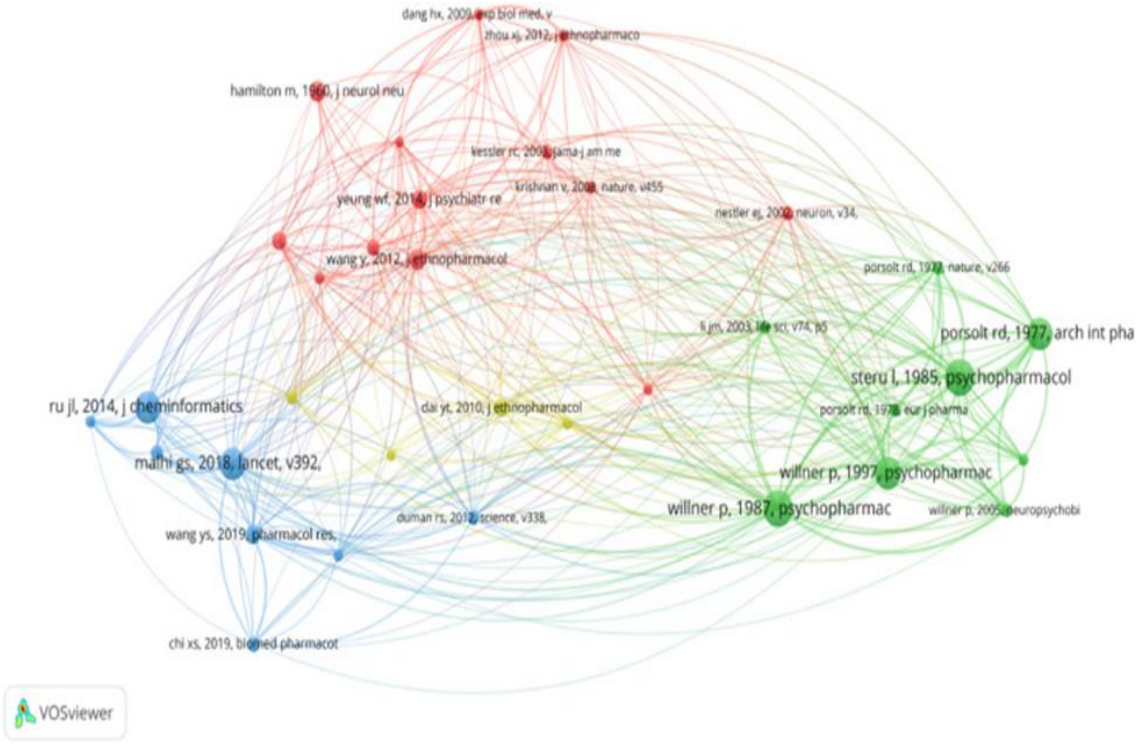

Figure 11. Co-citation analysis of references.

Table 7. List of the high-frequency cited literature.

Rank	Publication Title	Year	Citations (in this field)
1	Reduction of sucrose preference by chronic unpredictable mild stress, and its restoration by a tricyclic antidepressant	1987	62
2	The tail suspension test: A new method for screening antidepressants in mice	1985	62
3	Validity, reliability and utility of the chronic mild stress model of depression: a 10-year review and evaluation	1997	56
4	Depression	2018	55
5	TCMSP: a database of systems pharmacology for drug discovery from herbal medicines	2014	55

Our analysis shows that although depression has been widely examined since the early 2000s, research specifically linking it to TCM did not initially draw substantial scholarly engagement. Publication activity between 2002 and 2011 remained limited. After this slow phase, a marked acceleration occurred around 2017, followed by a sustained rise. By 2022 and 2023, yearly outputs remained above 140 papers, representing 31.38 % of all included publications. This surge suggests growing recognition of TCM's potential in depression research, accompanied by a rapid expansion of academic output. One likely contributor to this shift is the increasing use of network pharmacology, which opened new methodological pathways for exploring formula-based therapies in TCM. Numerous studies applying network pharmacology to TCM antidepressant mechanisms have appeared, positioning it as a contemporary research frontier.

In total, 4,898 authors from 894 institutions across 37 countries contributed 921 publications. However, the distribution of contributions is uneven: China produced 847 of 921 papers (i.e., 91.97 %), far surpassing all other regions, with the United States ranking next at 54 publications. These two countries form the central hubs of the international collaboration network. Nonetheless, as illustrated in **Figure 4**, global engagement remains limited. Issues such as variability in TCM standardisation, gaps in theoretical training, the complexity of herbal formulations, uneven international acceptance of formula-based research, and longstanding concerns about safety may all contribute to this imbalance. A notable outlier is Poland, which published only three papers but achieved an average of 124 citations each, largely due to a highly influential meta-analysis in Neuroscience and

Biobehavioral Reviews on chronic unpredictable mild stress models [45], which continues to be widely referenced in preclinical depression studies.

Journal and citation analysis revealed that the Journal of Ethnopharmacology, Frontiers in Pharmacy, and Evidence-Based Comprehensive and Alternative Medicine were the top three venues in publication volume. The Journal of Ethnopharmacology is indexed in the JCR1 category, and together with Frontiers in Pharmacology, primarily publishes studies involving pharmacological and toxicological evaluation, indicating that mechanistic and pharmacodynamic investigations of TCM-based antidepressants remain a central and forward-moving direction in the field [46]. The strong representation of open-access journals such as Frontiers in Pharmacy and Evidence-Based Comprehensive and Alternative Medicine reflects the broader expansion of open-science platforms, which has indirectly facilitated growth in TCM-related depression research.

The journals with the highest citation averages were the Journal of Ethnopharmacology (21.31 citations/article) and Biomedicine & Pharmacotherapy (20.91 citations/article), suggesting that work published in these outlets garners substantial attention. Articles in the Journal of Ethnopharmacology were predominantly reviews summarising TCM antidepressant activity [47, 48] and mechanistic investigations—e.g., modulation of gut flora [49] and anti-inflammatory pathways [50]. Biomedicine & Pharmacotherapy published both reviews [51, 52] and numerous studies focusing on classical prescriptions such as Chaihu Shugan San [53] and Xiaoyao San [54]. Collectively, these patterns highlight a shared emphasis among researchers and journals on mechanistic exploration and clinical assessment of traditional formulae in depression therapy.

Keyword-based evaluation, conducted through VOSviewer and CiteSpace, revealed nine clusters with strong internal coherence **(Figure 7)**. The three leading clusters centred on randomised controlled trials, TCM therapies, and hippocampal neurobiology.

- Cluster 1 (#0) grouped studies involving RCTs and meta-analyses of TCM treatments, contributing evidence regarding efficacy and safety in depressive disorders [55–57].
- Cluster 2 (#1) highlighted diverse TCM modalities and explored their biological actions in depression [58, 59].
- Cluster 3 (#2) focused on neurobiological mechanisms, particularly hippocampal injury and repair, which are widely recognised as critical in depression pathogenesis and TCM's therapeutic actions [53, 60].

These findings collectively indicate that future progress will continue to rely on both high-quality clinical trials—especially those addressing safety concerns and involving multi-centre, large-sample approaches—and deep mechanistic studies. Such work is essential not only for clarifying how TCM alleviates depressive symptoms but also for advancing its broader global acceptance and integration.

To illustrate how research priorities in this area have shifted over time, we examined the chronological evolution of topics and found that the major hotspots can be grouped into three distinct phases (2000–2010, 2010–2020, and post-2020), as shown in **Figure 8**. During 2000–2010, frequently occurring keywords primarily aligned with three clusters: Traditional Chinese Medicine, hippocampal-related neural studies, and the forced swimming test. The first two clusters have been discussed earlier, whereas the forced swimming test represents a classical behavioural assay widely used in foundational animal studies [61]. This pattern demonstrates that early research was largely centred on exploring TCM antidepressant mechanisms through experimental animal models. In the period 2010–2020, attention shifted toward randomised clinical trials and continued emphasis on hippocampal mechanisms, suggesting that, alongside animal studies, researchers increasingly prioritised evaluating the therapeutic effectiveness and safety of TCM in clinical settings, thereby contributing stronger evidence to the field. After 2020, network pharmacology [62] emerged as a prominent focus and developed rapidly into a leading research hotspot. Additionally, keyword-citation-time analysis showed a marked rise in citation frequency after 2020, likely associated with the growth in publication volume and reflecting heightened scholarly engagement.

Analysis of burst keywords revealed two major intervals of concentration: before 2010 and after 2020. Prior to 2010, burst terms were linked mainly to animal-based mechanistic work, consistent with the timeline analysis, involving behavioural paradigms (e.g., forced swimming and tail suspension tests) and modelling approaches (e.g., chronic cold stress). Between 2010 and 2013, neural regeneration became a core topic, aligning with the cluster related to hippocampal neurogenesis. From 2005 to 2015, the TCM prescription Banxia Houpu decoction drew substantial research attention, with investigations spanning randomised trials [63], animal studies [64], and metabolomics [65]. Since 2020, both network pharmacology and molecular docking have shown explosive growth, signalling that network-based approaches are becoming a central direction for future TCM-related

depression research. These methods have significantly supported the development of mechanism-oriented studies of TCM compounds.

Assessment of the frequently cited journals and literature indicated that the Journal of Ethnopharmacology, Evidence-Based Complementary and Alternative Medicine, and the Journal of Affective Disorders were the three most cited outlets. The first and third journals belong to high-ranking JCR1 categories, with one focusing on pharmacological/toxicological mechanisms and the other on mood-related disorders. The open-access nature of Evidence-Based Complementary and Alternative Medicine enables broad dissemination and can accelerate progress in emerging areas. Examination of co-cited articles revealed that among the top five, two publications by Willner evaluated the strengths and applicability of the Chronic Mild Stress model [66, 67]. In addition, Steru *et al*. developed the tail suspension test, a widely applied method for depression-related behavioural assessments [68]. These contributions provide robust methodological foundations for animal research in depression. The TCMSP database introduced by Ru laid key groundwork for network pharmacology-based TCM studies on depression [69]. Furthermore, a Lancet review on depression synthesised the field's overall research progress and current understanding [70]. The high-co-citation network generated in this study formed four clusters:

– Red (13 papers): randomised trials, meta-analyses, and foundational TCM experimental studies;
– Green (9 papers): methodologies involving modelling and behavioural testing;
– Blue (8 papers): network pharmacology methods and related reviews;
– Yellow (4 papers): research on Xiaoyao San's antidepressant effects mediated through gut microbiota and metabolic pathways.

Collectively, these works supply theoretical frameworks and methodological tools essential for advancing research in the field.

Although this study adopted an extensive and relatively unbiased bibliometric strategy to chart developments in TCM-related depression research, several limitations resembling those of prior work remain unavoidable [71, 72]. A key issue is that our search was restricted to the WOS database, which, while authoritative, may exclude high-quality studies indexed elsewhere and could thus influence the comprehensiveness of our results. Traditional bibliometrics also encounters challenges, such as subjective interpretation by non-experts, potential inconsistencies in manual citation evaluation, and substantial time demands for full-text examination [73]. With recent progress in artificial intelligence, natural-language-processing-driven bibliometric techniques have begun to mitigate these constraints by offering more systematic insights into citation patterns, document structures, and global research landscapes. Nonetheless, these developments represent areas beyond the scope of the present study.

In summary, although our work may not encompass every relevant publication, it significantly outlines major trends and emerging hotspots within this research domain and therefore has meaningful value for scholars working in the field.

Conclusion

To date, this study appears to be the first to provide a wide-ranging bibliometric overview of research themes and developmental trajectories concerning TCM-related depression since the early 2000s. It is also the first to construct a complete set of visual analytic maps that can support researchers in clinical practice and scientific exploration, while helping them identify potential collaborators, institutions, and future research frontiers. Overall, our findings indicate that global academic attention toward depression in TCM remains insufficient. Advancing the field will require large-scale, multicentre clinical studies together with rigorous basic-science investigations. Since 2020, the expansion of network pharmacology has both intensified interest in this research area and opened new pathways for studying multicomponent TCM interventions in depression, a direction that will likely continue to shape future work.

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