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REVIEW

Research Trends and Hotspots of Acupuncture Therapy on Allergic Diseases From 2004 to 2024: A Bibliometric Analysis

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Background: Over the past two decades, acupuncture has increasingly been applied in the treatment of allergic diseases, with a corresponding increase in the number of published articles.

Objective: To investigate the hotspots and frontiers of global scientific output in acupuncture research for allergic diseases over the past two decades.

Methods: The Web of Science Core Collection was used to collect literature on acupuncture therapy for allergic diseases, which spanned from 2004 to 2024. We used CiteSpace 6.3.1 and VOSviewer to conduct visual analysis of the relevant contents of the literature, and constructed a network graph in the software by using information such as the publication date of the article, country, institution, author, and journal.

Results: A total of 423 documents were retrieved. The results indicate that the annual publication volume on acupuncture treatment for allergic diseases has shown a fluctuating upward trend. China is the leading country in terms of publications. KyungHee University emerges as the most productive institution. Brinkhaus, B. is the most prolific author. *Medicine* is the most popular journal. *Annals of Internal Medicine* has the highest impact factor. Allergic rhinitis, the efficacy and safety of acupuncture as an alternative therapy for allergic diseases, and the mechanisms underlying acupuncture treatment are at the forefront of research in this field.

Conclusion: This study provides a comprehensive summary of the research hotspots and trends in the field of acupuncture treatment for allergic diseases over the past two decades, which can assist researchers in better understanding the development of this field and offer directions for future research.

Keywords: acupuncture, allergic diseases, bibliometric analysis, citespace, VOSviewer

Introduction

Allergic diseases are a group of conditions characterized by the immune system's hypersensitivity to environmental allergens. These conditions encompass allergic rhinitis (AR), allergic asthma (AA), atopic dermatitis (AD), urticaria, allergic gastroenteritis, chronic rhinosinusitis with or without nasal polyps (CRSwNP), and specific allergic reactions to food or medication.[1] In recent years, the prevalence of allergic diseases has been on the rise globally, affecting 20% of the world's population, especially children.[2] Consequently, the World Health Organization has designated allergic diseases as one of the three major diseases to be prioritized for prevention and control in the 21st century, highlighting their status as a significant global health issue.[3] Allergic diseases are prone to relapse, have unclear etiologies, and impose substantial treatment costs in clinical practice. They are incurable, severely affecting the quality of life of patients and presenting a considerable challenge to healthcare systems.[4]

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Traditional Chinese medicine (TCM) has a long history in the treatment of allergic diseases, with relatively good therapeutic effects. Although the concept of "allergic diseases" is not explicitly mentioned in TCM theory, ancient texts already contain descriptions of the symptoms, etiology, and pathogenesis of such diseases. Acupuncture, as an important part of TCM therapy, plays a significant role in the clinical treatment of allergic diseases. It has a promising application prospect due to its few adverse reactions, low treatment cost, significant therapeutic effects, and good patient compliance.[5] A recent study published in the Annals of Internal Medicine by Li Ying's team has found that acupuncture can alleviate the symptoms of chronic spontaneous urticaria. The study, conducted as a randomized trial, demonstrated the efficacy of acupuncture in reducing the Urticaria Activity Score 7 (UAS7), which indicates the severity of urticaria symptoms.[6] In a randomized controlled trial by Brinkhaus, B. et al pointed out that acupuncture leads to statistically significant improvements in disease-specific quality of life and antihistamine use indicators after 8 weeks of treatment.[7] Pfab, F.'s randomized controlled experiment demonstrated a significant reduction in type I hypersensitivity itching in patients with atopic eczema. Over time, the preventive point-specific effect weakened in terms of subjective itching sensation, while the inhibition of skin prick responses increased.[8] Admittedly, acupuncture research faces common challenges like methodological differences, placebo effects, and difficulties in standardizing treatment protocols, which can affect the accuracy of research findings. Currently, acupuncture researchers are continuously enhancing experiments to overcome these issues. A search in the Web of Science (WOS) for literature over the past two decades reveals a wealth of research related to acupuncture treatment of allergic diseases. To better understand the current state and development of acupuncture in treating allergic diseases, and to objectively identify the limitations and challenges in this research field, it is essential to investigate the characteristics, hotspots, and trends of related studies.

With the advancement of modern information technology, innovations in data analysis such as big - data analytics and AI algorithms have made processing complex literature datasets possible. The popularization of information - sharing platforms and open - source software tools has lowered the barriers to literature access. Against this backdrop, bibliometrics has emerged as a valuable tool. Bibliometrics has been employed as a technique for visualizing pertinent literature, facilitating quantitative analysis of research information, observing interconnections among various research topics, and identifying research hotspots across different domains. In the medical field, bibliometric techniques have emerged as a powerful tool for medical research. They enable a quick and comprehensive grasp of medical science and disease monitoring trends by transforming bibliometric results into intuitive visual formats through visualization technologies. This application not only propels the development of medical science but also significantly strengthens the capacity for disease monitoring and early warning. In recent years, bibliometric analysis has been applied to the literature concerning acupuncture treatment for a range of conditions, including Parkinson's disease,[9] migraine,[10] and cerebral infarction.[11] However, there has been a paucity of analysis on the application of acupuncture therapy in allergic diseases. The present study aims to conduct a bibliometric analysis to examine the information related to the application of acupuncture in the treatment of allergic diseases over the past two decades, identify hotspots and trends in this field, provide a comprehensive overview of the current state of this field, and offer perspectives on future research prospects.

Materials and Method

Data Sources and Search Strategies

All publications for this study were sourced from the Web of Science Core Collection (WoSCC), with the search conducted on August 29, 2024. The types of publications included in our analysis were restricted to articles and reviews, with a time frame spanning from January 1, 2004, to August 29, 2024.The retrieval strategy is as follows: TS = ("allergic disease*" OR "atopic disease*" OR allerg* OR anaphyla*) AND TS = (acupunct* OR acupoint* OR electroacupunct* OR electro-acupunct* OR auricularacupunc* OR "auricular needle*" OR "transcutaneous electrical acupoint stimulation" OR acupre* OR moxibust*). Our keyword selection is scientifically constructed to ensure comprehensive and precise literature retrieval. We first identified two core research themes: allergic diseases and acupuncture. For "allergic diseases", we selected terms like "allergic disease", "atopic disease", "allerg", and "anaphyla" which are diverse yet commonly used in existing research. For "acupuncture", we selected a series of terms such as "acupunc", "acupoint", "electroacupunct", "electro-acupunct", "auricularacupunc", "auricular needle", "transcutaneous electrical acupoint

stimulation", "acupre", and "moxibust". Given the diversity of acupuncture-related techniques, our keyword selection aimed to ensure that the search was not limited to traditional acupuncture but covered various acupuncture treatment methods. By combining these two sets of keywords with the Boolean operator "AND", we precisely retrieved literature on the application of acupuncture in the treatment of allergic diseases, ensuring high relevance of the search results to our research topic. Overall, this search strategy, based on a deep understanding of the research topic and literature characteristics, aims to comprehensively and accurately obtain relevant documents.We retrieved all files in the "Plain Text File" format, and "Full Record and Cited References" was selected forRecord Content".

Data Processing

Inclusion Criteria of Literature

① Literature related to the application of acupuncture in allergic diseases, including clinical studies, experimental studies, reviews, etc., with complete literature information. ② The literature is published articles. ③ Literature from the WOS core collection database, with no restrictions on the language of the literature.

Exclusion Criteria for Literature

① Repetitive literature. ② Conference records, newspapers, theses, patents, information, etc.

Data Analysis

In this study, we employed CiteSpace 6.3.1 and VOSviewer to conduct a visual analysis of the literature's relevant content. Initially, we conducted deduplication of all documents and excluded those that did not align with the thematic criteria of our research. A total of 423 articles were obtained. Subsequently, we standardized the naming of institutions and authors across different documents. The processed information such as articles' publication dates, countries, institutions, authors, and journals was used to construct a network map within the software. Some of the parameters of CiteSpace are set as follows: time slicing (2004–2024); years per slice (1); association strength algorithm (cosine); selection criteria (node threshold selection criteria), g-index (k=25).Through the analysis, we identified research hotspots and trends within the field.

Results

Basic quantitative information: The 423 publications which were used in this study came from 2038 authors from 662 institutions in 45 countries, and citing 14,376 references from 4,562 distinct journals.

Annual Publication Outputs and Time Trend

Through a search of the Web of Science Core Collection, we identified 458 records from 2004 to 2024. After eliminating records that are clearly irrelevant to the subject matter and deduplication, we retained articles (n = 299) and reviews (n = 124) for bibliometric analysis, resulting in a total of 423 publications included in the study. Figure 1 illustrates the number of publications on acupuncture treatment for allergic diseases over the past two decades. The literature count fluctuated due to various factors during the study period. The period from 2008 to 2015 marked the first phase of rapid development in this field, with an overall increasing trend in annual publication volume. After reaching a peak in 2015, there was a moderate decline in the first phase. The second phase of rapid development spanned from 2017 to 2022, with the highest number of publications in 2020, after which there was a subsequent decrease in 2022. Overall, the volume of publications on acupuncture treatment for allergic diseases showed a trend of fluctuating growth, indicating continuous progress in this field.

Between 2004 and 2024, researchers from 45 countries/regions published a total of 423 articles. Figure 2A depicts the six countries/regions with more than 10 publications, with China leading in publication output (179 articles), followed by the United States (USA) (71 articles) and South Korea (68 articles). The top three countries in terms of total citation counts are the United States, China, and Germany. Using VOSviewer, a visualization map of the national cooperation network was generated, as shown in Figure 2B. China, the United States, Germany, and South Korea have played

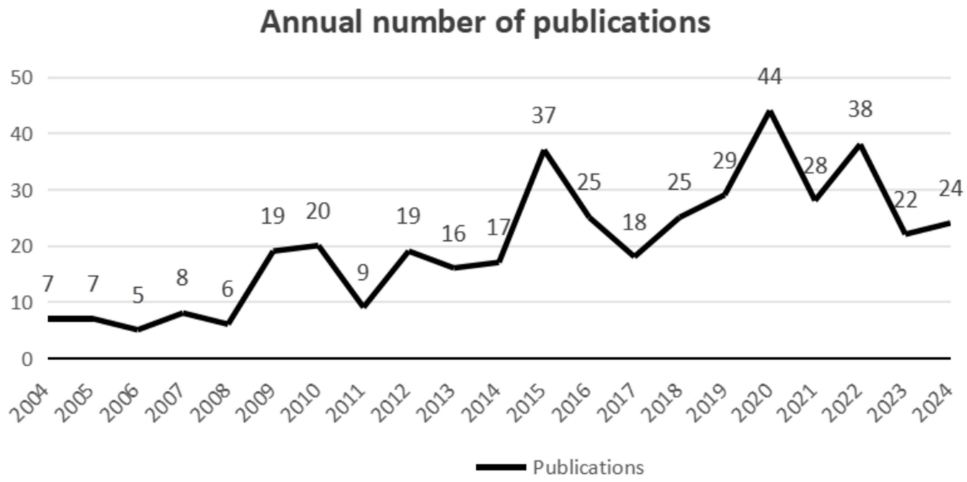

Figure 1 Annual number of publication.

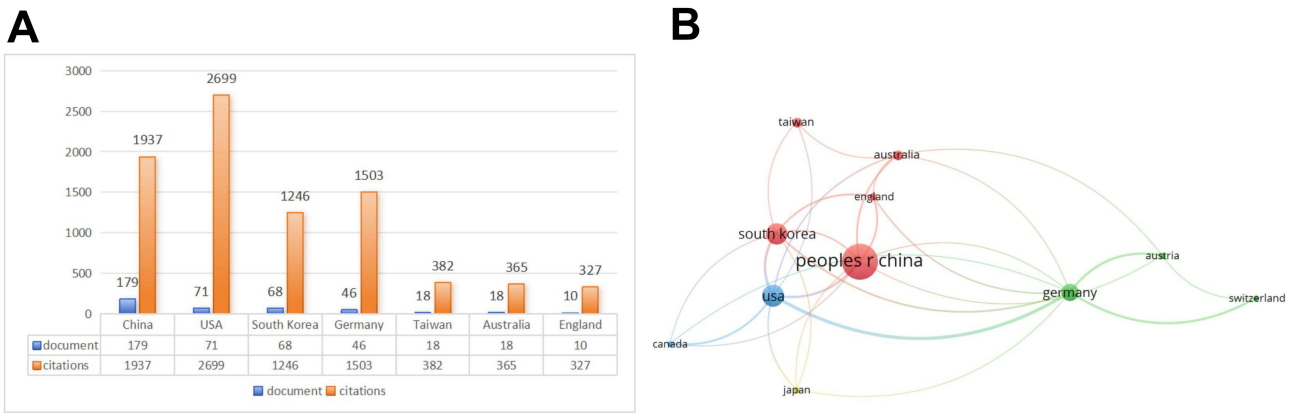

Figure 2 (**A**) The countries/regions with more than 10 publications.(**B**) Visualization map of the national cooperation network.

significant roles in the research within this field, with close collaborative relationships, forming their respective cooperation networks.

Analysis of Institutions

Among the 423 publications contributing to the medical research on acupuncture treatment for allergic diseases, the analysis of the top 10 prolific institutions is presented in Table 1. Out of these 10 universities, five are located in China, two in South Korea, and the remaining three are in the United States, Australia, and Germany. KyungHee University (n=32), Chengdu University of Traditional Chinese Medicine (n=23), and the Chinese Academy of Medical Sciences (n=21) are the top three most productive universities. Among the top 10 institutions, Charité – Universitätsmedizin Berlin has the highest total citation count. Harvard University has the highest average citations per publication. As shown in Figure 3, the majority of institutional collaborations are primarily within their respective countries, and the thin connections between nodes indicate that academic exchanges across institutions are not sufficiently rich.

Analysis of Authors and Cited Authors

We conducted an analysis of the authors, and the top 9 most prolific authors are depicted in Table 2. Brinkhaus, B. from Charite Universitatsmedizin Berlin published the highest number of articles, totaling 15, making him the most productive author in this field. Stefan N. Willich, also from the same institution, has the highest average citation frequency per article in this domain. The H-index, which integrates the number of publications and citation frequency, is a metric for gauging

Table 1 The Top 10 Institutions with the Most Publications

Affiliations	Publications	Citations	Mean Citations/Publication
Kyung Hee University	32	635	19.84
Chengdu University of Traditional Chinese Medicine	23	106	4.61
Chinese Academy of Medical Sciences	21	180	8.57
Charité–Universitätsmedizin Berlin	20	788	39.4
China Medical University	17	460	27.06
Beijing University of Traditional Chinese Medicine	17	142	8.35
Korea Institute of Oriental Medicine	16	352	22
Technische Universität München	14	472	33.71
Royal Melbourne Institute of Technology University	13	291	22.38
Harvard University	10	416	41.6

Note: (Mean Citations/Publication=Total Publications/Total Citations).

a researcher's academic impact. Willich, S.N., Witt, C.M., and Brinkhaus, B. are the authors with the highest H-indices in this field, indicating their significant contributions to the medical research on acupuncture for allergic diseases. The fact that these authors all hail from Charite Universitatsmedizin Berlin underscores the institution's pivotal role in the field of acupuncture for allergic diseases.

As depicted in the author distribution map Figure 4A, the collaborative relationships among authors are not closely knit, and the distribution is relatively dispersed, with the establishment of collaboration networks primarily based on the country or institution to which they belong. Figure 4B illustrates the co-citation patterns among cited authors, encompassing four major clusters.

Analysis of Journals and Subject Categories

A total of 423 publications were distributed across 175 journals, with Table 3 presenting the top 10 journals by number of publications. "Medicine" is the most popular journal, with 32 publications, followed by "Evidence-Based

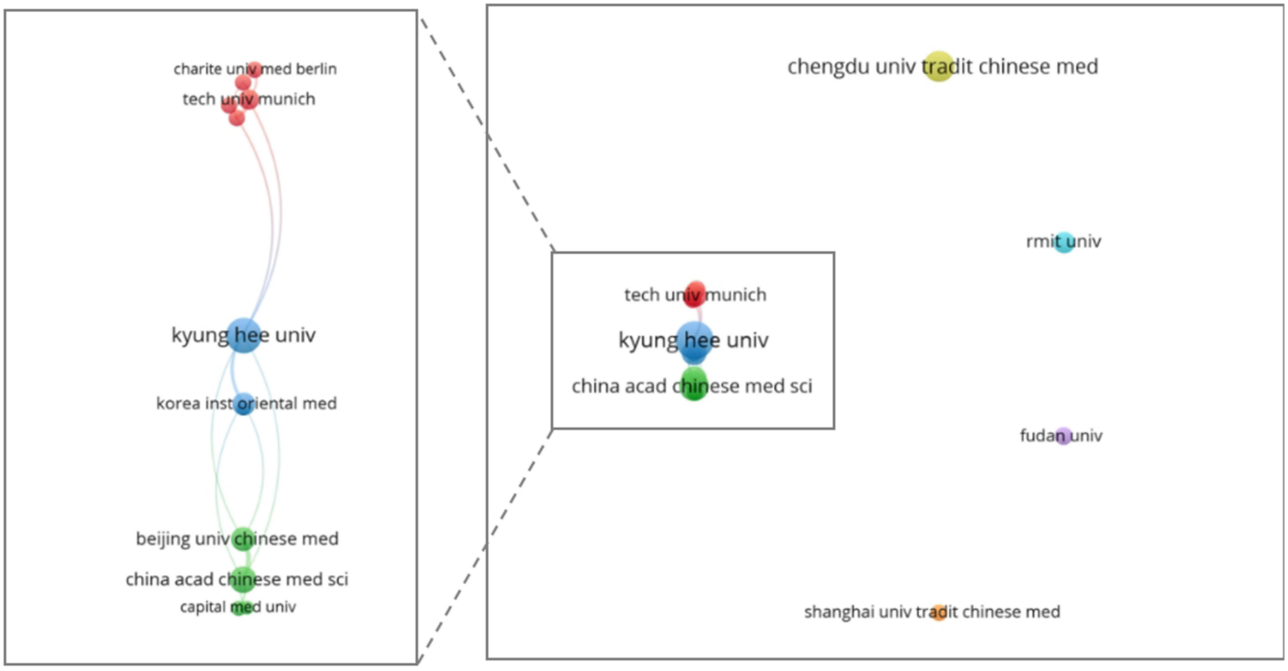

Figure 3 The distribution map of institutions.

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Table 2 The Top 9 Authors with the Most Publications

Rank	Author	Organization	Documents	Citations	Mean Citations/Publication	H-index
1	Brinkhaus, B.	Charite Universitatsmedizin Berlin	15	657	43.8	36
2	Zhang, Q.X.	Chengdu University of Traditional Chinese Medicine	12	56	5.6	16
3	Witt, C.M.	Charite Universitatsmedizin Berlin	10	663	66.3	45
4	Ortiz, M.	Charite Universitatsmedizin Berlin	10	176	17.6	10
5	Willich, S.N.	Charite Universitatsmedizin Berlin	9	624	69.33	70
6	Pfab, F.	Technical University of Munich	8	268	33.5	21
7	Chen, S.	Beijing University of Traditional Chinese Medicine	8	44	5.5	6
8	Yang, J.	Jiangxi University of Traditional Chinese Medicine	8	10	1.25	6
9	Wang, X.	Jiangxi University of Traditional Chinese Medicine	7	10	1.43	2

Note: (Mean Citations/Publication=Total Publications/Total Citations).

Complementary and Alternative Medicine" (n = 30) and "Trials" (n = 18). The top three journals in terms of citation frequency are "Evidence-Based Complementary and Alternative Medicine" "Forschende Komplementarmedizin" and "Annals of Allergy, Asthma & Immunology". The journal with the highest impact factor is "Annals of Internal Medicine" (IF = 19.6), followed by "Trends in Food Science & Technology" (IF = 15.1) and "Journal of the American Academy of Dermatology" (IF = 12.8). Among the included publications, two articles were published in "Annals of Internal Medicine" while all others had only one publication. A total of 12 papers were published in journals with an impact factor greater than 10.

From the Figure 5, it can be observed that the co-citation network of journals is composed of four clusters, corresponding to the four colors in the diagram. The top three journals in terms of citation frequency are the "Journal of Allergy and Clinical Immunology" (cited 811 times), "Allergy" (cited 661 times), and "Annals of Allergy, Asthma & Immunology" (cited 444 times), all of which are esteemed journals in the field of immunology. Among the four clusters, the red and blue clusters primarily consist of journals from the clinical medicine domain, while the green cluster is predominantly composed of journals from the immunology field. Journals from these two domains mainly provide theoretical support and clinical data for research on acupuncture treatment of allergic diseases. The yellow cluster mainly

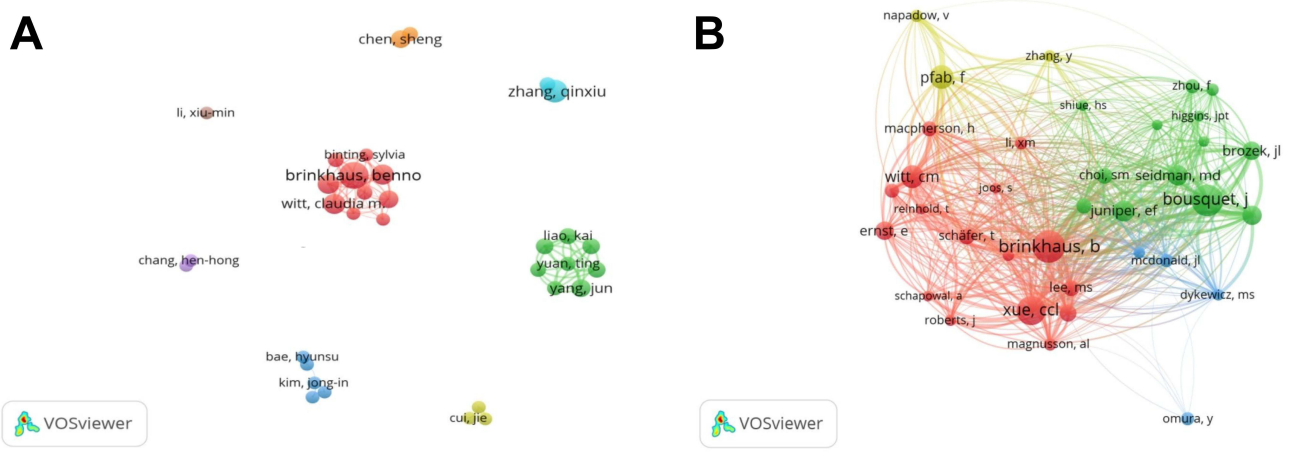

Figure 4 (**A**) The distribution map of authors. (**B**) The co-citation map of cited authors.

Table 3 The Top 10 Journals with the Most Publications

Source	Document	Citations	Mean Citations/Publication	IF (2024)
Medicine	32	131	4.09	1.3
Evidence-based complementary and alternative medicine	30	404	13.47	2.65
Trials	18	146	8.11	2.0
Bmc complementary and alternative medicine	13	242	18.62	3.3
Complementary therapies in medicine	13	241	18.54	3.3
Journal of alternative and complementary medicine	11	207	18.82	2.3
Annals of allergy asthma and immunology	9	322	35.78	5.8
Journal of traditional Chinese medicine	9	48	5.33	2
Acupuncture in medicine	8	110	13.75	2.4
World journal of acupuncture-moxibustion	8	18	2.25	0.6

Note: (Mean Citations/Publication=Total Publications/Total Citations).

includes journals from the pediatrics field, and the citation of journals in this domain is largely due to children being a high-incidence group for allergic diseases, with a substantial amount of research on allergic diseases within pediatrics.

Analysis of Documents and Cited References

The most frequently co-cited references reveal how different research findings are interconnected. By identifying clusters of frequently co-cited papers, it is possible to determine key themes and foundational works crucial for the field's advancement. This, in turn, aids in mapping the comprehensive development of the field and identifying its frontiers, providing researchers with a strategic overview. The documents with the most citations in a field serve as key references that underpin its knowledge foundation. They signify core contributions and influential ideas that have significantly

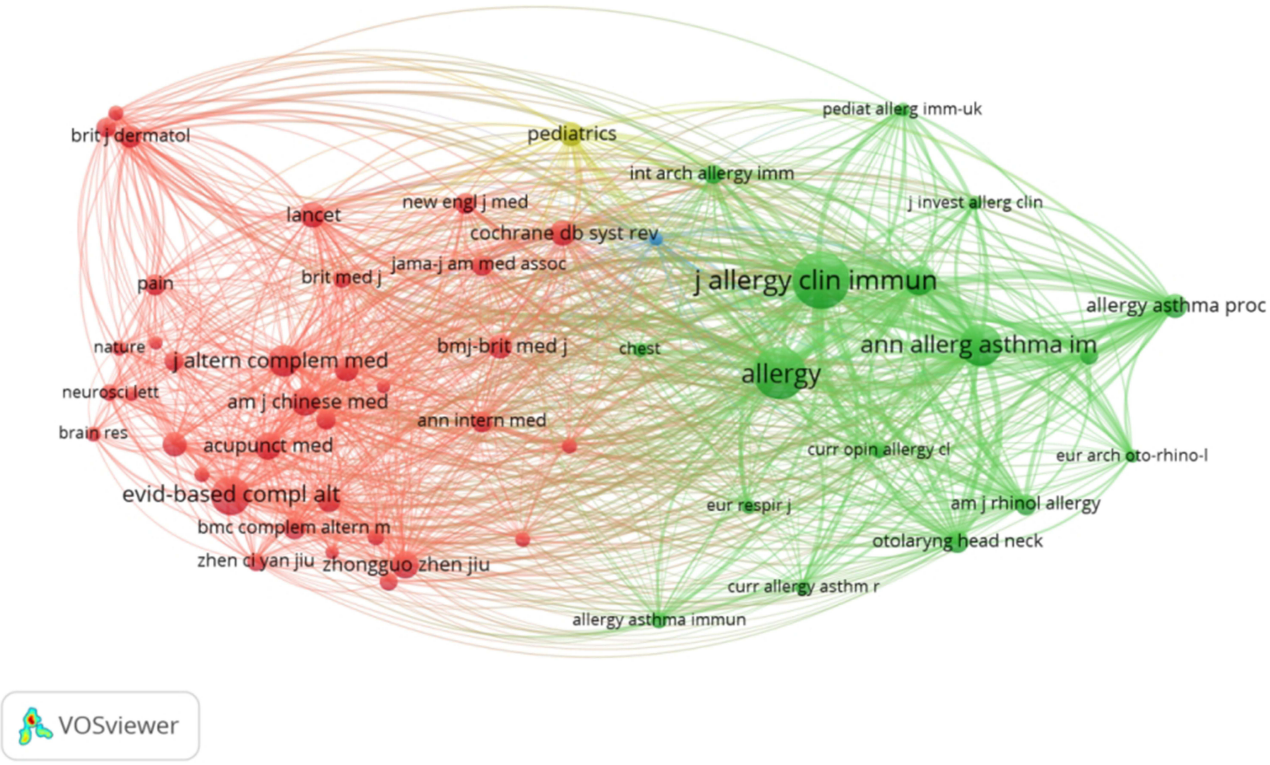

Figure 5 Visualization map of co-cited journals network.

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shaped the research landscape. These documents reflect the general consensus within the academic community and are essential for researchers to grasp the basic theories and methodologies of the discipline. We analyzed and listed the top 10 publications with the highest co-citation counts (Table 4) and the highest citation counts (Table 5), representing the main research directions in the field. Concurrently, We generated a cluster visual analysis of cited literature on acupuncture for

Table 4 The Top 10 Co-Cited References with the Most Citations

Rank	Document	Title	Journal	Citations
1	Bousquet, J.,2008	Allergic rhinitis and its impact on asthma (ARIA) 2008 update	Allergy	59
2	Ng, D.K.,2004	A double-blind, randomized, placebo-controlled trial of acupuncture for the treatment of childhood persistent allergic rhinitis	Pediatrics	50
3	Xue, C.C.,2002	Effect of acupuncture in the treatment of seasonal allergic rhinitis: A randomized controlled clinical trial	American Journal of Chinese Medicine	50
4	Brinkhaus, B., 2008	Acupuncture in patients with allergic rhinitis: a pragmatic randomized trial	Annals of Allergy, Asthma & Immunology	48
5	Xue, C.C.,2007	Acupuncture for persistent allergic rhinitis: a randomised, sham-controlled trial	Medical Journal of Australia	46
6	Brinkhaus, B., 2013	Acupuncture in Patients With Seasonal Allergic Rhinitis A Randomized Trial	Annals of Internal Medicine	46
7	Choi, S.M.,2013	A multicenter, randomized, controlled trial testing the effects of acupuncture on allergic rhinitis	Allergy	46
8	Schäfer, T., 2002	Alternative medicine in allergies -: prevalence, patterns of use, and costs	Allergy	42
9	Seidman, M.D.,2015	Acupuncture and allergic rhinitis	Otolaryngology-Head and Neck Surgery	39
10	Brozek, J.L.,2010	Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines: 2010 Revision	Journal of Allergy and Clinical Immunology	34

Table 5 The Top 10 Documents with the Most Citations

Rank	Document	Title	Journal	Citations
1	Seidman, M.D.,2015	Clinical Practice Guideline: Allergic Rhinitis	Otolaryngology-Head and Neck Surgery	544
2	Witt, C.M.,2009	Safety of Acupuncture: Results of a Prospective Observational Study with 229,230 Patients and Introduction of a Medical Information and Consent Form	Forschende Komplementarmedizin	334
3	Hadrup, N.,2018	Toxicity of silver ions, metallic silver, and silver nanoparticle materials after in vivo dermal and mucosal surface exposure: A review	Regulatory Toxicology and Pharmacology	193
4	Wu, B.,2007	Meta-analysis of traditional Chinese patent medicine for ischemic stroke	Stroke	155
5	Dykewicz, M.S.,2020	Rhinitis 2020: A practice parameter update	Journal of Allergy and Clinical Immunology	147
6	Jindal, V.,2008	Safety and efficacy of acupuncture in children - A review of the evidence	Journal of Pediatric Hematology/ Oncology	126
7	Tran, N P,2011	Management of Rhinitis: Allergic and Non-Allergic	Allergy, Asthma & Immunology Research	125
8	Passalacqua, G.,2006	ARIA update: I - Systematic review of complementary and alternative medicine for rhinitis and asthma	Journal of Allergy and Clinical Immunology	116
9	Ng, D.K.,2004	A double-blind, randomized, placebo-controlled trial of acupuncture for the treatment of childhood persistent allergic rhinitis	Pediatrics	97
10	Kim, S.K.	Acupuncture and immune modulation	Autonomic Neuroscience-Basic and Clinical	97

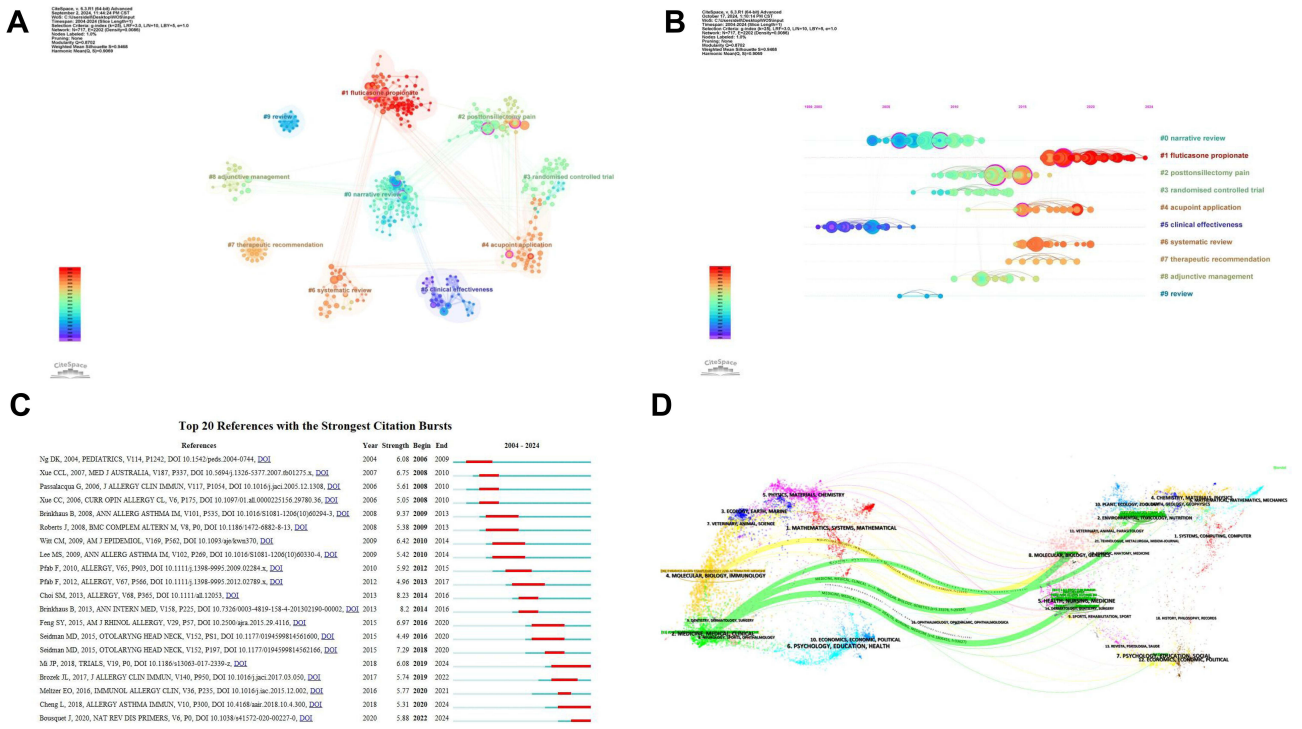

Figure 6 (**A**) The clusters of cited references in this study. (**B**) Timeline view of the cited references in this study. (**C**) Top 20 references with the strongest citation burst. (**D**) Dual-map overlay visualization of documents.

the treatment of allergic diseases (Figure 6A), which displays 10 major clusters, indicating the hot topics in the field. The three largest clusters are #0 narrative review, #1 fluticasone propionate, and #2 posttonsillectomy pain. To clearly understand the development process and trends in acupuncture treatment for allergic diseases, we created a visual timeline (Figure 6B) using the aforementioned main clusters, showing the emergence and disappearance of clusters from 2004 to 2024. The timeline also displays structural information for each cluster. Cluster #1 fluticasone propionate is the most recently emerged and developing cluster, and its study in comparison or combination with acupuncture as a treatment for respiratory diseases such as asthma and rhinitis holds significant promise. The purple circles identify key nodes, indicating a centrality of at least 0.1; clusters #0 narrative review, #1 fluticasone propionate, #2 posttonsillectomy pain, and #4 acupoint application all feature purple circles at different times, suggesting their higher centrality. Figure 6C shows the top 20 references with the strongest citation bursts. Systematic reviews and randomized controlled trials are the most cited types of literature. Multiple articles related to the study of acupuncture in treating allergic rhinitis demonstrate the current active citation bursts in this field.

The Dual-Map Overlay visualization technique presents data on the dispersion of scholarly articles across various disciplines, citation patterns, and the evolution of research focal points. Within the Dual-Map Overlay visualization (Figure 6D), literature is predominantly featured in two domains on the left side of the citation map: the green zone, designated as medicine/medical/cl inical, and the yellow zone, labeled as molecular/biology/immunology. This delineates the primary fields of application for acupuncture in the context of allergic diseases.

Analysis of Keywords

Keywords serve as a concise summary of the publications and content of the literature. Among the 423 analyzed publications, a total of 1759 keywords were identified. Using VOSviewer, a keyword co-occurrence map was generated (Figure 7A), with a threshold set for keyword usage frequency of 10 times, resulting in the selection of 60 keywords with higher usage frequency. The top 10 keywords with the highest usage frequency and centrality are presented in the Table 6. The five most frequently used keywords are acupuncture, allergic rhinitis, asthma, impact, and alternative medicine.

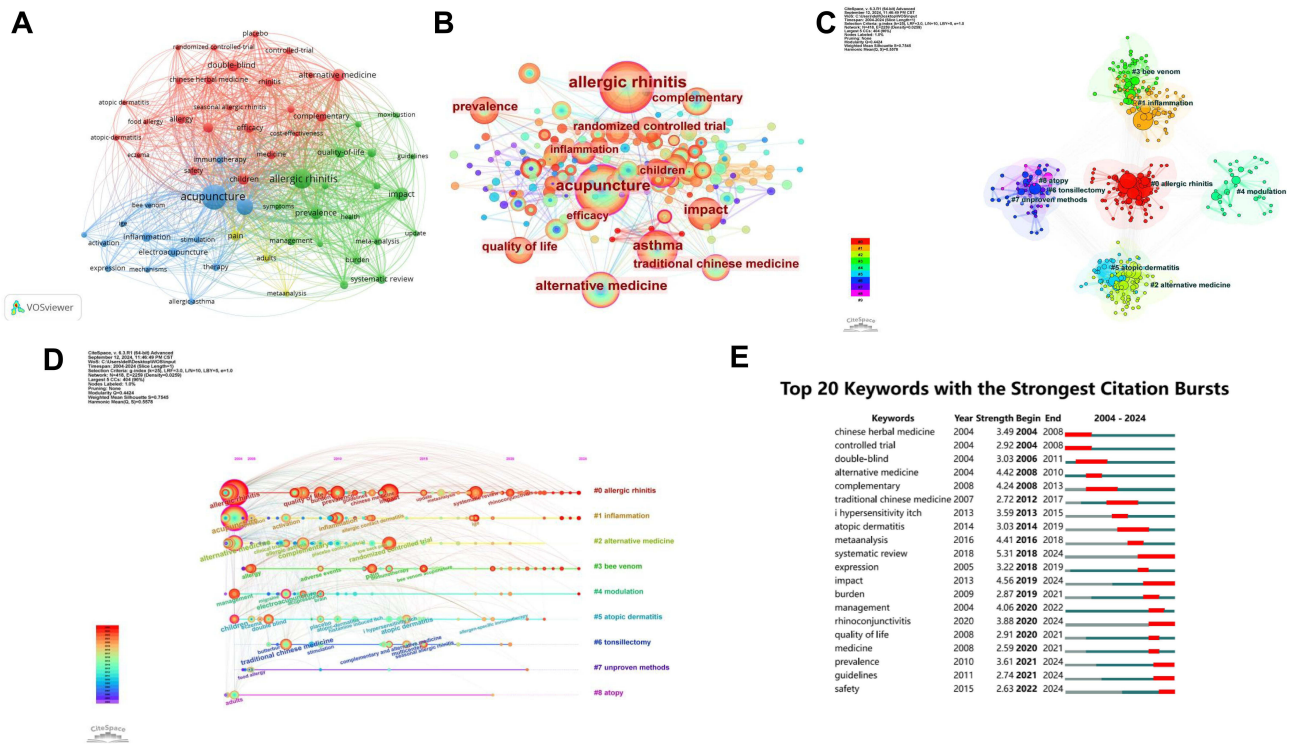

Figure 7 (**A**) Network visualization map of keywords related to acupuncture for allergic diseases. (**B**) The keyword co-occurrence map about acupuncture for allergic diseases. (**C**) The clusters of keywords in this study. (**D**) Timeline view of the keywords in this study. (**E**) The top 20 keywords with the strongest citation bursts.

The keyword co-occurrence map consists of 189 nodes and 663 links (Figure 7B). The top 10 most frequently used keywords were “acupuncture”, “allergic rhinitis”, “asthma”, “impact”, “alternative medicine”, “prevalence”, “complementary”, “tradition Chinese medicine”, “quality of life”, “randomized controlled trial”. The top ten keywords in centrality were “acupuncture”, “Children”, “alternative medicine”, “asthma”, “allergic rhinitis”, “electroacupuncture”, “tradition Chinese medicine”, “bee venom”, “Pain”, “Efficiency”. Upon comprehensive analysis, “acupuncture”, “alternative medicine”, “asthma”, “traditional Chinese medicine” and “allergic rhinitis” emerge as the primary hot topic in the treatment of allergic diseases with acupuncture.

We performed clustering on the existing keywords (Figure 7C), resulting in nine distinct clusters: “allergic rhinitis”, “inflammation”, “alternative medicine”, “bee venom”, “modulation”, “atopic dermatitis”, “tonsillectomy”, “unproven methods” and “atopy”. The modularity Q-value of the clusters exceeds 0.3, and the average silhouette S-value is greater than 0.7, indicating that the clustering structure is significant and convincing.

Table 6 The Top 10 Keywords with the Most Frequency

Ranking	Count	Keyword	Ranking	Centrality	Keyword
1	123	Allergic rhinitis	1	0.36	Acupuncture
2	94	Acupuncture	2	0.19	Children
3	61	Asthma	3	0.18	Alternative medicine
4	52	Impact	4	0.14	Asthma
5	47	Alternative medicine	5	0.14	Allergic rhinitis
6	35	Prevalence	6	0.12	Electroacupuncture
7	34	Randomized controlled trial	7	0.10	Traditional Chinese medicine
8	33	Quality of life	8	0.09	Bee venom
9	31	Complementary	9	0.08	Pain
10	30	Traditional Chinese medicine	10	0.08	Efficiency

The timeline illustrates the evolution of keywords over time, with clustered terms arranged along a horizontal timeline as shown in Figure 7D. In the figure, the outermost purple circles represent keywords with higher betweenness centrality, such as "allergic rhinitis" "acupuncture" and "alternative medicine." The size of the keyword circles corresponds to the frequency of their occurrence; the larger the circle, the higher the frequency of the keyword's appearance. From the timeline, it is evident that over the past two decades, topics such as "allergic rhinitis" "inflammation" and "alternative medicine" received significant attention in the early years, while subsequently, topics like "modulation" and "bee venom" have also become hot topics, with their popularity persisting to the present. Two less popular topics "unproven method" and "atopy" gradually cooled down after a short period of attention.

"Burst" indicates that keywords have appeared more frequently and received attention over a period of time. From 2004 to 2024, the top 20 keywords with the most significant burst are depicted in Figure 7E. The five keywords with the highest strength, are "systematic review (2020–2022)", "impact (2019–2024)", "alternative medicine (2008–2010)", "meta-analysis (2016–2018)", and "complementary (2008–2013)". The most recent bursts are "safety", "guidelines", "prevalence", "medicine", and "quality of life". Keywords such as "controlled trial", "rhinoconjunctivitis", "alternative medicine", "double-blind" and "i hypersensitivity itch" are associated with clinical research on acupuncture for allergic diseases. "Meta-analysis" and "systematic review" represent studies of the same category. "Quality of life" "expression" and "burden" are not highly burst keywords but reflect the social impact and necessity of research into allergic diseases.

Discussion

We conducted a bibliometric analysis of the application of acupuncture in the treatment of allergic diseases over the past two decades by searching the Web of Science Core Collection. The aim of this study was to summarize the general information and research hotspots and trends in this field. A total of 423 publications were included in this study, comprising 299 articles and 124 reviews. From 2004 to 2024, the annual publication count in this domain has generally shown a fluctuating upward trend, indicating a growing emphasis on the application of acupuncture in the treatment of allergic diseases.

General Information

Outputs of Publications

An analysis of the annual publication trends in acupuncture treatment for allergic diseases from 2004 to 2024 reveals a fluctuating increase in research, with two distinct phases of rapid development. The first phase was characterized by exploration and knowledge accumulation, during which the number of publications grew gradually each year. As research progressed, the second phase, beginning in 2017, saw the field enter a more rapid developmental trajectory. However, the overall growth trend was not smooth, particularly with significant fluctuations in publication numbers between 2020 and 2023. This may be attributed to changes in the life sciences research environment under the influence of the COVID-19 pandemic. During this period, the shift in financial incentives towards COVID-19 research, coupled with the postponement or suspension of numerous medical clinical trials due to the global spread of the virus, led to a stagnation in overall research progress.[12] Studies have noted a reduction in the number of hospitalizations for asthma during the COVID-19 pandemic,[13] which may be related to habits such as maintaining social distancing and increasing the use of face masks. The decrease in the incidence of allergic diseases during this period may also be one of the reasons for the fluctuation in the number of research studies in this field. Under such circumstances, the publication cycle may have been extended, leading to fluctuations in the number of publications. Observations of the included publications also indicate that during this period, the majority of published studies were review articles and systematic evaluations, with fewer randomized controlled trials. Overall, research on acupuncture treatment for allergic diseases remains a topic of interest among researchers and continues to make progress, albeit with some twists and turns.

Status of Cooperation

Figure 2A indicates that China has the highest number of publications, and the majority of the top ten most prolific institutions are Chinese, which may be related to the origin of acupuncture in China. The United States has the highest citation rate, suggesting that the quality and recognition of the literature of American scholars are relatively high.

Germany and South Korea also have a significant number of publications and citations, contributing importantly to the field. Overall, China and the United States are leading in the domain of acupuncture treatment for allergic diseases and maintain good cooperative relationships with other countries. China, the United States, Germany, and South Korea have each formed their own cooperation networks centered around universities. Among them, the research cooperation between China and the United States, the United States and South Korea, and the United States and Germany is relatively close, while research cooperation between other countries remains relatively weak. In terms of collaboration content, international cooperation in this field is predominantly focused on review articles and systematic evaluations, with relatively few multi-center trials being conducted. In addition, the analysis of institutional cooperation among countries shows that cooperation is often limited to domestic institutions with relatively weak international connections. In light of this situation, countries, especially the leading nations such as China, the United States, Germany, and South Korea, should attempt to break down academic barriers and enhance exchange and cooperation. Relevant institutions and researchers should promote the application of acupuncture in the treatment of allergic diseases.

In the field of acupuncture treatment for allergic diseases, Brinkhaus, B. has published the highest number of articles, totaling 15, primarily investigating the effects of acupuncture on Seasonal Allergic Rhinitis (ACUSAR) through randomized trials. Witt, C.M., ranked third in publication volume, is also the author with the highest average citation frequency in this field, focusing on the safety, efficacy,[14] and cost-effectiveness[15] of acupuncture for allergic rhinitis. Zhang, Q.X., who ranks second in publication volume, and his team have studied the impact of various treatment methods including acupuncture[16,17] ear acupressure,[18] and catgut implantation at acupoints[19,20] on allergic rhinitis, but the average citation frequency of these articles is relatively low, suggesting a need for improvement in research quality. Willich, S.N. also among the top five in publication volume, has been involved in research on acupuncture for a variety of allergic diseases, including seasonal allergic rhinitis,[7],[15] allergic asthma,[21] and atopic dermatitis,[22] indicating the therapeutic potential of acupuncture for multiple allergic conditions. Notably, four of the top five authors in the publication volume hail from Charite Universitatsmedizin Berlin, indicating that this institution has an important position in its field and has conducted a variety of research on acupuncture for allergic diseases. After summarization, it is found that several high-yielding countries have different research focuses. Analysis of existing literature shows that Chinese scholars actively explore the effects of different acupuncture methods on allergic diseases, and some studies combine acupuncture with traditional Chinese medicine, which is very unique. Other countries mostly use simple needling or electroacupuncture as treatment methods. In addition, Chinese scholars also focus particularly on immunomodulatory mechanisms, exploring the biological mechanisms of acupuncture in treating allergic diseases through clinical and basic research. German research focuses on providing high-quality evidence to support the efficacy of acupuncture in treating allergic diseases through rigorous clinical trials. American research pays more attention to acupuncture as an adjuvant therapy, especially in how it combines with conventional medications (such as antihistamines and inhaled corticosteroids) in allergic disease treatment to enhance therapeutic effects. Korea has conducted extensive research on the unique therapy of bee venom acupuncture.

Quality of Publications

In the domain of acupuncture for allergic diseases' treatment, among the top ten journals by publication volume, "Medicine" leads with a total of 32 articles. As a journal dedicated to the field of internal medicine, it aligns well with the theme of allergic diseases. "Evidence-Based Complementary and Alternative Medicine" has the highest citation frequency for its published literature, playing a crucial role in the field. Notably, some clinical guidelines for allergic diseases have included acupuncture as a treatment option, such as the "Clinical Practice Guideline: Allergic Rhinitis" and "Clinical practice guideline for acupuncture and moxibustion: Allergic rhinitis", which suggests acupuncture for patients seeking non-pharmacological treatment and affirms its efficacy in treating allergic rhinitis.[23] Although these two guidelines do not have a high impact factor, they have been widely cited and have garnered significant attention. However, it is undeniable that the average impact factor of the top ten journals by publication volume is relatively low, indicating a lack of more influential specialized journals to guide the field. Of course, there are some high-quality papers published in this field, with the highest impact factor journal being "Annals of Internal Medicine" (IF = 19.6), which has published articles such as "Acupuncture in Patients With Seasonal Allergic Rhinitis: A Randomized Trial"[7] and "Efficacy of Acupuncture

for Chronic Spontaneous Urticaria: A Randomized Controlled Trial"[6] demonstrating the therapeutic effects of acupuncture on allergic rhinitis and chronic urticaria. Such high-quality literature serves as a base for research in allergic diseases, representing the highest standards in the field and providing robust evidence for future studies. However, only 12 papers have been published in journals with an impact factor greater than 10, indicating an overall scarcity of high-quality literature. In the future, researchers in this field should delve deeper into their research and strive to publish high-quality articles in more prestigious journals.

Research Hotspots and Frontiers

Currently, acupuncture for the treatment of allergic diseases has garnered significant attention from researchers, who have conducted numerous clinical randomized trials to study its efficacy and safety. Acupuncture has been widely applied as a relatively effective alternative therapy for the treatment of allergic diseases. Keywords can summarize and encapsulate the content and main ideas of an article, while highly cited literature represents the primary direction of research during a certain period. By combining these two elements and conducting cluster analysis, we can infer the research hotspots in the field. As shown in Table 6, the top 10 most frequently used keywords are "allergic rhinitis" "acupuncture" "asthma" "impact" "alternative medicine" "prevalence" "randomized controlled trial" "quality of life" "complementary" and "traditional Chinese medicine." Among these, two pertain to the names of allergic diseases, two relate to the societal impact of allergic diseases, "randomized controlled trial" is a conventional research method in this field, and the remaining keywords are associated with the nature of acupuncture itself.

We classified high-frequency, high-centrality keywords and highly cited literature and found that in the research on acupuncture treatment of allergic diseases, allergic rhinitis is the most popular indication. Allergic rhinitis is now the fifth most common chronic disease in the United States, leading to a significant decrease in patients' quality of life, affecting patients' work or study, and resulting in a loss of social productivity.[23] There is an urgent need to find more effective and cost-efficient alternative therapies. The literature on acupuncture treatment for seasonal allergic rhinitis is of high quality and has a substantial impact. For instance, a high-impact article "A multicenter, randomized, controlled trial testing the effects of acupuncture on allergic rhinitis"[24] demonstrated the efficacy and safety of acupuncture for allergic diseases through a comparison of acupuncture and sham acupuncture. Several other randomized trials have also shown that acupuncture has specific and long-term therapeutic effects on allergic rhinitis, significantly improving patients' quality of life.[7] In the United States, acupuncture has been included in the clinical guidelines for otolaryngology (ENT)[23] and is widely recognized by physicians and patients. In addition to allergic rhinitis, asthma is also one of the popular indications. Brinkhaus, B. et al conducted randomized trials and research on acupuncture for allergic asthma, confirming that additional acupuncture treatment based on conventional therapy can improve disease-specific and health-related quality of life.[21] Nurwati, I., and her team integrated research on acupuncture for allergic asthma, discussing the potential mechanisms of acupuncture in preventing and treating asthma,[25] and providing a theoretical basis for the use of acupuncture in allergic asthma treatment.

The five largest clusters of keyword are "#0 allergic rhinitis", "#1 inflammation", "#2 alternative medicine", "#3 bee venom", the "#4 modulation". The largest cluster, "#0 allergic rhinitis", has been analyzed as expected. The second - largest cluster, "#1 inflammation", includes keywords like "anti - inflammatory effects", "apoptosis", and "activation". This indicates that research on the mechanisms of acupuncture treatment for allergic diseases is gradually becoming a hot topic. While some voices question the efficacy of acupuncture for allergic diseases,[26] more researchers are exploring the mechanisms of acupuncture treatment from various aspects to prove its effectiveness. For instance, Tu, W.Z. et al found that point application therapy can alleviate allergic inflammation and treat allergic diseases by inhibiting the expression of nerve growth factor (NGF) and its downstream key proteins such as IL-4 and IL-5 in nasal mucosa tissue.[27] Wang, Z. et al demonstrated that electroacupuncture treatment can suppress Th1 differentiation, thereby restoring the Th1/Th2 balance and improving Th1-mediated allergic skin inflammation.[28] The third-largest cluster is "#2 alternative medicine" encompasses numerous studies on acupuncture, traditional Chinese medicine, and herbal medicine. This is likely due to the fact that acupuncture has been recognized by the World Health Organization (WHO) as a branch of alternative and complementary medicine,[29] and is used as an alternative therapy to support or combine with drug treatment for allergic diseases.[30,31] The fourth-largest cluster is "#4 bee venom" a special acupuncture intervention technique that has also

become a research hotspot. It involves injecting diluted bee venom into relevant acupoints to achieve anti-inflammatory and analgesic effects.[26,32] However, analysis of the keywords in this cluster shows that in addition to focusing on its efficacy, a significant amount of attention is also paid to the safety and mechanism of action of bee venom acupuncture.[33,34] Moreover, the keyword timeline also shows that bee venom has received increasing attention over the past 20 years, possibly due to its popularity as an application technique in the field alongside acupuncture. The emergence of the fifth-largest cluster, "modulation" further confirms the current focus on mechanistic research in this field. Scholars are exploring the mechanisms of acupuncture in treating allergic diseases through multiple perspectives, such as immunomodulation[35] and signaling modulation of inflammatory pathways (eg, the IL-33/ST2 pathway),[36] to advance the modernization of acupuncture.

The frequency, clustering, and centrality analysis of cited and co-cited articles can also reflect research trends over a certain period. Among the top ten articles by citation frequency, five are related to rhinitis. In the top ten co-cited articles, seven pertain to randomized controlled trials of acupuncture for rhinitis, indicating that acupuncture treatment for allergic diseases, particularly rhinitis, is an important branch and a hot topic. The clustering of cited articles and keyword clustering results are similar, both identifying hot topics such as allergic rhinitis, alternative medicine, and randomized controlled trials. By analyzing keyword bursts, literature bursts, and literature timelines, we can explore the comprehensive research trends in the treatment of allergic diseases with acupuncture. We found that the keywords rhinoconjunctivitis, systematic review, impact, prevalence, guidelines, and safety emerged later and have a significant influence, with increasing attention, thus they can be judged as the current research frontier with certain development potential. The increased influence of rhinoconjunctivitis has been explained in the previous text. "Prevalence" a significant characteristic of allergic diseases, fits the mainstream research trend in the context of the continuous development of epidemiology and evidence-based medicine. Additionally, we found that "impact" often appears as a keyword in mechanism-related studies, and its emergence may be related to the gradually advancing research on the mechanisms of acupuncture.[37] The appearance of "systematic review" and "guidelines" suggests that research in this field has reached a relatively mature level, with a substantial number of experimental studies laying the foundation for systematic evaluations. At the same time, relevant research has confirmed the effectiveness of acupuncture for allergic diseases, promoting its inclusion in clinical guidelines. Moreover, the emergence of the keyword "safety" is not surprising. As acupuncture therapy continues to develop internationally, "safety" has gradually become as important as "effectiveness" especially when facing groups such as women and children. An increasing number of studies are discussing the safety of various acupuncture therapies.[38–41]

By analyzing the research hotspots and frontiers in this field, researchers can carry out in-depth medical analysis. They can explore the effectiveness of acupuncture for allergic diseases based on identified hotspots and delve into emerging frontiers like acupuncture safety in vulnerable groups. This will help develop more effective and safer treatment plans. Medical management agencies and policymakers can use these findings to implement policies supporting acupuncture's integration into mainstream healthcare, especially for allergic diseases. They can also expand acupuncture's coverage in health insurance and encourage its use in public health. These actions will provide positive feedback into the field of acupuncture for allergic diseases, driving its further advancement.

Strengths and Limitations

In this study, we visually represented the literature data related to acupuncture treatment for allergic diseases using a visual mapping technique, making the research trends and hotspots in this field readily apparent. However, there are several limitations to our study. Firstly, our search was confined to the Web of Science Core Collection and did not include literature from other English or Chinese databases, which may affect the outcomes. Additionally, we have endeavored to select as many relevant keywords as possible for our search; however, it is acknowledged that our search may require a more comprehensive set of terminology to ensure a more exhaustive coverage of the literature. Lastly, while our search spanned from 2004 to 2024, it was completed on August 29, 2024, therefore, the literature published after this date was not included, resulting in the impact of the number of publications in 2024 and the keyword burst, which may bias our analysis.In future research, to address the aforementioned limitations, researchers could expand the search scope beyond the Web of Science Core Collection by including additional databases such as

PubMed and CNKI. This broader approach would enhance the comprehensiveness of the literature search. For keyword selection, researchers might employ text-mining tools and draw on experiences from similar studies to develop a more extensive set of keywords, ensuring all relevant research is captured. Lastly, to maintain the currency of the research, the search should be updated periodically to include the latest publications, and the analysis should be repeated at regular intervals.

Future Outlook

According to the annual number of publications, the research on acupuncture and moxibustion in the treatment of allergic diseases is still in the development stage, and more and more scholars and institutions are involved in the research in this field, indicated that there is still a large room for development of related research in the future. Extensive previous studies have confirmed the positive therapeutic effects of acupuncture, for example an article in The BMJ synthesizes systematic reviews related to acupuncture, highlighting that acupuncture demonstrates significant effects in improving nasal symptoms of allergic rhinitis with a high level of evidence-based support.[42] However, the mechanism by which acupuncture treats allergic diseases is not well understood. At present, a significant body of research into the efficacy of acupuncture for treating allergic conditions remains at the experimental phase. Scholars are committed to establishing its safety and elucidating the mechanisms of action through randomized controlled trials. Further research should continue to explore these aspects in greater depth.Concurrently, scholars in this field should aim to enhance the quality of their research, publishing more high-quality, influential articles while ensuring progress in their studies.

Amid growing global attention to smart cities and improving healthcare systems, this study uses big data and visualization tech to map research on acupuncture for allergic diseases. It helps researchers pinpoint hotspots and trends, guides future research directions, and promotes acupuncture's application in allergic disease treatment. And it will enhance patient outcomes, reduce healthcare costs, and boost treatment efficiency. Ultimately, it will ensure sustainable and effective healthcare quality improvements to meet rising healthcare demands.[43] As urbanization speeds up, scholars can use a similar research framework to identify areas with a high prevalence of allergic diseases. This enables the pre-layout of acupuncture services and provides timely, effective treatment for residents in high-incidence areas. Consequently, this enhances regional healthcare service quality and promotes a more equitable distribution of medical resources.[44]

Conclusion

The study, based on the WOS Core Collection database, employs bibliometric methods to conduct a comprehensive analysis of research on acupuncture treatment for allergic diseases from 2004 to 2024. The findings indicate that the field is rapidly evolving, yet there is a notable absence of high-quality literature. Only 12 papers were published in journals with an impact factor greater than 10, suggesting significant room for development. China (179 articles), the United States (71 articles), and South Korea (68 articles) are the main producers, and they have their cooperation networks. Among them, there is more frequent research collaboration between China and the United States, as well as between the United States and South Korea. These collaborations are primarily focused on reviews and systematic evaluations, with relatively few multi-center collaborative trials. However, the transnational and inter-agency cooperation among the authors is weak. Keyword analysis showed that allergic rhinitis, specific dermatitis, and asthma were popular diseases, and acupuncture and bee acupuncture were the main intervention measures. In summary, allergic rhinitis, the therapeutic efficacy and safety of acupuncture as an alternative treatment for allergic diseases, and the mechanisms of acupuncture in treating allergic diseases are at the forefront of research in this field.The integration of smart city healthcare innovations and health informatics to enhance acupuncture-related medical services is an innovative topic worth further exploration in acupuncture treatment for allergic diseases.[45]

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Author Contributions

All authors made a significant contribution to this study, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work., institutions, and authors in the field for their diligent contributions to related research.

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References

1. Breiteneder H, Peng Y-Q, Agache I, et al. Biomarkers for diagnosis and prediction of therapy responses in allergic diseases and asthma. *Allergy*. 2020;75(12):3039–3068. doi:10.1111/all.14582
2. Haahtela T, et al. Finnish Allergy Programme 2008-2018–time to act and change the course. *Allergy*. 2008;63(6):634–645.
3. Yu JE, Lin RY. The Epidemiology of Anaphylaxis. *Clin Rev Allergy Immunol*. 2018;54(3):366–374.
4. Zuberbier T, et al. Economic burden of inadequate management of allergic diseases in the European Union: a GA(2) LEN review. *Allergy*. 2014;69 (10):1275–1279.
5. Pfab F, et al. Acupuncture for allergic disease therapy - the current state of evidence. *Exp Rev Clinl Immunol*. 2014;10(7):831–841.
6. Zheng H, Xiao X-J, Shi Y-Z, et al. Efficacy of acupuncture for chronic spontaneous urticaria a randomized controlled trial. *Ann Internal Med*. 2023;176(12):1617–1624. doi:10.7326/M23-1043
7. Brinkhaus B, Ortiz M, Witt CM, et al. Acupuncture in patients with seasonal allergic rhinitis a randomized trial. *Ann Internal Med*. 2013;158 (4):225–234. doi:10.7326/0003-4819-158-4-201302190-00002
8. Pfab F, Huss-Marp J, Gatti A, et al. Influence of acupuncture on type I hypersensitivity itch and the wheal and flare response in adults with atopic eczema - a blinded, randomized, placebo-controlled, crossover trial. *Allergy*. 2010;65(7):903–910. doi:10.1111/j.1398-9995.2009.02284.x
9. Zhao Y, Huang L, Li W. Mapping knowledge domain of acupuncture for Parkinson's disease: a bibliometric and visual analysis. *Front Aging Neurosci*. 2024;16(1388290). doi:10.3389/fnagi.2024.1388290
10. He K, Zhan M, Li X, et al. A bibliometric of trends on acupuncture research about migraine: quantitative and qualitative analyses. *J Pain Res*. 2022;15:1257–1269. doi:10.2147/JPR.S361652
11. Zhao Y, et al. A bibliometric analysis of acupuncture for cerebral infarction from 1993 to 2023. *Front Neurol*. 2024;15(1386164).
12. Riccaboni M, Verginer L. The impact of the COVID-19 pandemic on scientific research in the life sciences. *PLoS One*. 2022;17:e02630012. doi:10.1371/journal.pone.0263001
13. Chan Ng PPL, Kang AYH, Shen L, et al. Improved treatment adherence and allergic disease control during a COVID-19 pandemic lockdown. *Pediatric Allergy Immunol*. 2022;33(1). doi:10.1111/pai.13688.
14. Witt CM, Pach D, Brinkhaus B, et al. Safety of Acupuncture: results of a Prospective Observational Study with 229,230 Patients and Introduction of a medical information and consent form. *Forschende Komplementarmedizin*. 2009;16(2):91–97. doi:10.1159/000209315
15. Witt CM, Reinhold T, Jena S, et al. Cost-effectiveness of acupuncture in women and men with allergic rhinitis: a randomized controlled study in usual care. *Am J Epidemiology*. 2009;169(5):562–571. doi:10.1093/aje/kwn370
16. Chen Q, Zhang Q, Jiang L, et al. Effectiveness of strengthened stimulation during acupuncture for the treatment of allergic rhinitis: study protocol for a randomized controlled trial. *Trials*. 2014;15(301). doi:10.1186/1745-6215-15-301.
17. Fu Q, Zhang L, Liu Y, et al. Effectiveness of Acupuncturing at the sphenopalatine ganglion acupoint alone for treatment of allergic rhinitis: a systematic review and meta-analysis. *Evid Based Complement Alternat Med*. 2019;2019(6478102):1–10. doi:10.1155/2019/6478102
18. Zhong J, Liu S, Lai D, et al. Ear acupressure for allergic rhinitis: a systematic review and meta-analysis of randomized controlled trials. *Evid Based Complement Alternat Med*. 2021;2021(6699749):1–20. doi:10.1155/2021/6699749
19. Li X, Liu Y, Zhang Q, et al. Effect of catgut implantation at acupoints for the treatment of allergic rhinitis: a randomized, sham-controlled trial. *BMC Complementary Alternative Med*. 2016;16(454). doi:10.1186/s12906-016-1400-x.
20. Li X, Zhang Q, Jiang L, et al. Clinical effect of catgut implantation at acupoints for allergic rhinitis: study protocol for a randomized controlled trial. *Trials*. 2013;14(12). doi:10.1186/1745-6215-14-12.
21. Brinkhaus B, Roll S, Jena S, et al. Acupuncture in patients with allergic asthma: a randomized pragmatic trial. *J Alternative Complementary Med*. 2017;23(4):268–277. doi:10.1089/acm.2016.0357
22. Rotter G, et al. Acupuncture and osteopathic medicine for atopic dermatitis: a three-armed, randomized controlled explorative clinical trial. *Clin Exp Dermatol*. 2022;47(12):2166–2175. doi:10.1111/ced.15340
23. Seidman MD, et al. Clinical practice guideline: allergic rhinitis. *Otolaryngology-Head and Neck Surg*. 2015;1521:S1–S43.
24. Choi SM, Park J-E, Li -S-S, et al. A multicenter, randomized, controlled trial testing the effects of acupuncture on allergic rhinitis. *Allergy*. 2013;68 (3):365–374. doi:10.1111/all.12053
25. Nurwati I, Muthmainah M, Huda KN. Acupuncture for Asthma: its Potential Significance in Clinical Practice. *Med Acupuncture*. 2020;32 (5):272–279. doi:10.1089/acu.2020.1443

26. Dykewicz MS, Wallace DV, Amrol DJ, et al. Rhinitis 2020: a practice parameter update. *J Allergy Clini Immunol*. 2020;146(4):721–767. doi:10.1016/j.jaci.2020.07.007
27. Tu W, et al. Acupoint application inhibits nerve growth factor and attenuates allergic inflammation in allergic rhinitis model rats. *J Inflammation-London*. 2020;17(41).
28. Wang Z, Chen T, Long M, et al. Electro-acupuncture at Acupoint ST36 Ameliorates inflammation and Regulates Th1/Th2 Balance in delayed-type hypersensitivity. *Inflammation*. 2017;40(2):422–434. doi:10.1007/s10753-016-0487-z
29. Organization WH. WHO traditional medicine strategy_ 2014-2023. 2023. Available from: https://iris.who.int/handle/10665/92455. Accessed October 13, 2024.
30. Yonekura S, Okamoto Y, Sakurai D, et al. Complementary and alternative medicine for allergic rhinitis in Japan. *Allergol Int*. 2017;66(3):425–431. doi:10.1016/j.alit.2016.10.006
31. Chu H, Jang B-H, Lee E, et al. Combined Korean medicine therapies in children with allergic rhinitis A multi-center, observational explanatory registry trial: a study protocol. *Medicine*. 2021;100(e2818151):e28181. doi:10.1097/MD.0000000000028181
32. Sung S, Lee G. Bee venom acupuncture effects on pain and its mechanisms: an updated review. *Toxins*. 2021;13(6089):608. doi:10.3390/toxins13090608
33. Lee MJ, Jang M, Choi J, et al. Bee venom acupuncture alleviates experimental autoimmune encephalomyelitis by upregulating regulatory t cells and suppressing th1 and th17 responses. *Mol Neurobiol*. 2016;53(3):1419–1445. doi:10.1007/s12035-014-9012-2
34. Cherniack EP, Govorushko S. To bee or not to bee: the potential efficacy and safety of bee venom acupuncture in humans. *Toxicon*. 2018;154:74–78. doi:10.1016/j.toxicon.2018.09.013
35. Liu J, Dong S, Liu S. Aberrant parasympathetic responses in acupuncture therapy for restoring immune homeostasis. *Acupuncture Herbal Med*. 2023;3(2):69–75. doi:10.1097/HM9.0000000000000060
36. Dong M, Ma C, Wang W-Q, et al. Regulation of the IL-33/ST2 pathway contributes to the anti-inflammatory effect of acupuncture in the ovalbumin-induced murine asthma model. *Acupuncture Med*. 2018;36(5):319–326. doi:10.1136/acupmed-2017-011377
37. Arranz L, Guayerbas N, Siboni L, et al. Effect of acupuncture treatment on the immune function impairment found in anxious women. *Am J Chin Med*. 2007;35(1):35–51. doi:10.1142/S0192415X07004606
38. Wen J, Chen X, Yang Y, et al. Acupuncture medical therapy and its underlying mechanisms: a systematic review. *Am J Chin Med*. 2021;49(1):1–23. doi:10.1142/S0192415X21500014
39. Yang C, Hao Z, Zhang -L-L, et al. Efficacy and safety of acupuncture in children: an overview of systematic reviews. *Pediatr Res*. 2015;78(2):112–119. doi:10.1038/pr.2015.91
40. Huang JJ, Liang J-Q, Xu X-K, et al. Safety of thread embedding acupuncture therapy: a systematic review. *Chin J Integr Med*. 2021;27(12):947–955. doi:10.1007/s11655-021-3443-1
41. Moon HY, Kim M-R, Hwang D-S, et al. Safety of acupuncture during pregnancy: a retrospective cohort study in Korea. *BJOG*. 2020;127(1):79–86. doi:10.1111/1471-0528.15925
42. Lu L, et al. Evidence on acupuncture therapies is underused in clinical practice and health policy. *BMJ*. 2022;376:e067475.
43. Mohammadzadeh Z, Saeidnia HR, Lotfata A, et al. Smart city healthcare delivery innovations: a systematic review of essential technologies and indicators for developing nations. *BMC Health Serv Res*. 2023;23(1):1180. doi:10.1186/s12913-023-10200-8
44. Chi YL, Mak HW. From comparative and statistical assessments of liveability and health conditions of districts in hong kong towards future city development, in sustainability. *Sustainability*. 2021;13:8781. doi:10.3390/su13168781
45. Javaid M, Haleem A, Singh RP. Health informatics to enhance the healthcare industry's culture: an extensive analysis of its features, contributions, applications and limitations. *Informatics Health*. 2024;1(2):123–148.