

Research Trends of Acupuncture Therapy on Chronic Pelvic Pain Syndrome from 2000 to 2022: A Bibliometric Analysis

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Background: Acupuncture is considered an important means of analgesic, which has been widely used in chronic pelvic pain syndrome (CPPS) management and treatment in recent years, published a large number of related documents. However, the relevant literature in this field has not been summarized and quantitatively analyzed. Therefore, this study aims to analyze the hotspots and predicting future research trends of acupuncture on pelvic pain syndrome.

Methods: Search for the relevant publications of the web of science database from 2000 to 2022 about the treatment of acupuncture on chronic pelvic pain syndrome. The Citespace software and VosViewer software are used to analyze the visualization of the countries, institutions, authors, keywords and references and references in the literature.

Results: A total of 173 publications were included. The annual number of essays gradually showed an overall growth trend over time. Medicine magazine is the most published journal in this field. J UROLOGY and Acupunct Med are the most cited journals and the most influential magazines; The most active and influential country is China, and the most produced institutions are Beijing University of Chinese Medicine; The most produced authors are Liu Zhishun. The most cited and most influential authors are Nickel JC and Armour M; keywords and cited reference analysis show that the quality of life, mechanism research, alternative medicine and electro-acupuncture will be the scientific hotspot of acupuncture treatment for chronic pelvic pain syndrome.

Conclusion: This study shows that acupuncture on CPPS is increasingly valued and recognized. The future research hotspots will focus on the effects and mechanisms. In the future, more high-quality animal basic research will be required to explore the exact mechanism of acupuncture on CPPS. In addition, different parameters of acupuncture such as electric-acupuncture, stimulating frequency, duration and strength are also the focus of future research. More clinical trials are required to verify its safety and effectiveness.

Keywords: acupuncture, chronic pelvic pain syndrome, bibliometrics, CiteSpace

Introduction

Chronic pelvic pain syndrome (CPPS) is a clinically prevalent chronic pain syndrome¹⁻³ described as pain that persists in the pelvis for more than 6 months or occurs in periodic episodes lasting more than 3 months and manifests as pelvic pain, abdominal pain, or low back and hip pain.⁴ According to studies, the syndrome can affect 10%~15% of the male population in the world and results in nearly 2 million outpatient visits each year,⁵ with males predominantly experiencing urinary tract discomfort or pain in the pelvic area, which is frequently connected with urologic problems and/or sexual dysfunction.⁶ According to European consensus statement, 20% of women who have acute pelvic inflammatory episodes have persistent pelvic discomfort, in addition to gynecological disorders like endometriosis that might trigger the illness.³ Patients frequently claim unpleasant symptoms such as sexual intercourse pain, difficult bowel motions, and greater pain during menstruation in addition to the above-mentioned everyday discomfort.^{7,8} Chronic pelvic pain

syndrome (CPPS) is a difficult condition for specialists that adversely affects patients' health and quality of life. It can also cause sexual dysfunction and certain psychological issues, which can seriously impair patients' ability to function physically and mentally.

However, the exact etiology and pathogenesis of CPPS are still unclear but may include inflammatory or non-inflammatory etiologies.^{9,10} Studies have shown that female CPPS may overlap with menstrual difficulties and dysmenorrhea, as well as gastrointestinal, urogenital, neurological, endocrine, and musculoskeletal disorders; and psychological and sociocultural factors may also contribute to CPPS.^{11,12} In males, CPPS may overlap with heredity, infection, voiding abnormalities, hormone imbalance, intraprostatic reflux, immunological or allergic triggers, or psychological traits.^{13,14} At present, CPPS treatment methods include drug treatment, surgical treatment and psychotherapy. Typical drug treatment methods such as α -receptor blockers, antibiotics and anti-inflammatory drugs are usually used, and the effects of physiological functions are relatively small.¹⁴ But the effectiveness of these treatments is controversial, lack of clinical trials of large samples data support. It is not sensitive to antibiotic treatment, because CPPS is usually not a single disease entity but a series of symptoms that may be caused by other male or gynecological diseases.

Acupuncture is an important part of TCM for disease prevention and treatment¹⁵, and it has recently gained attention and clinical application in many countries, particularly developed countries such as China, the United States, Japan, Korea, and Germany, due to its efficiency, simplicity, and low cost.¹⁶ There is sufficient evidence to prove that acupuncture can stimulate acupoints, improve local blood circulation, and promote the absorption of inflammatory pain factors, thus relieving pain. Furthermore, acupuncture analgesia has achieved an expert international consensus and is widely used in the clinical management of various pain syndromes with satisfactory efficacy.¹⁷ Therefore, acupuncture is also the most common intervention of CPPS, and its clinical trials and experimental basic research are gradually attracted attention by relevant researchers.¹⁸ According to Qin et al's randomized controlled trial (RCT), the acupuncture group outperformed the sham acupuncture group in the treatment of chronic prostatitis/CPPS.^{19,20} Acupuncture mixed with rehabilitation has been found in several clinical investigations in China to have high clinical effectiveness in the treatment of CPPS in women. However, the small sample size of these clinical RCT trials does not give adequate proof of sufficient efficacy of acupuncture alone, and the whole mechanism of acupuncture for CPPS still has to be clarified by more fundamental research results.²¹ According to the experimental findings of a research team at the University of Rochester Medical Center led by Maiken Nedergaard, adenosine is released at the adenosine A1 receptor during acupuncture stimulation of acupuncture points, and the body exerts analgesic effects through the release of adenosine.^{22,23} Additionally, it has been shown that acupuncture can exert an anti-inflammatory impact and provide analgesia by regulating inflammatory mediators in chronic inflammatory illnesses through a variety of mechanisms.

At present, acupuncture can effectively improve and alleviate the symptoms of chronic pelvic pain syndrome (CPPS) which has been proven by more and more clinical trials.^{24,25} However, as far as we know, the related research distribution of acupuncture on CPPS is relatively scattered, which makes it difficult for medical workers and researchers engaged in the relevant research field to grasp the system review of the research field and the future emerging trends and hotspots. Therefore, this study aims to quantitatively evaluate the detailed research trends and hotspots of acupuncture on CPPS in the past 23 years (2000–2022) and make decisions for future academic research.

Bibliometric analysis is a quantitative assessment of the academic documents published in the scientific citation of scientific network (WOS) scientific quotes (SCI-EXPANDED) database,²⁶ analyzing and exploring the connection in the field of research, as well as the impact and trend of publishing.²⁷ Citespace and Vosviewer are visual software used in this study. By analyzing co-citation and co-occurrence to generate the visual map of the designated research field, it can discover and display the existing popular research themes and newly emerging research themes.

Methods

Source of Literature

We conducted a comprehensive search of the Web of Science database from January 2000 to December 2022 to identify research papers on acupuncture for CPPS. The search terms used were “acupuncture” AND “pelvic pain” OR “chronic pelvic pain”. Integrated all studies related to the title, abstract, keywords and retrieval of topic words. WOS does not limit

language. The research type is not limited, and the data is complete, authentic and reliable. Two researchers independently screening and reviewing the literature based on the proposed standards. If there are differences, it will be negotiated and resolved by Hu Jinyu and Xiao Yuanyi. According to the search strategy, 173 documents were screened in the core collection of WOS (Table 1). After using the CiteSpace software and artificially eliminated repeated documents, 173 documents are still used for literature measurement analysis. The search for the scientific network database of WOS comes from CARSI application resources of Jiangxi University of Chinese Medicine.

Analysis Tool

Document measurement analysis and data visualization adopt Citespace (6.2.R3) (64-bit) Advanced and VosViewer Version 1.6.19 software.²⁸ Citespace is a visualization and analysis tool created by Professor Chen Chaomei of Drachizel University, which is committed to providing researchers with data visualization and analysis networks, tracking the development of the academic field.²⁹ VosViewer is a software tool created by the University of Leiden at the University of the Netherlands to build and visualize literature metering networks. They can be constructed based on quotation, cited references, or cited authors, and can also provide document mining functions to build and visually.

Before using Citespace (6.2.R3) (64-bit) advanced version software analysis, we perform parameter settings as follows: Time Slicing (2003–2022), Set the Years Per Slice (1), Text processing (all options), Node Types (Select 1 item each time), Selection Criteria (g-index, k = 25), Pruning (pathfinder, pruning sliced networks, pruning the merged networks). The “Project” Datomy shows: WOS source literature nodes = 557, links = 1765. The visual analysis diagram consists of two parts: node and link. The keywords will be analyzed with clustering analysis and cutting-edge disciplinary emergencies. Use VosViewer software to analyze the distribution and close connection between the core countries/regions in this field of research and form a world distribution map.

Results and Discussion

Thesis Annual Publication Analysis

The annual publishing capacity of thesis is an important indicator of the hotspot development and trend progress of the research field, which can reflect the changing trend of year-by-year in the research direction. According to the retrieval strategy and incorporated standards, a total of 173 documents were selected. The Excel software was used to draw a statistical diagram of the number of annual publishing materials related to acupuncture in CPPS, as shown in Figure 1. We can see that the annual publications are constantly changing over time based on the statistical diagram, but the overall ascension trend. According to the result of a linear regression analysis, $y=0.8323x - 0.0895$ $R^2=0.7353$, the posting trend increased significantly and the trend line reliability was strong. For the first time in the WOS database, the literature in the research field was in 2003. In 2021, the annual number of published documents reached the highest peak and published 21 articles. Followed by 2022, 19 articles were published. It can be seen from the figure that although there are not many papers volume in nearly ten years since 2003, there are fluctuations, but the overall increase has increased. Especially after 2015, the research on this field has gradually increased, and the amount of issuance has remained at

Table 1 The Topic Search Query

Set	Results	Search Query
#1	29,725	TS=(Chronic pelvic Pain) OR (Pelvic Pain in Endometriosis) OR (Pelvic Congestion Syndrome) OR (chronic prostatitis) OR (genito-pelvic pain) OR (Chronic Prostatitis with Chronic pelvic Pain Syndrome) OR (Chronic pelvic Pain Syndrome) OR (Myofascial Pelvic Pain) OR (endometriosis) OR (Chronic pelvic inflammatory disease) OR (Pelvic inflammatory disease) Indexes=Web of Science, Timespan=2000–2022
#2	19,792	TS=(Acupuncture) OR (Acupuncture Therapy) OR (Acupuncture Treatments) OR (Acupuncture Points) OR (Manual Acupuncture) OR (Needle Acupuncture) OR (body acupuncture) OR (Acupuncture, Ear) OR (Acupuncture Analgesia) OR (Auricular Acupuncture) OR (Electroacupuncture) OR (electro-acupuncture) OR (Warm Acupuncture) OR (Moxibustion) Indexes=Web of Science, Timespan=2000–2022
#3	173	#1 AND #2

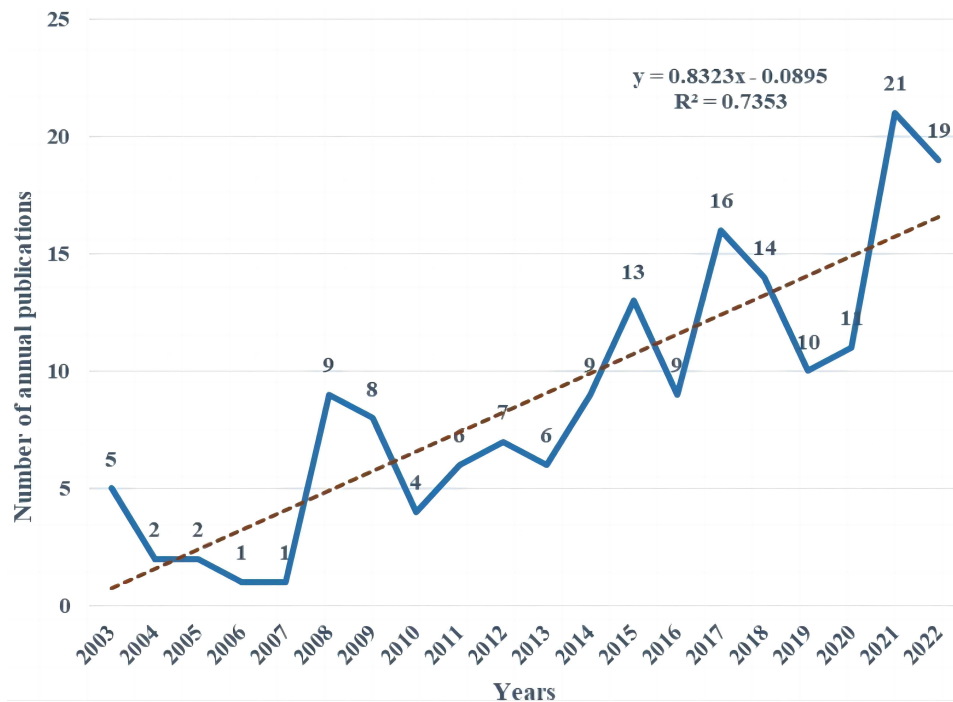


Figure 1 The annual number of publications on acupuncture treatment for CPPS between 2000 to 2022.

a high level. It shows that the field has gradually attracted the attention of researchers. Acupuncture has gradually been recognized as a replacement therapy for CPPS, widely used in clinical.

Analysis of Documents Type

Among the 173 documents incorporated in this study, there are composed of five literature types. Among the most literature types are journal articles, with a total of 100 articles, accounting for 57.80% of the total. Next is Review 59, accounting for 34.10%, Editorial Material (11, 6.36%), Letter (2, 1.16%) and Meeting Abstract (1, 0.58%), see Figure 2 in detail.

Analysis of Journals and Cited Journals

In the 173 documents included in the field of CPPS research in acupuncture, we have screened the top ten of production journals and related impact factor (IF). Medicine is the journal with the most articles and has published 18 articles in the

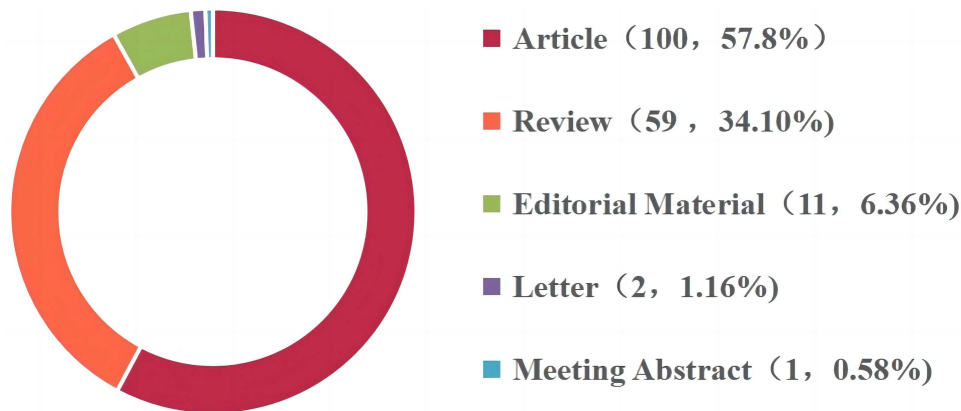


Figure 2 Type of publications on acupuncture treatment for CPPS between 2000 to 2022.

Table 2 Top 10 Scholarly Journals Related to Acupuncture on CPPS

Rank	Publications	Journal	IF (2022)	Rank	Publications	Journal	IF (2022)
1	18	Medicine	1.6000	6	5	Urology	2.1001
2	8	Evid-Based Compl Alt	2.6498	7	4	Acupuncture Electro	0.3000
3	6	J Altern Complem Med	2.6002	8	4	Cochrane Db Syst Rev	8.4001
4	6	J Urology	6.6002	9	3	BMC Complem Altern M	4.7824
5	5	Acupunct Med	2.5000	10	3	Chin J Integr Med	2.8997

field of acupuncture intervention in CPPS in the past 20 years. Followed by Journal of Evid-Based Compl Alt, it published 8 articles in this field. J Altern Complem Med and J UROLOGY Magazine both published 6 articles and ranked third together. At the same time, we have observed that the highest influence factor in the top ten high-yield magazines is the COCHRANE DB SYST Rev, IF is 8.4001 with 4 articles. It is a magazine under the British Wiley Publishing Company, which focuses on evidence-based medical decision-making and provides high-quality evidence for clinical medicine. The top ten high-yield magazines average IF is 3.4433, specifically visible in Table 2.

Using Citespace software to combine the journal quotation and node centrality to generate the top ten journals of the number of references and the citations map, where Node = 442, Link = 1586, as shown in Figure 3 and Table 3. We can clearly see that the magazine with the highest frequency in the period of citations is J UROLOGY, followed by UROLOGY and COCHRANE DB SYST Rev journal. The first-ranking magazine is a magazine that specializes in epidemiology, mechanisms, and clinical treatment of CPPS. Therefore, the highest number of cited references in this research field is logical. In centrality, Acupunct Med is the first-ranking journal, which intends to further the understanding of acupuncture and associated treatments in science by disseminating publications on their application in clinical practice and health services, as well as scientific studies of their efficacy and mechanisms of action. This demonstrates that the journal is very compelling and representative in this research field, and the high number of citations can support our study with substantial proof.

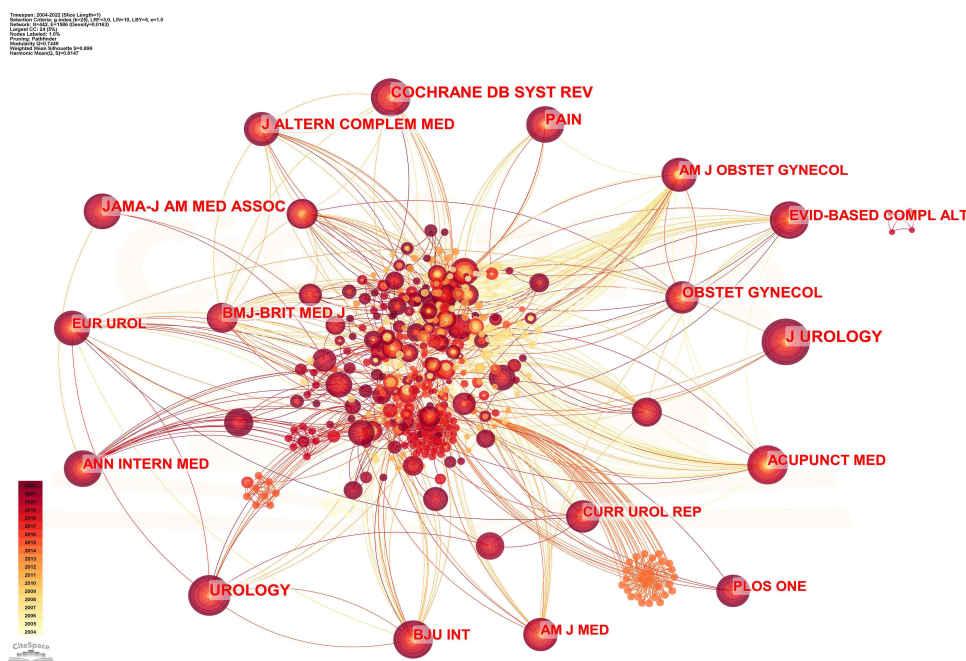


Figure 3 Cited journal map related to acupuncture treatment on CPPS research from 2000 to 2022. The nodes in the map represent journals, and the lines between the nodes mean co-citation relationships. The different colors of the nodes represent the different years. The larger the node area, the greater the number of cocitations. The purple ring represents centrality, and nodes with high centrality are considered as pivotal points in the publications.

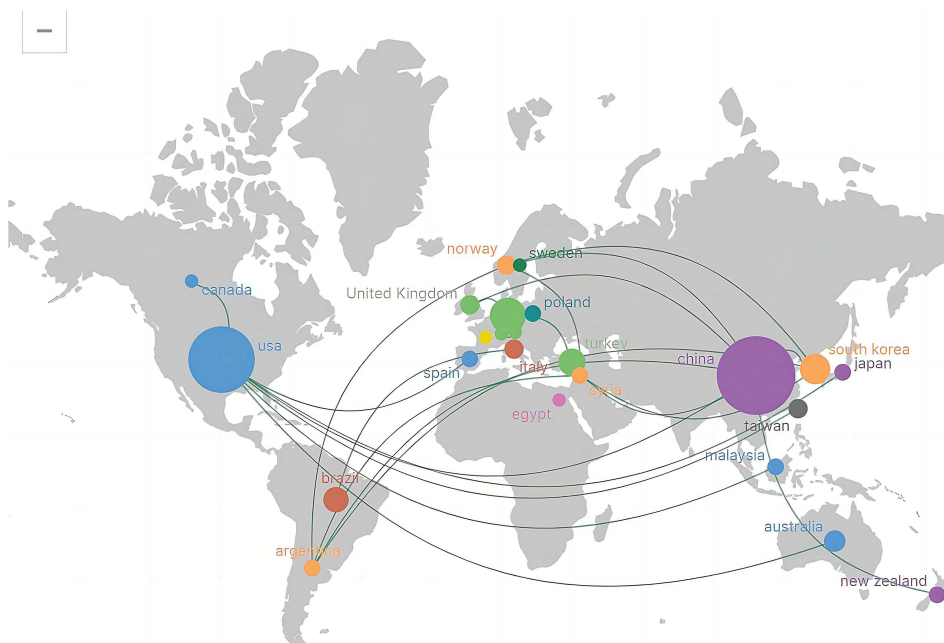


Figure 5 Geographical distribution of acupuncture on CPPS. The lines with the same color in the figure represent the closeness of the cooperative relationship between the connected countries, while the size of the circles indicates the magnitude of the country's influence.

most influential affect in the field of research. Many countries in the world have extensive cooperation with China. It is mainly concentrated in Europe, Asia, and the Americas. The second influence is the United States.

Table 4 counts the top ten of the publications and centrality of Countries/Region related to this research field. China has published 67 articles ranking first, and the United States has published 46 articles ranked second. In addition, Germany, South Korea, Turkey, and Brazil's research on this field also show a booming trend. They have widely strengthened regional cooperation between Europe, South America, and Asia.

According to centrality, China is the most influential country in this field (Centrality = 0.51). As we all know, acupuncture is an important part of TCM. It is not surprising to rank first because China has always attached importance to the clinical and basic research of acupuncture. The next ranking is the United States (0.50), the United Kingdom (0.32), Germany (0.27), and South Korea (0.26), We found that although there are not many publishing articles in the UK, its influence is far more than other countries/regions, indicating that their research quality and research value are high in this field. In addition, the United States also attaches great importance to the research and has cooperated with

Table 4 Top 10 Publications and Centrality of Countries/Region Related to Acupuncture on CPPS

Rank	Publications	Countries	Rank	Centrality	Countries
1	67	Peoples R China	1	0.51	Peoples R China
2	46	USA	2	0.50	USA
3	14	Germany	3	0.32	England
4	10	South Korea	4	0.27	Germany
5	8	Turkey	5	0.26	South Korea
6	7	Brazil	6	0.05	Norway
7	5	Austria	7	0.05	Argentina
8	4	Taiwan	8	0.00	Turkey
9	4	England	9	0.00	Brazil
10	4	Norway	10	0.00	Austria

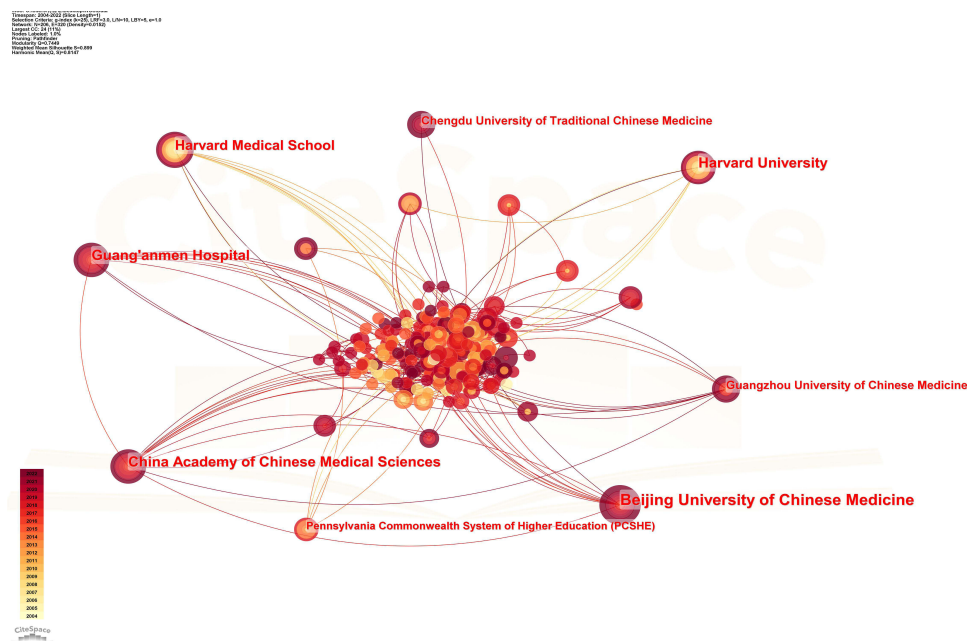


Figure 6 Map of institutions researching acupuncture on CPPS research from 2000 to 2022. The nodes in the map represent institutions, and the lines between the nodes represent collaborative relationships. The different colors in the nodes represent the different years, and the larger the node area, the larger the number of publications.

many developed countries in Europe and Asia, indicating that acupuncture has gradually been recognized in many developed countries.

Analysis of Institution

Using CiteSpace software to generate the contribution map of research institutions, the results show that it consists of Node = 206, Link = 320. From **Figure 6**, a total of 206 research institutions are dedicated to the research of acupuncture to treat CPPS and make contributions. It can be seen from the figure that the institutional network is low-density (density = 0.0152), which indicates that the cooperation among institutions engaged in this research field is not close and relatively scattered. **Table 5** lists the top ten institutions with the highest number of publishing and the highest centrality. Half of research institutions are from China. Beijing University of Chinese Medicine is the most produced institution (14), followed by Harvard University, Guang'anmen Hospital, and the Chinese Academy of Chinese Medical Sciences

Table 5 Top 10 Publications and Centrality of Institutions Related to Acupuncture on CPPS

Rank	Publications	Institutions	Rank	Centrality	Institutions
1	14	Beijing University of Chinese Medicine	1	0.09	Guangzhou University of Chinese Medicine
2	11	Harvard University	2	0.07	Massachusetts General Hospital
3	11	Guang'anmen Hospital	3	0.07	Guangzhou Medical University
4	11	China Academy of Chinese Medical Sciences	4	0.05	Harvard University
5	10	Harvard Medical School	5	0.04	China Academy of Chinese Medical Sciences
6	6	Guangzhou University of Chinese Medicine	6	0.03	Harvard Medical School
7	6	Chengdu University of Traditional Chinese Med	7	0.03	Tianjin University of Traditional Chinese Medic
8	5	Pennsylvania Commonwealth System of Higher Education (PCSHE)	8	0.03	Beth Israel Deaconess Medical Center
9	4	Technical University of Munich	9	0.02	Beijing University of Chinese Medicine
10	4	Massachusetts General Hospital	10	0.02	Guang'anmen Hospital 14

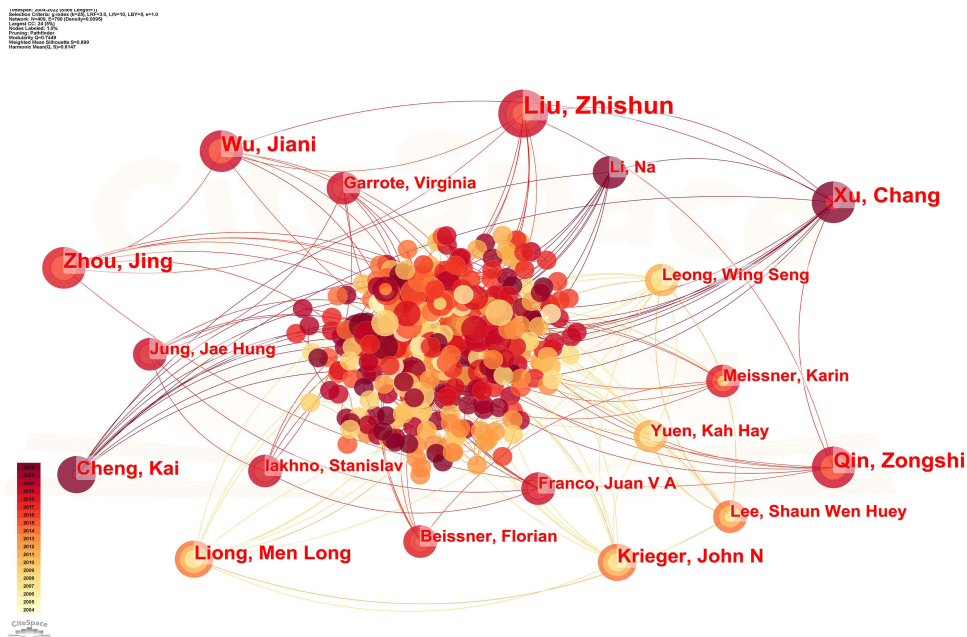


Figure 7 Map of authors related to acupuncture on CPPS research from 2000 to 2022. The nodes represent authors, and the lines between the nodes represent the collaborative relationships. The different colors of the nodes represent the different years. The larger the node area, the greater the number of publications.

(11). The top three institutions in the centrality ranking are Guangzhou University of Chinese Medicine (0.09), Harvard University, Guangzhou Medical University (0.07), and Massachusetts Comprehensive Hospital (0.05). It is not difficult to find that Chinese research institutions have closer cooperation in this field of research, mainly concentrated in research institutions in Beijing and Guangzhou. In addition, Harvard University is also committed to this study and has achieved high influence.

Analysis of Author and Cited Author

The most prolific author can reflect the influence and importance of researchers in this field. Their research results can predict future research directions and trends, provide ideas and inspiration to successor researchers, and can also help researchers find suitable and excellent collaborators. We analyzed the author of 173 articles and obtained the network map of prolific the author, node = 409, link = 790 (Figure 7). From the results of the figure, 409 researchers have been committed to acupuncture on CPPS research and published research results in the past 20 years, but there is a lack of cooperation and contact between these researchers (Density = 0.0095). Table 6 counts the top 10 authors of the most productive forces. Professor Liu Zhishun contributed 7 articles as the most produced author. Professor Liu Zhishun is the chief researcher of the Chinese Academy of Chinese Medical Sciences. He is committed to acupuncture diagnosis and basic research on pelvic floor dysfunction and female reproductive endocrine diseases.³⁰ He published in *Annals of Internal Medicine* (IF25.391) entitled “Efficacy of Acupuncture for Chronic Prostatitis/Chronic Pelvic Pain Syndrome: A Randomized Trial” provides exact high-quality clinical research evidence for acupuncture to treat CP/CPPS’s long-

Table 6 Top 10 Prolific Authors Related to Acupuncture on CPPS

Rank	Publications	Author	Rank	Publications	Author
1	7	Liu, Zhishun	6	4	Krieger, John N
2	5	Qin, Zongshi	7	4	Liong, Men Long
3	5	Wu, Jiani	8	4	Cheng, Kai
4	5	Xu, Chang	9	3	Beissner, Florian
5	5	Zhou, Jing	10	3	Meissner, Karin

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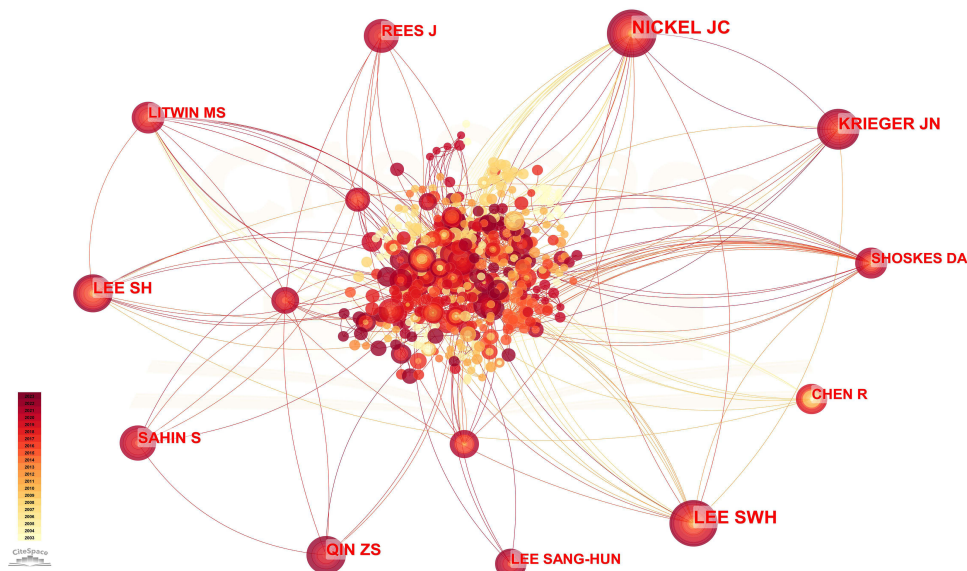


Figure 8 Map of cited authors related to acupuncture on CPPS research from 2000 to 2022. The nodes represent authors, and the lines between the nodes represent the co-citation relationships. The different colors of the nodes represent the different years. The larger the node area, the greater the number of co-citations. The purple ring represents centrality, and nodes with high centrality are considered as pivotal points in the publications.

term efficacy. In addition, we found that the top five researchers were closely linked in this research field and were loyal research partners. Except for Xu Chang from the University of Qatar, the top four came from the China Academy of Chinese Medical Sciences and published 5 articles.

477 nodes and 1451 links constitute the map of the cited author (Figure 8). The author with the highest cited rate comes from Professor J Curtis Nickel of the Queen’s University.³¹ Professor J Curtis Nickel has been committed to the study of CPPS in men and women and has won an outstanding contribution award from the American Association of Urology.³² Professor J Curtis Nickel is a leading expert engaged in CPPS diagnostic standards and pathogenic factors. The recent research results have updated the definition and classification of CPPS, providing a new diagnostic paradigm for this difficulty. Its results were extensively cited by researchers in acupuncture on CPPS and became the most cited author in the field (43). The next is Lee SWH (42), Krieger JN (29), qin ZS, Lee SH (27) (Table 7). According to centrality,³³ Professor Mike Armour of Western Sydney University is the most influential author in the research field (0.38).^{34–36} His main research direction is acupuncture to treat primary dysmenorrhea, CPPS, and endometriosis. He

Table 7 Top 10 Frequency and Centrality of Cited Authors Related to Acupuncture on CPPS

Rank	Frequency	Author	Rank	Centrality	Author
1	43	Nickel JC	1	0.38	Armour M
2	42	Lee SWH	2	0.33	Brown J
3	29	Krieger JN	3	0.23	Liu BP
4	27	Qin ZS	4	0.23	Wayne PM
5	27	Lee SH	5	0.20	Siegel S
6	22	Rees J	6	0.19	Litwin MS
7	22	Sahin S	7	0.18	Fall M
8	20	Litwin MS	8	0.17	Nickel JC
9	18	Shoskes DA	9	0.16	Anderson RU
10	17	Lee Sang-Hun	10	0.15	Lee SWH

dedicated to find non-drug management strategies such as acupuncture and other oriental medicine replacement therapy. Next is Brown J (0.33), LiU BP (0.23), Wayne PM (0.23). They have made great contributions in the field of acupuncture on CPPS and provide authoritative research results, as well as provide potential partners for researchers in the future.

Analysis of Cited Reference

A cluster diagram of the cited references consists 557 nodes and 1729 links (Figure 9). Gathering the literature of the same theme can easily find researchers to quickly find the corresponding literature required for research. Citespace software analysis results indicate that the network diagram is a high-quality cluster analysis and significant cluster structure is convincing (Silhouette, $S = 0.9659$, Modularity $Q = 0.9108$). It is not difficult to see that the figure includes 12 cluster modules. The rank top 5 modules are #1Pelvic floor disorder, #2New development, #3Usual care, #4Systematic review, #5Non-pharmacology intervention. The first two cluster modules are related to the definition and epidemiology of CPPS. It is interesting that research is a large proportion of conventional nursing and non-drug replacement treatment modules, which shows that researchers in this field have long realized the efficacy of alternative therapy in the treatment of CPPS. Researchers began to conduct evidence-based medicine, using system review to find high-quality evidence to prove their clinical effects.

The top ten are shown in Table 8 by the frequency of cited references.³⁷ Sahin et al published a randomized, Sham-Controlled trial of CPPS which is the article with the most cited articles (18). The results of the article show that acupuncture treatment can effectively improve the symptoms of patients with CPPS. The article written by the Qin ZS team is also cited frequent (18), also a random control test research on the acupuncture treatment CPPS, which included in 68 research subjects.¹⁸ The results showed that acupuncture showed satisfactory efficacy and lasting benefits to chronic prostatitis/chronic pelvic pain syndrome. This experiment lacks large samples, but two years later,³⁰ his team used large samples, multi-centered clinical trial design, and recruited 440 test patients to prove the effectiveness of acupuncture therapy for CPPS, providing high-quality evidence for clinical decision-making essence.

According to the centrality, the top ten cited documents in the center as shown in Table 9. The most centralized article is a systematic review of acupuncture to treat CPPS by Sang-Hun Lee in 2011 (0.27).⁴⁴ The article system summarizes

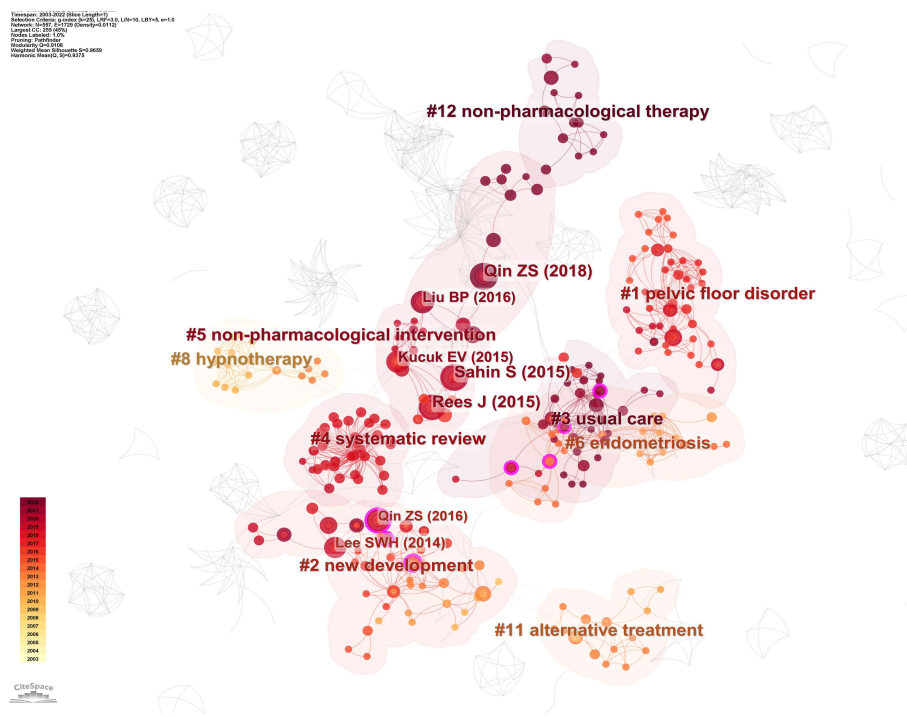


Figure 9 Cluster networks of cited references related to acupuncture on CPPS research from 2000 to 2022. In the map, each color represents a cluster. The smaller the clustering label, the more articles in the cluster.

Table 8 Top 10 Frequency of Cited References Related to Acupuncture on CPPS

Rank	Frequency	References	Author and Publication Year
1	18	Acupuncture relieves symptoms in chronic prostatitis/Chronic pelvic pain Syndrome: a randomized, sham-controlled trial ³⁷	Sahin S (2015)
2	18	Acupuncture for Chronic Prostatitis/Chronic pelvic pain Syndrome: A Randomized, Sham Acupuncture Controlled Trial ¹⁸	Qin ZS (2018)
3	17	Diagnosis and treatment of chronic bacterial prostatitis and chronic prostatitis/Chronic pelvic pain Syndrome: a consensus guideline ³⁸	Rees J (2015)
4	12	Acupuncture and immune function in chronic prostatitis/Chronic pelvic pain Syndrome: A randomized, controlled study ³⁹	Lee SWH (2014)
5	11	Effect of acupuncture on clinical symptoms and laboratory indicators for chronic prostatitis/Chronic pelvic pain Syndrome: a systematic review and meta-analysis ⁴⁰	Liu BP (2016)
6	11	Effectiveness of Acupuncture on Chronic Prostatitis/Chronic pelvic pain Syndrome Category IIIB Patients: A Prospective, Randomized, Nonblinded, Clinical Trial ⁴¹	Kucuk EV (2015)
7	10	Systematic Review of Acupuncture for Chronic Prostatitis/Chronic pelvic pain Syndrome ⁴²	Qin ZS (2016)
8	7	Electroacupuncture Relieves Pain in Men With Chronic Prostatitis/Chronic pelvic pain Syndrome: Three-arm Randomized Trial ²³	Lee SH (2009)
9	7	Acupuncture versus Sham Acupuncture for Chronic Prostatitis/Chronic pelvic pain Syndrome ²²	Lee SWH (2008)
10	7	Network Meta-Analysis of the Efficacy of Acupuncture, Alpha-Blockers and Antibiotics on Chronic Prostatitis/Chronic pelvic pain Syndrome ⁴³	Qin ZS (2016)

Table 9 Top 10 Centrality of Cited References Related to Acupuncture on CPPS

Rank	Centrality	References	Author and Publication Year
1	0.27	Use of Acupuncture as a Treatment Method for Chronic Prostatitis/Chronic pelvic pain Syndrome ⁴⁴	Lee Sang-Hun (2011)
2	0.26	Acupuncture for pain in endometriosis ⁴⁵	Zhu XS (2011)
3	0.20	Systematic Review of Acupuncture for Chronic Prostatitis/Chronic pelvic pain Syndrome ⁴²	Qin ZS (2016)
4	0.20	Hormone therapy for endometriosis and surgical menopause ⁴⁶	Al Kadri H (2009)
5	0.17	Endometriosis ⁴⁷	Bulun SE (2009)
6	0.16	Cyclooxygenase-2 Regulates Survival, Migration, and Invasion of Human Endometriotic Cells through Multiple Mechanisms ⁴⁸	Banu SK (2008)
7	0.16	Treating primary dysmenorrhoea with acupuncture: a narrative review of the relationship between acupuncture "dose" and menstrual pain outcomes. Acupuncture in Medicine ⁴⁹	Armour M (2016)
8	0.16	A principal component analysis is conducted for a case series quality appraisal checklist ⁵⁰	Guo B (2016)
9	0.14	Management of Chronic Prostatitis/Chronic pelvic pain Syndrome: A Systematic Review and Network Meta-analysis ⁵	Anothaisintawee T (2011)
10	0.14	The effectiveness of long-needle acupuncture at acupoints BL30 and BL35 for CP/CPPS: a randomized controlled pilot study ⁵¹	Zhou MJ (2017)

the clinical practice, clinical research and efficacy mechanism of acupuncture treatment CPPS in the past. The results were believed that acupuncture treatment CPPS may be a safe and effective treatment method. The effect of acupuncture therapy CPPS can be explained through the following assumption mechanism: local peripheral events, spinal (segment) mechanism and supraspinal (extra-segmental or central) mechanism.

2848 nodes and 9365 links to form a timeline map for cited reference category (Figure 10). It can be seen from the figure that #4 antiangiogenic therapy, #7 electroacupuncture, #8 adenomyosis, #28 percutaneous tibial nerve stimulation are the theme and direction of the closest five-year span in the quotation. This shows that the theme of

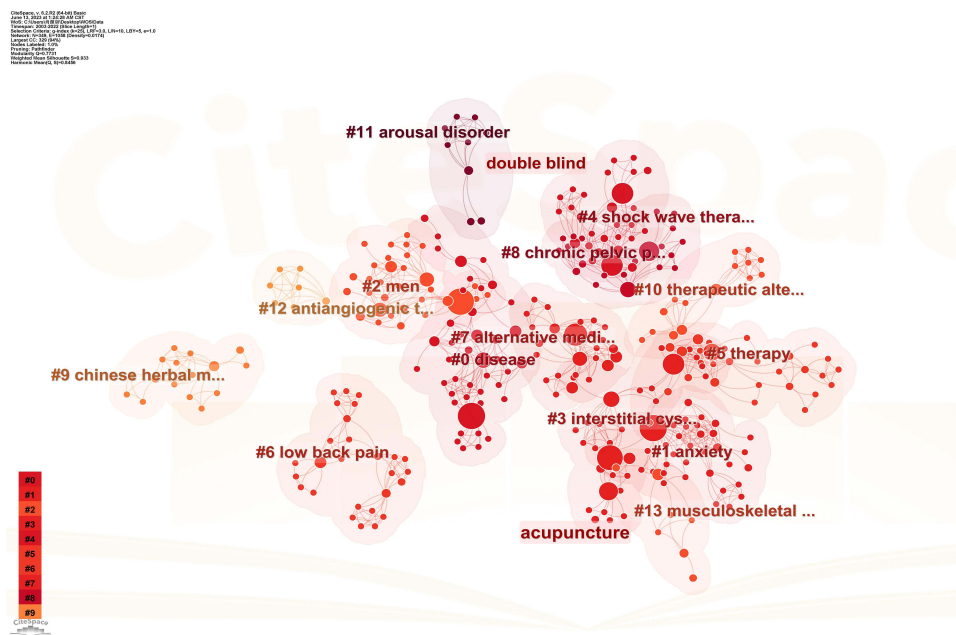


Figure 10 Timeline view of acupuncture on CPPS. In the map, the later the timeline corresponding to each cluster indicates that the more likely the cluster is to become a new research hotspot.

these four cluster labels is the emerging theme of the current field of research, which provides hot spots and directions for future research. In these four research directions, the node size and time span of #8 adenomyosis are the longest, indicating that the research direction of the cluster represents not only the most influential emerging theme at present but also a classic theme.⁵² It is an important research direction in this field in the future. In addition, meta-analysis is also a hot theme, indicating that the use of evidence-based medical methods to provide high-quality evidence for acupuncture treatment CPPS has gradually received the attention of researchers. The results of multiple meta-analysis have confirmed that acupuncture therapy CPPS is effective.⁵³ In recent years, the treatment of chronic pelvic syndrome for electric acupuncture treatment has become a hotspot of research.⁵⁴ At the same time, the physiological mechanism of its related animal research has also become a hot spot for research.

Analysis of Keywords

The keywords of the article can reflect the central ideas and research fields of the paper. Through keyword analysis, it is conducive to evaluating some hot cutting edge themes and future research direction in the field of acupuncture on CPPS research. The analysis of Citespace software was used to generate a network co-occurrence cluster map of keywords, consisting of 349 nodes and 1058 links. From Figure 11, it can be clearly seen that the cluster structure is significant and the average silhouette value of the clustering is greater than 0.7, which illustrated result is convincing (Modularity, $Q = 0.7731$, Silhouette, $S = 0.933$). There are a total of 13 cluster module areas in the figure. Among them, acupuncture and dual blind appear more frequency and the most influential, which shows that the most influential research is mainly the clinical research of acupuncture therapy CPPS random, comparison, and blind method. Obviously, the effectiveness of acupuncture on CPPS is still questioned, mainly due to lack of high-quality evidence with large samples, multi-center RCTs. In the future, the direction of research needs to pay more attention to this shortcoming, and better provide a basis for clinical decisions. Table 10 lists keywords with the top ten of the frequency and centrality ranking. There is no doubt that “chronic pelvic pain syndrome” and “acupuncture” are the most common keywords, ranking in the top two. Other common keywords are “men”, “women”, “chronic prostatitis”, “double blind”, “management”, “pelvic pain”, “prevalence”, “quality of life”.

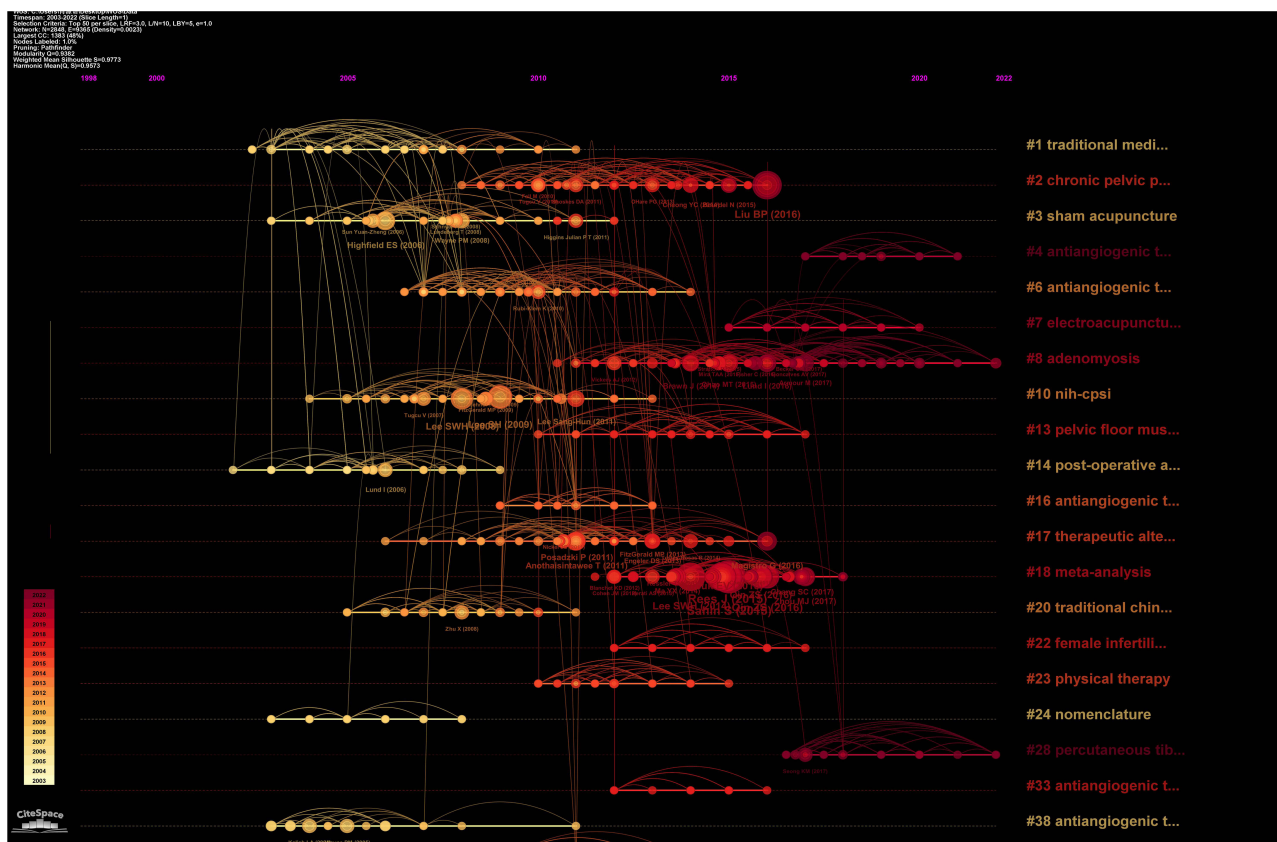


Figure 11 Clustered networks of keywords related to acupuncture on CPPS research from 2000 to 2022. In the map, each color represents a cluster. The smaller the clustering label, the more articles in the cluster.

Use Citespace software to explore the top 20 keywords with the highest reference rate in the past 20 years (Figure 12). Sudden words refer to the keywords that nodes are reused at a certain time node, which can well reflect the current research hotspots. Since 2003, research in the field of CPPS acupuncture therapy has flourished, mainly focusing on the improvement of the quality of life of CPPS patients. The first ranking is the “quality of life” (3.24), followed by “management” (2.79) and “alternative medicine” (2.74). In the top 20 burst keywords, we are paying attention to “systematic analysis” as the latest keywords, and it has always been research hotspot, indicating that researchers attach great importance to the research on evidence decision-making in the field of acupuncture on CPPS, and actively seek supplementary alternative therapy management strategy. There are also explanations of keywords such as “symptoms” and “non-bacterial prostatitis”. The cause that epidemiology and basic research of CPPS are current research hotspots.

Table 10 Top 10 Frequency and Centrality of Keywords Related to Acupuncture on CPPS

Rank	Keyword	Frequency	Rank	Keyword	Centrality
1	Chronic pelvic pain Syndrome	39	1	Acupuncture	0.58
2	Acupuncture	38	2	Double blind	0.33
3	Men	37	3	Endometriosis	0.33
4	Women	33	4	Chronic pelvic pain Syndrome	0.30
5	Chronic prostatitis	25	5	Complementary medicine	0.29
6	Double blind	23	6	Diagnosis	0.22
7	Management	23	7	Health	0.19
8	Pelvic pain	22	8	Chronic prostatitis	0.18
9	Prevalence	19	9	Epidemiology	0.14
10	Quality of life	17	10	Dysfunction	0.13

Top 20 Keywords with the Strongest Citation Bursts

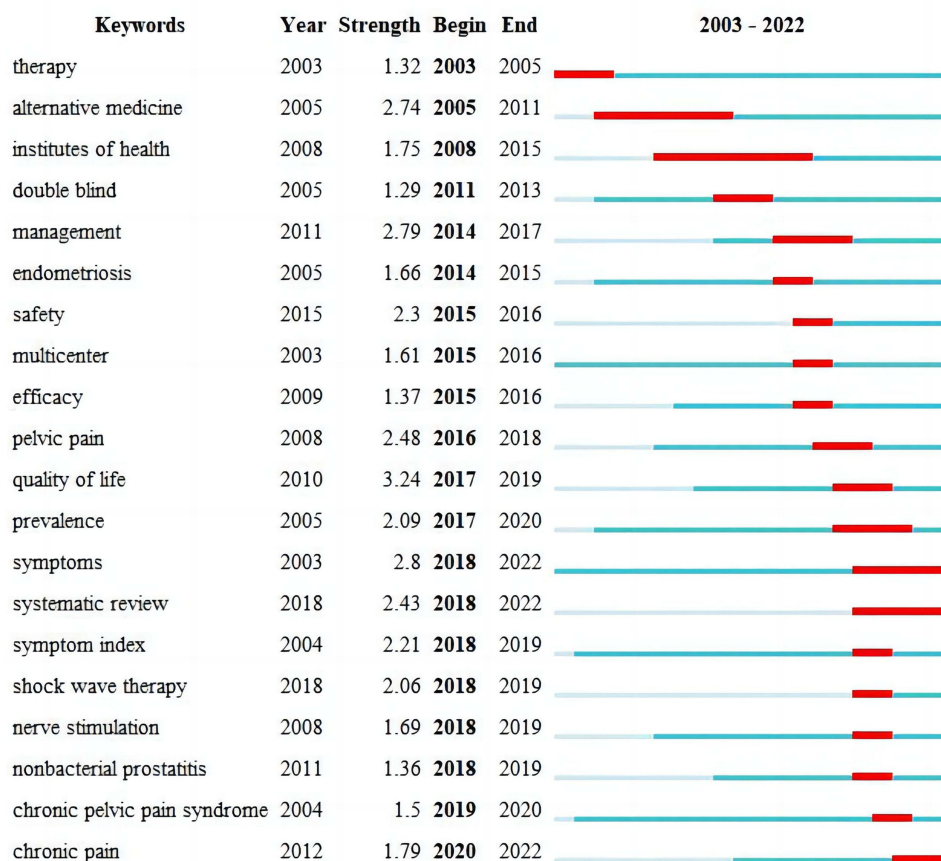


Figure 12 Top 20 keywords with the strongest citation bursts.

Notes: The red bars demonstrated that the keyword was cited frequently, the green bars showed that the keyword was cited infrequently.

Discussion

General Information

This study analyzed 173 publications from 2003 to 2022 through the literature measurement method. The general information obtained from the results is as follows:

1. Judging from the changes in the number of publications each year, the number of publications every year is constantly changing in the past 20 years, and the overall can be divided into three stages:

The first stage (2000–2007): In the early stages of research in this field, during this period, the research results of acupuncture treatment CPPS increased slowly (as shown in Figure 1). The number of publications each year is particularly small. The average publication in the first five years is 2. The research direction is mainly to explore the clinical efficacy of acupuncture and alternative therapy in CPPS.

The second stage (2008–2015): The development period of this research field. At this stage, the annual average paper publishing volume can reach 7 articles, showing a stable growth trend. The main research direction at this stage is acupuncture treatment of CPPS clinical RCTs and mechanism research.

Third stage (2016–2022): The rapid development period in this field. During this period, the number of research papers published increased rapidly. Researchers are more concerned about the study of acupuncture on CPPS in evidence-based medical and animal experimental mechanisms.

2. From the analysis of the magazine journal, *Medicine* (IF2022 1.600, 18 publications) is the most published, productive journal, followed by *Evid-Based Compl Alt* (IF2022 2.6498, 8 publications) and *J Altern Complem Med* (IF2022 2.6002, 6 publications), *J UROLOGY* (IF2022 6.6002, 6 publications). In addition, the most frequent magazines and the most influential magazines are *J UROLOGY* and *Acupunct Med*. The best part of the paper is published in medicine, medical, and clinical journals, and at the same time cited health, nursing and medical journals to a large extent. It shows that high-level papers have increased significantly, providing direction for future research.
3. Among the top ten countries or regions, 4 are in Asia, 3 in Europe, one in North America, one in South America, and one in the Oceania. Acupuncture, as a traditional Oriental therapy, is widely used in Asian countries. In addition, developed countries attach great importance to the research of acupuncture intervention in CPPS, such as the United States, Britain, Germany, Australia, etc. According to centralized results, Chinese researchers are the most influential in this field of research. This is not surprising, because acupuncture originated in China, and its related research has always received much attention. Followed by developed countries such as the United States, Britain, and Germany, they may be related to the medical policies and high-level medical security of these countries, and pay more attention to the management of alternative therapies in CPPS.
4. Among the top ten institutions, 5 are from China, 4 from the United States, and 1 from Germany. It shows that China is the leading country in the field of CPPS acupuncture. It has relatively close domestic cooperation, but lacks international cooperation. In addition, American researchers are very interested in this field and have high achievements, indicating that acupuncture is highly accepted in the United States, and patients are willing to accept this green alternative therapy.
5. Among the 409 researchers in this field, the most productive author is Liu Zhishun. His research fields are concentrated in clinical trial research in acupuncture therapy CPPS, but researchers lack cooperation and contact. The research results confirmed the positive role in acupuncture intervention in CPPS. Professor J Curtis Nickel is the most frequent cited author. His research results update the definition and classification of CPPS. Professor Mike Armor is the most influential author who has been cited frequently. He believes that acupuncture has a positive effect on CPPS, but it requires more clinical trials and long-term efficacy observation.

Research Hotspots

According to the analysis of the references, the physiological mechanism and clinical evidence level standards of acupuncture treatment CPPS are likely to become a new research direction. According to the results of the references timing diagram, clusters such as #1traditional Chinese medicine therapy, #2chronic pelvic pain, #3sham acupuncture, #4antiangiogenic therapy, #7electroacupuncture therapy, #8adenomyosis, #10NIH-CPSI, #17alternative medicine, #18 System Evaluation, #23physical therapy, #28percutaneous tibial nerve stimulation mainly focus on the treatment method of CPPS and also involve the mechanism of acupuncture in CPPS, clinical trials and the development of animal experiments. To grasp the research trend in this field, we should pay attention to the latest four clusters (#4antiangiogenic therapy, #7electroacupuncture, #8adenomyosis, #28percutaneous tibial nerve stimulation). These show that researchers are more concerned about the recent and long-term efficacy and evidence level and basic research of acupuncture treatment.

The burst word is an effective way to find a sudden increase in hotspots in specific research areas. Our analysis shows that the keyword “quality of life” is the current hotspot in this field. CPPS is a common and usually heterogeneous disease, and the serious consequences of the quality of life of patients have been confirmed. Katharina Piontek, Piontek K, and Dybowski C have published the symptoms of CPPS on the research results associated with the physical symptoms and quality of life. Researchers have found that CPPS treatment requires individualized comprehensive treatment solutions. In the expert consensus and guidelines of CPPS diagnosis and treatment, alternative therapy was clearly proposed to improve symptoms and quality of life. Among them, the best-studying non-drug therapy includes acupuncture, electro-acupuncture, pelvic floor physical therapy and psychological support treatment. The explosive intensity of “management” and “alternative therapy” is second only to “quality of life”, indicating that the management and treatment of CPPS has always been a hot spot for research in recent years.

We summarize the keywords on the acupuncture therapy CPPS research article published in the near five years. Four hot keywords were summarized, namely acupuncture, systematic review, randomized controlled trial, and mechanism of action. From this, four themes and directions can be summarized. The first is research on treatment methods and stimulation parameters, the second is literature research, the third is research on mechanism of action, and the fourth is clinical trial research.

1. Treatment:⁵⁵ Currently, the commonly used treatments for CPPS are α -blockers and non-steroidal anti-inflammatory drugs, which selectively block prostate α -adrenergic receptors,^{56,57} causing prostate smooth muscle to relax and interact with the sympathetic nerves of the pelvic diaphragm, and relieve pelvic floor muscle pain.⁵⁸ Additionally, the treatment of this disease with traditional Chinese medicine has been a hot research direction in recent years, and acupuncture has been proven to be effective and fast. In addition,²³ electroacupuncture,⁵⁹ moxibustion and⁶⁰ cupping can also be used to treat CPPS. Abdulaziz, Khadiga et al used neurogenic acupoint dry cupping therapy to treat chronic pelvic pain (CPP) and found that it had a significant improvement effect on women's high-sensitive C-reactive protein (hs-CRP) levels, pain perception and intensity, and pelvic pain. In addition, traditional Chinese medicine treatment is also a hot topic in recent research, but it needs TCM syndrome differentiation and treatment as the basis.
2. Systematic review: Evidence-based medicine is an important method to provide high-level clinical medical evidence and guide decision-making. In recent years, evidence-based medicine in traditional Chinese medicine has become a research hotspot. In order to provide high-quality clinical evidence for acupuncture, many researchers have published a large number of related articles.^{61,62} A large number of systematic reviews have shown that acupuncture can improve the symptoms and quality of life of patients with CPPS and improve pelvic dysfunction. Whether it is a single intervention or combined with other treatment options, the results are satisfactory. However, its evidence-based recommendations are of low to medium quality and lack the support of high-quality large samples and multi-center randomized controlled trials. Further research and improvement are needed in the future.
3. Randomized controlled clinical trial: The random control test is recognized as the highest level of clinical evidence representing evidence-based medicine. In recent years, the random control clinical trials of acupuncture therapy CPPS have also become a hot spot in the field of research.⁵⁸ Li et al recently found that acupuncture and placebo are used to compare with placebo. The results show that acupuncture is to alleviate pelvic pain, shorten the duration of pain, improve happiness and quality of life.³⁰ Sun et al use large sample multi-center random control research methods. The results show that compared with fake acupuncture, acupuncture can make the symptoms of moderate-to-severe CP/CPPs, and it has a strong long-term efficacy. In the future, we still need a large number of random control test design with high-quality, large samples to confirm the effectiveness and safety of acupuncture.
4. Mechanism of therapeutic: The mechanism of acupuncture treatment CPPS is also a research hotspot in recent years.^{63,64} A number of experimental studies have shown that acupuncture can activate the vagus nerves, inhibit the activation of macrophages and the production of inflammatory factors, promote the production of myelin dopamine, and thereby control inflammation. The mechanism of electro-needle treatment of CPPS has attracted much attention. Through rats experiments,⁶⁵ Xu C believes that immune and inflammation reactions are the main biological events that induce chronic pelvic pain in rats. The expression of related genes on PI3K-AKT/JAK-STAT signal pathway to play an anti-inflammatory and analgesic effect.⁵³ Wu XL is based on the rat experiment and believes that the analgesic mechanism of EA on CP/CPPS may be achieved through modulation of cAMP-PKA-TRPV1/PLC-PKC-TRPV1 signaling pathway. However, the specific action mechanism of acupuncture still needs to be further studied.

Limitations

First of all, we only search for related documents in WOSCC, which may cause other documents that have not been included in the database. Since WOS is an English database, it may ignore other documents related to chronic pelvic pain

syndrome. Secondly, due to manual screening, the type of literature will appear, and the unpublished documents will have deviations.

Conclusion

However, the research of acupuncture/electroacupuncture treatment CPPS and the number of animal test research have gradually increased. A number of related clinical trials have confirmed that acupuncture intervention CPPS has achieved positive results, but the specific mechanism is still unclear. For example,^{39,66} the influence mechanism of acupuncture on neurological media and cell immunomics still needs to be further studied. Therefore, medical providers should be encouraged to use random control test design of large samples and multi-centers to study the frequency of acupuncture, acupoint selection, stimulating frequency and duration and treatment course to control the pain of CPPS and improve physical symptoms.

The results of this article show that (1) Regarding the status quo of research: In the past 20 years, the number of publications in the research field has been increasing, the influence factors and quality level of journals has continued to increase, indicating that acupuncture as a replacement therapy has been gradually valued by medical workers. In addition, from a geographical point of view, the relevant research of acupuncture intervention CPPS is mainly distributed in some developed countries with high medical levels. Each continent has a diversified world layout. The most influential and most produced countries are China and the United States. Cross-regional and international cooperation is still not close. (2) Research hotspot: By analyzing the analysis of Citespace and VOSViewer of literature, we can conclude that the future research hotspot and trend of acupuncture on chronic pelvic pain will focus on the safety and long-term efficacy mechanism of acupuncture on CPPS, Animal experiments, other alternative medicines will be more and more valued. In addition, we analyzed that the electronic-acupuncture as an important part of acupuncture, which played an important role that cannot be ignored in CPPS intervention, is the emerging theme of the current field of research.

Data Sharing Statement

Direct access to raw data is provided by the Web of Science Core Collection (WoSCC).

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Author Contributions

All authors made a significant contribution to the work reported, 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.

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Disclosure

The authors report no conflicts of interest in this work.

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