

# A Bibliometric Analysis of Acupuncture Therapy in the Treatment of Primary Dysmenorrhea from 2001 to 2021

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**Background:** Acupuncture therapy has already extensively used in many countries around the world to treat primary dysmenorrhea. But there is no bibliometric analysis on this aspect. Therefore, the purpose of this study is to evaluate the research trends of acupuncture therapy in the treatment of primary dysmenorrhea through literature research from 2001 to 2021 by using Citespace 6.1.R1(64-bit) Basic.

**Methods:** Relevant literature is extracted from the Web of Science database. CiteSpace conducts cooperative network analysis on the information of authors, countries and institutions, co-occurrence network analysis on keywords, and co-citation analysis on cited journals, cited authors and cited references.

**Results:** A total of 189 publications were extracted from 2001 to 2021. The total numbers of publication have steadily increased over the past two decades, and we have identified the most active countries, institutions, journals and authors in the field of acupuncture for primary dysmenorrhea. The EVID-BASED COMPL ALT was the most productive journal, and the COCHRANE DB SYST REV with the highest IF. The first in the frequency and centrality is the journal of AM J OBSTET GYNECOL. The most productive country and institution are China and Beijing University Chinese Medicine. YANG J was the most prolific author and CHEN H had the highest citation counts. The centrality of cite references ranked the first conducted by Burnett M. The keyword of “primary dysmenorrhea” ranked first for research developments with the highest frequency.

**Conclusion:** The research results of Metrology in this paper provide the current situation and trend of clinical research on primary dysmenorrhea acupuncture Therapy in recent twenty-one years, which is helpful for researchers to identify the hot spots in this field and explore new directions of future research.

**Keywords:** primary dysmenorrhea, acupuncture therapy, CiteSpace, bibliometric analysis, research trends

## Introduction

Primary Dysmenorrhea (PD) refers to the disease that occurs with menstruation and has periodic lower abdominal pain without organic lesions of reproductive organs. It is often accompanied by systemic symptoms such as lumbar acid, nausea, vomiting, diarrhea, fatigue and sleep disorders, and the duration is generally no more than 3 days.<sup>1,2</sup> It is the most common gynecological pain disease. It usually occurs in adolescent girls or young women who have not given birth 2–3 years after menarche.<sup>3,4</sup> The predisposing factors of PD mainly include: family history, premature menarche age, no birth, menorrhagia, obesity, bad living habits and environmental factors.<sup>2,5,6</sup>

However, its pathogenesis has not been completely clear. According to epidemiological surveys, the prevalence of PD in different countries is between 45% and 90%,<sup>7,8</sup> It seriously affects women's normal study and work, reduces the quality of life, and then causes great social and economic losses.<sup>9–11</sup> There are research reports:<sup>12</sup> in the United States,

the number of hours of absenteeism caused by PD is as high as 140 million hours every year, and in Japan, the economic loss caused by PD is as high as 4.2 billion dollars every year.

At present, the treatment of PD with western medicine is mainly symptomatic. The commonly used drugs include non-steroidal anti-inflammatory drugs, contraceptives, calcium channel blockers, etc. a few patients are treated with surgery.<sup>13–15</sup> The latest clinical guidelines for dysmenorrhea recommend:<sup>16</sup> nonsteroidal anti-inflammatory drugs (NSAIDs) as the first-line medication for the treatment of dysmenorrhea, and acupuncture point stimulation as an important complementary alternative therapy is also recommended. However, NSAIDs have serious gastrointestinal and nervous system side effects, causing nausea, indigestion, headache, sleepiness and so on.<sup>17–19</sup>

Acupuncture therapy is more and more favored by dysmenorrhea subjects because it is simple, effective, convenient and cheap without toxic and side effects.

Bibliometrics is a subject that studies the distribution structure, quantitative relationship, change law and quantitative management of literature and information, and then discusses some structures, characteristics and laws of science and technology, taking the literature system and bibliometric characteristics as the research object, using mathematical, statistical and other metrological research methods. This is of great significance for accurately grasping the research trends and hot spots.<sup>20–25</sup>

CiteSpace is a visual tool invented by Professor Chen Chaomei, which can intuitively display the co cited information of countries, institutions, authors, keywords, cited journals, cited authors, cited references through maps.<sup>26–28</sup> So that researchers can intuitively understand the research trends, hot spots and classic sources of the discipline, and provide reference for subsequent research.

In recent years, a large number of clinical studies<sup>29–31</sup> have shown that acupuncture and moxibustion treatment of PD has good curative effect and quick effect. It not only has significant immediate analgesic effect, but also has obvious sustainability of curative effect, which can effectively prevent the recurrence of primary dysmenorrhea; However, as far as we know, there is no bibliometric analysis of acupuncture and moxibustion for the treatment of primary dysmenorrhea based on CiteSpace. This study aims to evaluate the research trends of acupuncture therapy in the treatment of PD through literature research from 2001 to 2021 through bibliometric analysis.

## Methods

### Source of Literature

To prevent the omission of searching the literature, we obtained the synonyms for “dysmenorrhea” and “acupuncture Therapy” through the MeSH Database in PubMed, we find the Entry Terms of “dysmenorrhea” include “Dysmenorrheas”, “Pain, Menstrual”, “Menstrual Pain”, “Menstrual Pains”, “Pains, Menstrual”, “Menstruation, Painful”, “Menstruations, Painful”, “Painful Menstruation”, “Painful Menstruationsand”, the Entry Terms of “acupuncture Therapy” include “Acupuncture Treatment”, “Acupuncture Treatments”, “Treatment, Acupuncture”, “Therapy, Acupuncture”, “Pharmacoacupuncture Treatment”, “Treatment, Pharmacoacupuncture”, “Pharmacoacupuncture Therapy”, “Therapy, Pharmacoacupuncture”, “Acupotomy”, “Acupotomies” and some other synonyms that we found from other articles.<sup>28,32</sup> We put it together to searching, All data collection was performed on July 19, 2022, searching the WOSCC for all literature published ranged from January 1, 2001, to December 31, 2021. The search was not restricted to the category, language or document type. Two authors independently searched the references. Any differences were resolved by GP Zhong and YY Xiao, and a total of 192 publications were identified (Table 1). and after Citespace deleted duplicates, 189 publications remained for bibliometric analysis. We removed two corrections and one meeting abstracts. Data removal is done in the form of a combination of manual verification and CiteSpace software. And the searched Web of science database stems from the Library of Jiangxi University of Chinese medicine database in China.

### Analysis Tool

The visualization software version is Citespace 6.1.R1 (64 bit) Basic, invented by Professor Chen Chaomei, Department of Computer and Information Science, Drexel University, USA, which can be used to analyze the structure, rule and distribution of scientific knowledge.<sup>33</sup>

**Table I** Search Queries

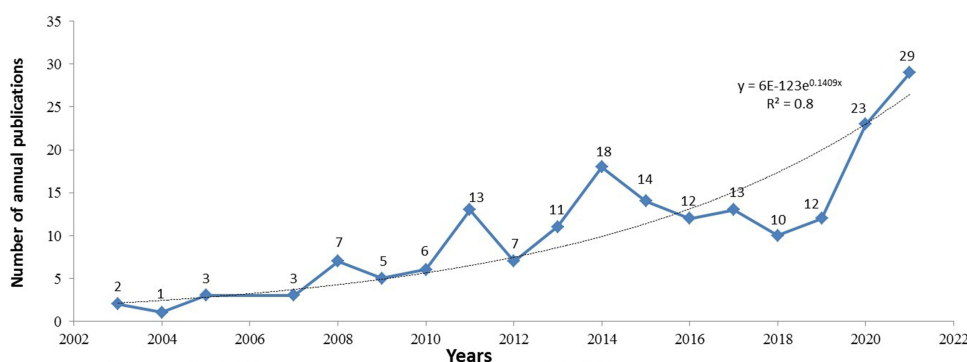
Set	Results	Search Query
#1	4984	TS=(Dysmenorrhea OR Dysmenorrheas OR Pain, Menstrual OR Menstrual Pain OR Menstrual Pains OR Pains, Menstrual OR Menstruation, Painful OR Menstruations, Painful OR Painful Menstruation OR Painful Menstruations)
#2	20461	TS=(Acupuncture Therapy OR Acupuncture Treatment OR Acupuncture Treatments OR Treatment, Acupuncture OR Therapy, Acupuncture OR Pharmacopuncture Treatment OR Treatment, Pharmacopuncture OR Pharmacopuncture Therapy OR Therapy, Pharmacopuncture OR Acupotomy OR Acupotomies OR Acupuncture OR Electroacupuncture OR electroacupuncture OR Acupuncture and moxibustion OR Needle knife OR body Acupuncture OR Needle Acupuncture OR Manual Acupuncture OR Acupuncture point OR Electro-acupuncture OR warm Acupuncture OR Auricular Acupuncture OR Ear Acupuncture OR Moxibustion OR Moxabustion OR acupoint injection OR catgut embedding OR catgut implantation at acupoint OR embedding thread OR moxibustion acupuncture OR fire needling OR fire needle OR fire acupuncture OR Scalp Acupuncture OR Scalp Acupuncture OR Skin Acupuncture)
#3	192	#1 AND #2

The citespace parameter is as follows: time slice, 2001–2021; Number of years per slice (1); Source terms, all options; Node selection type, one at a time; Trim, pioneer. Visual knowledge graph is mainly composed of nodes and links. Each node represents an element, such as author, institution, and country. Nodes with different colors between the inner and outer parts represent the period 2001–2021. The lines between nodes indicate that the co-citation occurs at the same time. Purple circle indicates centrality, and nodes with high centrality are considered more important.<sup>34,35</sup>

## Results and Discussion

### Analysis of Publication Outputs

The annual number of publications is an important value for evaluating the development of scientific research, which reflects the growth of knowledge in this field to a certain extent. We input the annual number of publications in different years into the Microsoft Excel sheet, and use the chart tool to generate a trend line of the annual number of publications. Figure 1 shows the current annual number of papers published in the research field of acupuncture and moxibustion for the treatment of dysmenorrhea.  $y = 6E-123e^{0.1409x}$   $R^2 = 0.8$ , it shows that the reliability of the trend line is very high. From 2001 to 2002, this field was in a blank state. Papers have been published since 2003, with four obvious growth time points. The first time is 2007–2008, and the literature increased from 3 to 7. The second time is 2009–2011, and the literature increased from 5 to 13. The third time is 2012–2014, and the literature increased from 7 to 18. The fourth time is 2018–2021, and the literature increased from 10 to 29, all in multiples. Especially after 2019, the number of papers on acupuncture and moxibustion treatment of dysmenorrhea increased rapidly, and the annual number of papers published in 2021 reached a record high. In general, although there are some fluctuations in the annual number of articles published in

**Figure 1** The annual number of publications on acupuncture treatment for PD between 2001 to 2021.

the field of acupuncture and moxibustion for dysmenorrhea, it shows a steady growth trend, reflecting that acupuncture and moxibustion as an auxiliary treatment method has received more and more attention.

## Analysis of Journals and Cited Journals

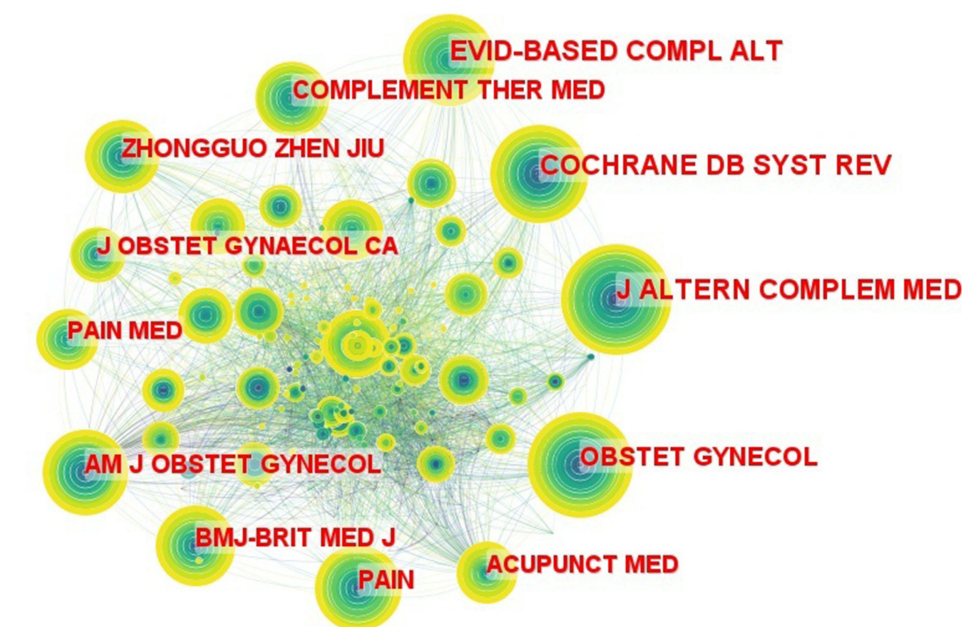
Six document types were identified from a total of 189 references. Journal articles (127) are the most commonly used literature types, accounting for 67.20% of the total number of references. Followed by reviews (54, 28.57%) and editorial materials (4, 2.11%; Table 2). The top 10 journals of acupuncture treatment on PD are shown in Table 3. According to the 2022 Journal Citation Reports by the Institute for Scientific Information, we know that among these Journals the journal of Cochrane Database of Systematic Reviews with the highest impact factor (IF), which has 12.008. The average IF of the top 10 journals was 3.7759. The journal of Evidence based complementary and alternative medicine was the most productive journal with 31 articles, followed by the journal of Medicine with 20 articles. We click on the citespace node key compute node centrality. Combining co-citation with centrality, CiteSpace has generated a map of cited journals, including 1999 references (Figure 2 and Table 4). The nodes in the map represent journals, and lines between the nodes represent co-citation relationships. The various colors in the nodes represent 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 literature. Through the table, there is not difficult for us to find the first in the frequency and centrality is the journal of J ALTERN COMPLEM MED and AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, respectively. This shows that the journal is highly representative and persuasive in this research field, and the citation rate is also very high, which can provide strong evidence for our research in this field. The most cited article was “The Status and Future of Acupuncture Clinical Research”.<sup>36</sup> In that article, Experts point out that in women’s health, acupuncture has been found to be beneficial for PMS, dysmenorrhea, several pregnancy-related disorders, and nausea in women with

**Table 2** Document Types for Documents Related to Acupuncture on PD

Rank	Type	Counts (%)	Rank	Type	Counts (%)
1	Article	127 (67.20%)	4	Letter	2 (1.06%)
2	Review	54 (28.57%)	5	Proceedings Paper	1 (0.05%)
3	Editorial Material	4 (2.11%)	6	Book Chapter	1 (0.05%)

**Table 3** Top 10 Scholarly Journals Related to Acupuncture on PD

Rank	Publications	Journal	IF (2022)	Rank	Publications	Journal	IF (2022)
1	31	EVIDENCE BASED COMPLEMENTARY AND ALTERNATIVE MEDICINE	2.65	6	6	ACUPUNCTURE IN MEDICINE	1.976
2	20	MEDICINE	1.817	7	6	CHINESE JOURNAL OF INTEGRATIVE MEDICINE	2.626
3	9	JOURNAL OF ALTERNATIVE AND COMPLEMENTARY MEDICINE	2.381	8	6	COMPLEMENTARY THERAPIES IN MEDICINE	3.335
4	8	COCHRANE DATABASE OF SYSTEMATIC REVIEWS	12.008	9	5	BMC COMPLEMENTARY AND ALTERNATIVE MEDICINE	4.782
5	7	JOURNAL OF TRADITIONAL CHINESE MEDICINE	2.547	10	5	PAIN MEDICINE	3.637



**Figure 2** Cited journal map related to acupuncture treatment for PD research from 2001 to 2021.

cancer. Among these articles, there are many articles that confirm the acupuncture is effective in treating PD. Hye Lin Woo<sup>37</sup> suggest that acupuncture may be more effective in reducing menstrual pain and related symptoms than untreated or NSAIDs, and the efficacy can be maintained during short-term follow-up. This article points out that the acupuncture may be an effective and safe treatment for primary dysmenorrhea in women. Moreover Claudia M Witt<sup>38</sup> consider compared with conventional nursing treatment alone, additional acupuncture treatment for dysmenorrhea patients is associated with improvement in pain and quality of life, and is cost-effective within conventional thresholds.

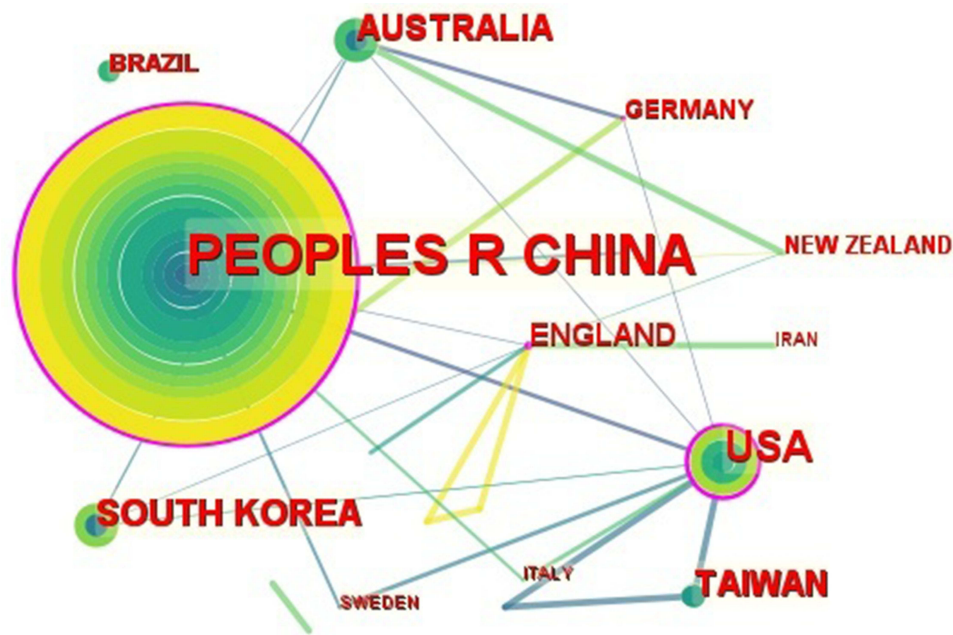
## Distribution of Countries and Institutions

Distribution of countries map was generated, 25 nodes and 29 links composed of the merged network (Figure 3). Nodes in the map represent countries or regions. Lines between nodes represent cooperative relationships. The various colors in the node represent different years, and the larger the area of the node, the greater the number of publications. Purple rings represent centrality, and nodes with high centrality are considered key points in the literature. 189 publications by

**Table 4** Top 5 Cited Journals and Centrality Related to Acupuncture Therapy on PD

Rank	Cited Journal	Frequency	Rank	Cited Journal	Centrality
1	JOURNAL OF ALTERNATIVE AND COMPLEMENTARY MEDICINE	34	1	AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY	0.22
2	PAIN	28	2	ANNALS OF INTERNAL MEDICINE	0.15
3	EVIDENCE BASED COMPLEMENTARY AND ALTERNATIVE MEDICINE	28	3	ACUPUNCTURE IN MEDICINE	0.15
4	COCHRANE DATABASE OF SYSTEMATIC REVIEWS	27	4	ANESTHESIOLOGY	0.15
5	AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY	25	5	ANESTHESIA AND ANALGESIA	0.15





**Figure 3** Map of countries researching acupuncture for PD from 2001 to 2021.

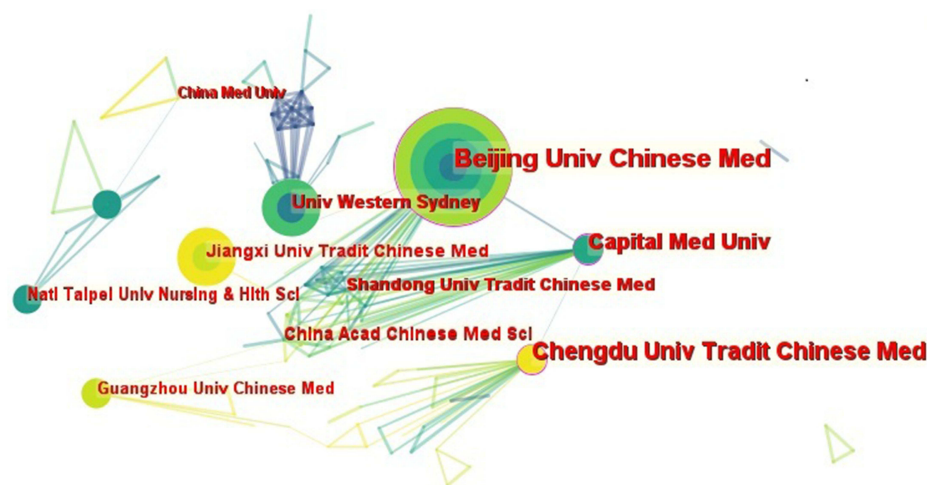
researchers in 25 countries, and the top 5 countries for centrality (purple ring) were England (0.39), USA (0.31), PEOPLES R CHINA (0.31), GERMANY (0.11), and AUSTRALIA (0.10). Besides, the top 10 countries of publications are displayed in Table 5. China has published 95 references, which may be related to the origin of acupuncture in China. The United States ranked second (27), which indicates that acupuncture treatment of PD has been widely used in the United States. In addition, China and South Korea are the most productive countries in Asia, while the United States and Australia are the most productive countries in the West (Table 5). Further analysis suggests that more high-quality randomized controlled trials of acupuncture for PD are currently underway.<sup>38–41</sup>

Distribution of institutions map consists of 241 nodes and

399 links (Figure 4). Nodes in the map represent countries or regions. Lines between nodes represent cooperative relationships. The various colors in the node represent different years, and the larger the area of the node, the greater the

**Table 5** Top 10 Publications and Centrality of Countries Related to Acupuncture Therapy on PD

Rank	Publications	Countries	Rank	Centrality	Countries
1	95	PEOPLES REPUBLIC OF CHINA	1	0.39	ENGLAND
2	27	USA	2	0.31	USA
3	18	SOUTH KOREA	3	0.31	PEOPLES REPUBLIC OF CHINA
4	15	AUSTRALIA	4	0.11	GERMANY
5	14	TAIWAN	5	0.10	AUSTRALIA
6	9	ENGLAND	6	0.10	SOUTH KOREA
7	6	BRAZIL	7	0.03	NEW ZEALAND
8	6	GERMANY	8	0.00	TAIWAN
9	5	NEW ZEALAND	9	0.00	SWEDEN
10	3	IRAN	10	0.00	ITALY

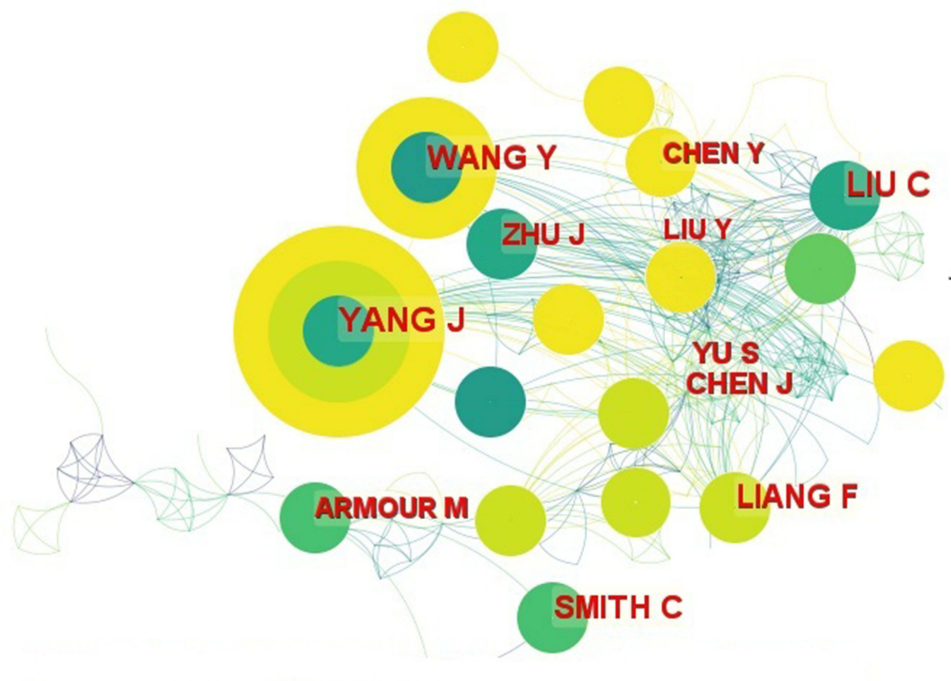


**Figure 4** Map of institutions researching acupuncture for PD from 2001 to 2021.

number of publications. Purple rings represent centrality, and nodes with high centrality are considered key points in the literature. A total of 241 institutions are dedicated to research on acupuncture for PD, among which the top 5 institutions of publications were Beijing University Chinese Medicine (25), Chengdu University Traditional Chinese Medicine (17), Capital Medicine University (15), University Western Sydney (9), and Chinese Academy of Medical Sciences (7), respectively (Table 6). Interestingly, Beijing University Chinese Medicine was not only the most prolific institution, but also the highest centrality institution, suggesting that Beijing University Chinese Medicine is the most important institution for researching acupuncture treatment of PD. Meanwhile, the top 3 centrality institutions included Beijing University Chinese Medicine, Capital Medicine University and Chengdu University Traditional Chinese Medicine. Therefore, based on the publications and centrality, we found that the institutions from China, USA, AUSTRALIA and SOUTH KOREA paid more concerns on the research of acupuncture treatment in PD currently, and Beijing University Chinese Medicine, Chengdu University Traditional Chinese Medicine and University Western Sydney were the strongest cooperation institutions.

**Table 6** Top 10 Publications and Centrality of Institutions Related to Acupuncture Therapy on PD

Rank	Publications	Institutions	Rank	Centrality	Institutions
1	25	Beijing Univ Chinese Med	1	0.11	Beijing Univ Chinese Med
2	17	Chengdu Univ Tradit Chinese Med	2	0.10	Capital Med Univ
3	15	Capital Med Univ	3	0.10	Chengdu Univ Tradit Chinese Med
4	9	Univ Western Sydney	4	0.09	Univ Western Sydney
5	7	China Acad Chinese Med Sci	5	0.09	Campbelltown & Camden Hosp
6	7	Jiangxi Univ Tradit Chinese Med	6	0.03	China Acad Chinese Med Sci
7	7	Shandong Univ Tradit Chinese Med	7	0.02	Univ Maryland
8	6	Natl Taipei Univ Nursing & Hlth Sci	8	0.02	Guangzhou Univ Chinese Med
9	6	Guangzhou Univ Chinese Med	9	0.01	Indiana Univ Sch Med
10	6	Kyung Hee Univ	10	0.01	Harvard Univ



**Figure 5** Map of authors related to acupuncture for PD from 2001 to 2021.

Analysis of Authors and Cited Authors

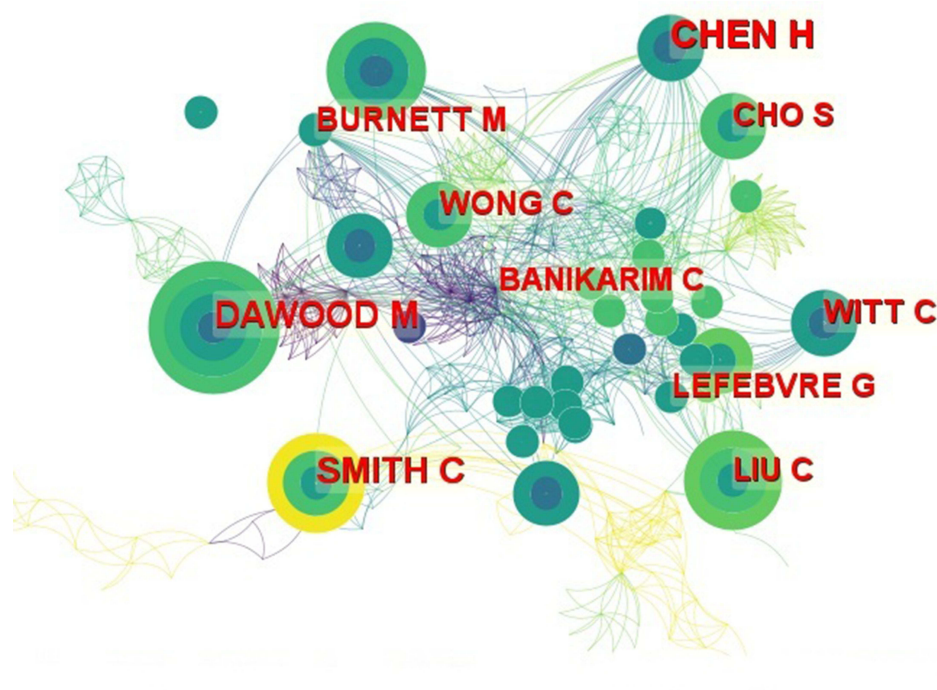
The authors of the 189 publications were analyzed and resulted in 363 nodes and 966 links (Figure 5), It shows that 189 articles were published by 363 authors. The purpose of the author map is to show the most prolific authors or co-authors, and to show the close cooperation between authors. This can provide information about influential research groups and potential collaborators, and help researchers establish cooperative relationships. The top 5 authors were YANG J, LIU C, WANG Y, SMITH C, LIANG F (Table 7). Among them, the most prolific author was YANG J, from Beijing University of Chinese Medicine, with 14 articles. These authors have published many articles on the treatment of primary dysmenorrhea with acupuncture and moxibustion, However, many articles indicate that these studies lack high-quality randomized controlled trials, the trial design is not rigorous enough, and the sample size is too small.<sup>42–44</sup> And from the pictures, we can know that these authors are not closely connected in this field and lack of cooperation and communication. If they can strengthen cooperation, they may be able to provide higher-quality clinical evidence.

The map of cited authors was composed of 396 nodes and 1501 links (Figure 6). CHEN H had the highest citation counts (18), followed by DAWOOD M (16), SMITH C (16), CHO S (11) and LIU C(11) (Table 8). The top 5 centrality of cited authors included Banikarim C(0.56), Barnard N(0.28), Chen H(0.17), Chen F(0.17), Kaptchuk T(0.15) (Table 8). A comprehensive analysis found that CHEN H, SMITH C, CHEN LX and LIU C were very active in this field, and had

**Table 7** Top 10 Prolific Authors Related to Acupuncture Therapy on PD

Rank	Publications	Author	Rank	Publications	Author
1	14	YANG J	6	9	CHEN J
2	12	LIU C	7	9	ZHU J
3	11	WANG Y	8	8	YU S
4	11	SMITH C	9	7	ARMOUR M
5	10	LIANG F	10	7	LIU Y





**Figure 6** Map of cited authors related to acupuncture for PD from 2001 to 2021.

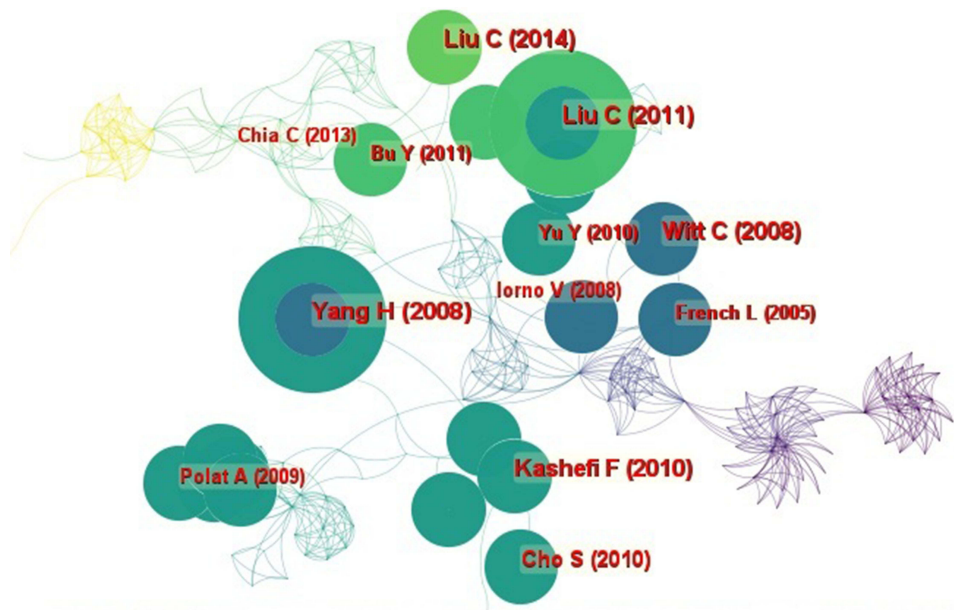
an important influence on the development of acupuncture treatment of PD. CHEN H ranked the first in the cited author frequency. One of her articles which “Effects of acupressure at the Sanyinjiao (SP6) point on primary dysmenorrhoea” pointed out that acupressure at Sanyinjiao (SP6) can be an effective, cost-free intervention for reducing pain and anxiety during dysmenorrhoea, and were commend its use for self-care of primary dysmenorrhoea.<sup>45</sup>

However, Prof. Caroline A Smith from Western Sydney University in the intervention Review of “Acupuncture for dysmenorrhoea”<sup>46</sup> point out there is insufficient evidence to demonstrate whether or not acupuncture or acupressure are effective in treating primary dysmenorrhoea, and for most comparisons no data were available on adverse events. The quality of the evidence was low or very low for all comparisons.

The main limitations were risk of bias, poor reporting, inconsistency and risk of publication bias. In another article<sup>30</sup> he pointed out although acupuncture improved menstrual mood symptoms in women with primary dysmenorrhea during the treatment phase, the trend in the improvement of symptoms during the active phase of treatment, and at 6 and 12 months was non-significant, indicating that a small treatment effect from acupuncture on dysmenorrhea may exist. He thinks acupuncture was acceptable and safe, but further appropriately powered trials are needed before recommendations for clinical practice can be made.

**Table 8** Top 5 Frequency and Centrality of Cited Authors Related to Acupuncture Therapy on PD

Rank	Frequency	Author	Rank	Centrality	Author
1	18	Chen H	1	0.56	Banikarim C
2	16	Dawood M	2	0.28	Barnard N
3	16	Smith C	3	0.17	Chen H
4	11	Liu C	4	0.17	Chen F
5	11	Witt C	5	0.15	Kaptchuk T



**Figure 7** Map of cited references related to acupuncture for PD from 2001 to 2021.

Analysis of Cited References

The map of cited references was composed of 384 nodes and 1197 links (Figure 7). The top 5 frequency and centrality of cited references were shown in Tables 9 and 10. By analyzing the literature with high co-citation frequency and centrality, the knowledge foundation of the subject could be obtained. Among the top five articles cited, four are about randomized controlled trials, which are the “Immediate Analgesia Effect of Single Point Acupuncture in Primary Dysmenorrhea: A Randomized Controlled Trial” published in PAIN MEDICINE,<sup>40</sup> “Acupuncture in patients with dysmenorrhea: a randomized study on clinical effectiveness and cost-effectiveness in usual care” published in AM J OBSTET GYNECOL,<sup>38</sup> “Effect of acupressure at the Sanyinjiao point on primary dysmenorrhea: A randomized controlled trial” published in COMPLEMENT THER CLIN PRACT,<sup>47</sup> “A Randomized Controlled Trial of Single Point Acupuncture in Primary Dysmenorrhea” published in PAIN MEDICINE,<sup>48</sup> it shows the importance of these articles in this field, which also has a great impact in this field. But the first one is a systematic review,<sup>49</sup> The article believes that due to low methodological quality and small sample size, there is no convincing evidence that acupuncture treats primary dysmenorrhea. There is an urgent need for randomized, blinded, placebo-controlled trials to evaluate the effects of acupuncture.

**Table 9** Top 5 Frequency of Cited References Related to Acupuncture Therapy on PD

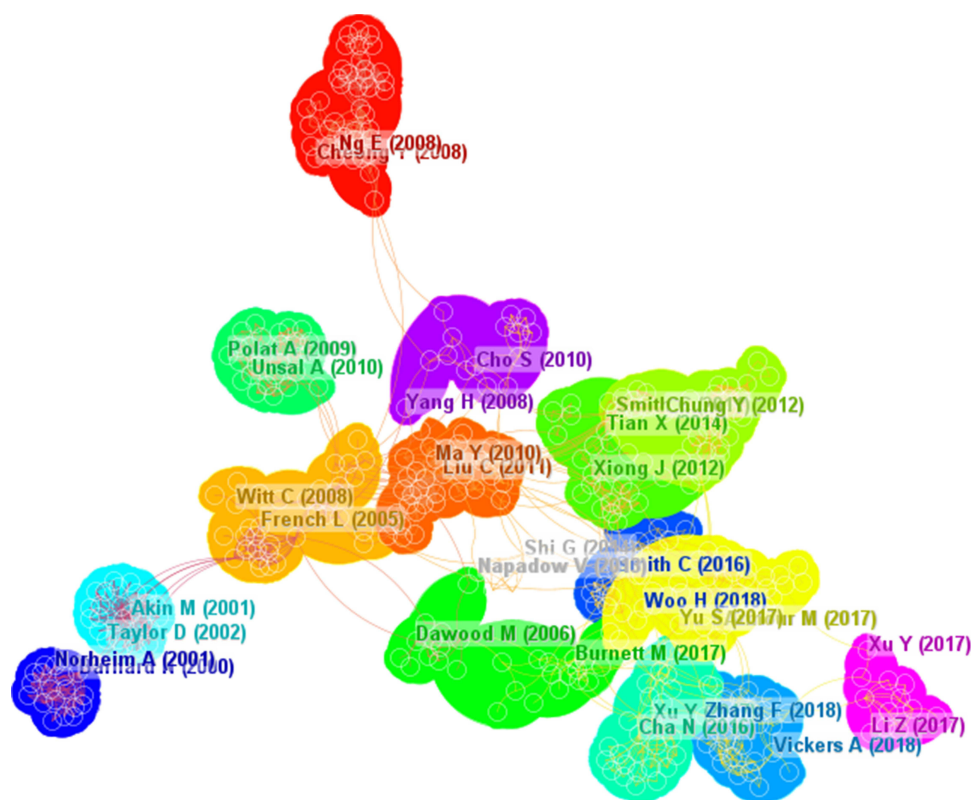
Rank	Frequency	References	Author and Publication Year
1	7	ACTA OBSTET GYN SCAN, 87, 1114. DOI:10.1080/00016340802443798	Yang H, 2008
2	6	PAIN MED, 15, 910. DOI:10.1111/pme.12392	Liu C, 2014
3	6	COMPLEMENT THER CLIN PRACT, 16, 198. DOI:10.1016/j.ctcp.2010.04.003	Kashefi F, 2010
4	6	AM J OBSTET GYNECOL, 198, 0. DOI:10.1016/j.ajog.2007.07.041	Witt C, 2008
5	6	PAIN MED, 12, 300. DOI:10.1111/j.1526-4637.2010.01017.x	Liu C, 2011

**Table 10** Top 5 Centrality of Cited References Related to Acupuncture Therapy on PD

Rank	Centrality	References	Author and Publication Year
1	0.18	J OBSTET GYNAECOL CA, 27, 765. DOI:10.1016/S1701-2163(16)30728-9	Burnett M, 2005
2	0.17	OBSTET GYNECOL, 100, 350. DOI:10.1016/S0029-7844(02)02085-9	Daniels S, 2002
3	0.11	J NURS RES, 16, 17.	Chiou M, 2008
4	0.11	J PAIN, 10, 191. DOI:10.1016/j.jpain.2008.08.006	Chantler I, 2009
5	0.10	J ACUPUNCTURE TUINA, 9, 295.	Chen B, 2011

The centrality of cite references ranked the first conducted by Burnett M,<sup>50</sup> who mainly elaborated the Prevalence of Primary Dysmenorrhea in Canada. She believes that most Canadian women suffer from dysmenorrhea at some time during their childbearing period. The existing prescription treatment is not fully utilized. Youth, smoking and not using OCs were independent risk factors for PD.

Co citation analysis is the most important research method in CO citation clustering research. But through the Figure 8, we can find that the relationship between different institutions and authors is not close enough, and there is not much mutual cooperation, but more just the connection between two. This may also affect the credibility of the evidence of acupuncture treatment of primary dysmenorrhea to a certain extent, which also points out the direction for our next work. We should strengthen cooperation and contact with each other.

**Figure 8** Map of co-citation cluster analysis related to acupuncture for PD from 2001 to 2021.



It is believed that the metric for evaluating cutting-edge topics or emerging trends is an increase in the number of keywords in citations, or an increase in the frequency of keywords over a certain period of time. Generated a keyword co-occurrence map consisting of 330 nodes and 1498 links (Figure 9). According to the frequency and centrality, we found the popular keywords were “primary dysmenorrhea”, “pain”, “acupuncture”, “women”, “prevalence”, “management”, “systematic review”, “clinical trial”, “randomized controlled trial” and “electroacupuncture” (Table 11). The top 6 keywords with the strongest citation burst from 2001 to 2021 are shown in Figure 10. “Burst words” are keywords that are frequently used in a given time period. As shown, keywords associated with citation bursts first appeared in 2003. The top five burst keywords were “trial”, “management”, “Sanyinjiao (SP6)”, “prevalence”, and “primary dysmenorrhea”. There is no hard for us to find out that Acupuncture treatment of primary dysmenorrhea mainly focuses on clinical trials at the early stage, but now it is mainly a systematic review, this shows that the quality of research is improving.

Rank	Keyword	Frequency	Rank	Keyword	Centrality
1	Primary dysmenorrhea	55	1	Pain	0.24
2	Pain	46	2	Women	0.23
3	Acupuncture	43	3	Primary dysmenorrhea	0.21
4	Women	35	4	Electroacupuncture	0.19
5	Prevalence	35	5	Acupuncture	0.14
6	managEment	20	6	Clinical trial	0.12
7	Systematic review	18	7	Acupressure	0.09
8	Clinical trial	17	8	Prevalence	0.07
9	Randomized controlled trial	15	9	Arterial blood flow	0.07
10	Electroacupuncture	13	10	Systematic review	0.06



**Figure 10** Top 6 keywords with the strongest citation bursts.

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

## Conclusion

Acupuncture therapy is an ancient medicine originated in China. Acupuncture therapy includes acupuncture and moxibustion. It is a summary of the experience of ancient physicians and working people in fighting against nature and diseases in long-term production practice, and plays a very important role in people's health. It has the characteristics of good therapy and less side effects. Now it is widely used in patients with PD all over the world as complementary and alternative therapy Acupuncture. And the authors of these references are composed of people from more than 20 countries, which shows that acupuncture treatment of primary dysmenorrhea is being accepted by people all over the world. However, through research we found that different countries, institutions and authors are not closely linked and have less cooperation.

Therefore, collaboration and linkages between different research groups should be strengthened, which will help promote the current PD view that acupuncture analgesia is an alternative approach. In addition, randomized controlled trials are the main research method to study the treatment of PD with acupuncture at present. In addition, as an external treatment, acupuncture cannot meet the double-blind principle, so how to design high-quality experimental principles is our next step to consider.<sup>51</sup> Meta analysis is the main method to evaluate the efficacy of acupuncture in the treatment of PD, but the high-quality evaluation of various acupuncture treatment methods is not sufficient at present,<sup>52</sup> which needs further research by physical therapists.

In conclusion, this study provides potential collaborators, institutions and research hotspots, thereby providing a perspective on the development trend of acupuncture for PD, which may help researchers to explore new research directions in this field in the future.

## Data Sharing Statement

Raw data are available directly from the Web of Science Core Collection (WoSCC).

## Acknowledgments

The author thanks Professor Chen Chaomei for inventing CiteSpace and using it for free.

## Author Contributions

All authors made significant contributions in the areas of conception and design, execution, data acquisition, data analysis and interpretation, or all; participated in drafting the article or made critical revisions to important intellectual content; gave final approval for upcoming edition; agreed to submit journal for the article; and agree to be responsible for all aspects of the work.



## Funding

This research was funded by the National Natural Science Foundation of China (No. 81860877), the Central Leading Local Science and Technology Development Project (No. 20202ZDG02043), and the Major Project Innovation Fund Project of Jiangxi Science and Technology Department (202021BBG73029).

## Disclosure

The authors report no conflicts of interest in this work.

## References

1. Tugay N, Akbayrak T, Demirtürk F, et al. Effectiveness of transcutaneous electrical nerve stimulation and interferential current in primary dysmenorrhea. *Pain Med*. 2007;8(4):295–300. doi:10.1111/j.1526-4637.2007.00308.x
2. De Sanctis V, Soliman A, Bernasconi S, et al. Primary dysmenorrhea in adolescents: prevalence, impact and recent knowledge. *Pediatr Endocrinol Rev*. 2015;13(2):512–520.
3. Hillen TI, Grbavac SL, Johnston PJ, et al. Primary dysmenorrhea in young Western Australian women: prevalence, impact, and knowledge of treatment. *J Adolesc Health*. 1999;25(1):40–45. doi:10.1016/S1054-139X(98)00147-5
4. Davis AR, Westhoff CL. Primary dysmenorrhea in adolescent girls and treatment with oral contraceptives. *J Pediatr Adolesc Gynecol*. 2001;14(1):3–8. doi:10.1016/S1083-3188(00)00076-0
5. Hailemeskel S, Demissie A, Assefa N. Primary dysmenorrhea magnitude, associated risk factors, and its effect on academic performance: evidence from female university students in Ethiopia. *Int J Womens Health*. 2016;8:489–496. doi:10.2147/ijwh.S112768
6. Iacovides S, Avidon I, Baker FC. What we know about primary dysmenorrhea today: a critical review. *Hum Reprod Update*. 2015;21(6):762–778. doi:10.1093/humupd/dmv039
7. Proctor M, Farquhar C. Diagnosis and management of dysmenorrhoea. *BMJ*. 2006;332(7550):1134–1138. doi:10.1136/bmj.332.7550.1134
8. Rencz F, Péntek M, Stalmeier PFM, et al. Bleeding out the quality-adjusted life years: evaluating the burden of primary dysmenorrhea using time trade-off and willingness-to-pay methods. *Pain*. 2017;158(11):2259–2267. doi:10.1097/j.pain.0000000000001028
9. Shetty GB, Shetty B, Mooventhan A. Efficacy of acupuncture in the management of primary dysmenorrhea: a randomized controlled trial. *J Acupunct Meridian Stud*. 2018;11(4):153–158. doi:10.1016/j.jams.2018.04.001
10. Matthewman G, Lee A, Kaur JG, et al. Physical activity for primary dysmenorrhea: a systematic review and meta-analysis of randomized controlled trials. *Am J Obstet Gynecol*. 2018;219(3):255.e1–55.e20. doi:10.1016/j.ajog.2018.04.001
11. Liu P, Liu Y, Wang G, et al. Aberrant default mode network in patients with primary dysmenorrhea: a fMRI study. *Brain Imaging Behav*. 2017;11(5):1479–1485. doi:10.1007/s11682-016-9627-1
12. Habibi N, Huang MS, Gan WY, et al. Prevalence of primary dysmenorrhea and factors associated with its intensity among undergraduate students: a cross-sectional study. *Pain Manag Nurs*. 2015;16(6):855–861. doi:10.1016/j.pmn.2015.07.001
13. Nie W, Xu P, Hao C, et al. Efficacy and safety of over-the-counter analgesics for primary dysmenorrhea: a network meta-analysis. *Medicine*. 2020;99(19):e19881. doi:10.1097/md.00000000000019881
14. Uysal G, Akkaya H, Cagli F, et al. A comparison of two different oral contraceptives in patients with severe primary dysmenorrhoea. *J Obstet Gynaecol*. 2018;38(6):828–832. doi:10.1080/01443615.2017.1410533
15. Ramirez C, Donnellan N. Pelvic denervation procedures for dysmenorrhea. *Curr Opin Obstet Gynecol*. 2017;29(4):225–230. doi:10.1097/gco.0000000000000379
16. Burnett M, Lemyre M. No. 345-primary dysmenorrhea consensus guideline. *J Obstet Gynaecol Can*. 2017;39(7):585–595. doi:10.1016/j.jogc.2016.12.023
17. Marjoribanks J, Ayeleke RO, Farquhar C, et al. Nonsteroidal anti-inflammatory drugs for dysmenorrhoea. *Cochrane Database Syst Rev*. 2015;2015(7):Cd001751. doi:10.1002/14651858.CD001751.pub3
18. Osayande AS, Mehulic S. Diagnosis and initial management of dysmenorrhea. *Am Fam Physician*. 2014;89(5):341–346.
19. Simon LS. Nonsteroidal anti-inflammatory drugs and their risk: a story still in development. *Arthritis Res Ther*. 2013;15(Suppl3):S1. doi:10.1186/ar4173
20. Li MH, Wang SH, Gao X. Acupuncture of the ganglion impar for primary dysmenorrhea. *Acupunct Med*. 2022;40(1):101–102. doi:10.1177/09645284211033607
21. Yao L, Hui L, Yang Z, et al. Freshwater microplastics pollution: detecting and visualizing emerging trends based on Citespace II. *Chemosphere*. 2020;245:125627. doi:10.1016/j.chemosphere.2019.125627
22. Guler AT, Waaijer CJ, Palmblad M. Scientific workflows for bibliometrics. *Scientometrics*. 2016;107(2):385–398. doi:10.1007/s11192-016-1885-6
23. Chen C, Hu Z, Liu S, et al. Emerging trends in regenerative medicine: a scientometric analysis in CiteSpace. *Expert Opin Biol Ther*. 2012;12(5):593–608. doi:10.1517/14712598.2012.674507
24. Chen C. Searching for intellectual turning points: progressive knowledge domain visualization. *Proc Natl Acad Sci U S A*. 2004;101(Suppl1):5303–5310. doi:10.1073/pnas.0307513100
25. Dalpé R. Bibliometric analysis of biotechnology. *Scientometrics*. 2002;55(2):189–213. doi:10.1023/A:1019663607103
26. Synnæstvedt MB, Chen C, Holmes JH. CiteSpace II: visualization and knowledge discovery in bibliographic databases. *AMIA Annu Symp Proc*. 2005;2005:724–728.
27. Belter CW. Bibliometric indicators: opportunities and limits. *J Med Libr Assoc*. 2015;103(4):219–221. doi:10.3163/1536-5050.103.4.014
28. Li R, Sun J, Hu H, et al. Research trends of acupuncture therapy on knee osteoarthritis from 2010 to 2019: a bibliometric analysis. *J Pain Res*. 2020;13:1901–1913. doi:10.2147/jpr.S258739
29. Liu CZ, Xie JP, Wang LP, et al. Immediate analgesia effect of single point acupuncture in primary dysmenorrhea: a randomized controlled trial. *Pain Med*. 2011;12(4):685. doi:10.1111/j.1526-4637.2011.01106.x

30. Smith CA, Crowther CA, Petrucco O, et al. Acupuncture to treat primary dysmenorrhea in women: a randomized controlled trial. *Evid Based Complement Altern Med*. 2011;2011:1–11. doi:10.1093/ecam/nep239
31. Yang MX, Chen XZ, Bo LN, et al. Moxibustion for pain relief in patients with primary dysmenorrhea: a randomized controlled trial. *PLoS One*. 2017;12(2). doi:10.1371/journal.pone.0170952
32. Zhao T, Guo J, Song Y, et al. A bibliometric analysis of research trends of acupuncture therapy in the treatment of migraine from 2000 to 2020. *J Pain Res*. 2021;14:1399–1414. doi:10.2147/jpr.S306594
33. Wang SQ, Gao YQ, Zhang C, et al. A bibliometric analysis using CiteSpace of publications from 1999 to 2018 on patient rehabilitation after total knee arthroplasty. *Med Sci Monit*. 2020;26:e920795. doi:10.12659/msm.920795
34. Zhang Y, Li C, Ji X, et al. The knowledge domain and emerging trends in phytoremediation: a scientometric analysis with CiteSpace. *Environ Sci Pollut Res Int*. 2020;27(13):15515–15536. doi:10.1007/s11356-020-07646-2
35. Liang C, Luo A, Zhong Z. Knowledge mapping of medication literacy study: a visualized analysis using CiteSpace. *SAGE Open Med*. 2018;6:2050312118800199. doi:10.1177/2050312118800199
36. Park J, Linde K, Manheimer E, et al. The status and future of acupuncture clinical research. *J Altern Complement Med*. 2008;14(7):871–881. doi:10.1089/acm.2008.SAR-4
37. Woo HL, Ji HR, Pak YK, et al. The efficacy and safety of acupuncture in women with primary dysmenorrhea A systematic review and meta-analysis. *Medicine*. 2018;97(23):e11007. doi:10.1097/md.00000000000011007
38. Witt CM, Reinhold T, Brinkhaus B, et al. Acupuncture in patients with dysmenorrhea: a randomized study on clinical effectiveness and cost-effectiveness in usual care. *Am J Obstet Gynecol*. 2008;198(2):166.e1–8. doi:10.1016/j.ajog.2007.07.041
39. Wang P, Zhang P, Ma LX, et al. Immediate analgesic effect of needling acupoints (bilateral De Qi vs unilateral De Qi) on primary dysmenorrhea: a multi-center, randomized, controlled trial. *J Tradit Chin Med*. 2016;36(6):711–717. doi:10.1016/S0254-6272(17)30004-3
40. Liu CZ, Xie JP, Wang LP, et al. Immediate analgesia effect of single point acupuncture in primary dysmenorrhea: a randomized controlled Trial. *Pain Med*. 2011;12(2):300–307. doi:10.1111/j.1526-4637.2010.01017.x
41. Jun EM, Chang S, Kang DH, et al. Effects of acupressure on dysmenorrhea and skin temperature changes in college students: a non-randomized controlled trial. *Int J Nurs Stud*. 2007;44(6):973–981. doi:10.1016/j.ijnurstu.2006.03.021
42. Chung Y-C, Chen -H-H, Yeh M-L. Acupoint stimulation intervention for people with primary dysmenorrhea: systematic review and meta-analysis of randomized trials. *Complement Ther Med*. 2012;20(5):353–363. doi:10.1016/j.ctim.2012.02.008
43. Liu T, Yu J, Cao B, et al. Acupuncture for primary dysmenorrhea: a meta-analysis of randomized controlled trials. *Altern Ther Health Med*. 2017;23(7):46–53.
44. Zhang F, Sun M, Han S, et al. Acupuncture for primary dysmenorrhea: an overview of systematic reviews. *Evid Based Complement Alternat Med*. 2018;2018:8791538. doi:10.1155/2018/8791538
45. Chen HM, Chen CH. Effects of acupressure at the Sanyinjiao point on primary dysmenorrhoea. *J Adv Nurs*. 2004;48(4):380–387. doi:10.1111/j.1365-2648.2004.03236.x
46. Smith CA, Armour M, Zhu X, et al. Acupuncture for dysmenorrhoea. *Cochrane Database Syst Rev*. 2016;4(4):Cd007854. doi:10.1002/14651858.CD007854.pub3
47. Kashefi F, Ziyadlou S, Khajehei M, et al. Effect of acupressure at the Sanyinjiao point on primary dysmenorrhea: a randomized controlled trial. *Complement Ther Clin Pract*. 2010;16(4):198–202. doi:10.1016/j.ctep.2010.04.003
48. Liu CZ, Xie JP, Wang LP, et al. A randomized controlled trial of single point acupuncture in primary dysmenorrhea. *Pain Med*. 2014;15(6):910–920. doi:10.1111/pme.12392
49. Yang H, Liu CZ, Chen X, et al. Systematic review of clinical trials of acupuncture-related therapies for primary dysmenorrhea. *Acta Obstet Gynecol Scand*. 2008;87(11):1114–1122. doi:10.1080/00016340802443798
50. Burnett MA, Antao V, Black A, et al. Prevalence of primary dysmenorrhea in Canada. *J Obstet Gynaecol Can*. 2005;27(8):765–770. doi:10.1016/s1701-2163(16)30728-9
51. Hu J, Li B, Zhang HN, et al. Sample size estimation in acupuncture and moxibustion clinical trials. *Zhongguo Zhen Jiu=Chinese Acupuncture & Moxibustion*. 2021;41(10):1147–1152. Chinese. doi:10.13703/j.0255-2930.20201020-0002
52. Chen Q, Wang Q, Ding S, et al. Problems lowering the study quality in traditional medicine, introspection from an example of meta-analysis of acupuncture. *BMC Complement Med Ther*. 2020;20(1):41. doi:10.1186/s12906-019-2806-z

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