



# The application of acupuncture in obstetrics and gynecology: a bibliometric analysis based on Web of Science

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**Background:** Acupuncture therapy has a wide range of applications in obstetrics and gynecology, especially for patients with reproductive issues, irregular menstruation, dysmenorrhea, and pelvic inflammatory disease. In recent decades, acupuncture therapy has gradually attracted the attention of professionals in China and overseas due to its beneficial effects, and has been the focus of many studies. This study aimed to conduct a statistical analysis of the relevant literature to understand the current application and research status of acupuncture in obstetric and gynecologic diseases.

**Methods:** A search of the SCI-EXPANDED database in the Web of Science Core Collection (WOSCC) was performed. Search strategy included two formulas: #1 WC=Obstetrics & Gynecology, limited: index=SCI-EXPANDED time span=all years; #2 subject: (ACUPUNCTURE-MOXIBUSTION) OR subject: (ACUPUNCTURE) OR subject: (MOXIBUSTION), limited: index=SCI-EXPANDED time span=all years. The final result was acquired by searching #1 AND #2. CiteSpace software was used to analyze and visualize the annual distribution of articles, and the distributions of disciplines, countries/institutions, journals, and authors. Keywords were used to infer the application of acupuncture in obstetrics and gynecology.

**Results:** A total of 593 research literatures, including 323 original articles, were retrieved. Since 1972, the number of literatures has shown a general increase. Studies on reproductive medicine accounted for the highest proportion of the retrieved literatures (139, 23.44%). The United States (25.5%), China (14.0%), Germany (7.6%), Australia (7.3%), and Sweden (7.1%) were the main contributors. The centrality index showed that the United States (0.19), the United Kingdom (0.19), and Germany (0.16) had the closest cooperation. The retrieved literatures covered 15 subdivision areas, including menstruation, embryo transfer, production, and pelvic pain. *Obstetrics & Gynecology*, *Cochrane Database of Systematic Reviews*, and *American Journal of Obstetrics and Gynecology* were found to be the most influential journals. The most frequently cited keywords were acupuncture (intensity =5.5326), low back pain (intensity =5.0506), and pregnancy (intensity =4.7016).

**Conclusions:** Acupuncture is receiving an increasing amount of attention in obstetrics and gynecology, and international cooperation in research in this field is also increasing.

**Keywords:** Acupuncture; obstetrics and gynecology; bibliometric analysis

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## Introduction

Acupuncture, an important form of Traditional Chinese Medicine (TCM), has a wide range of applications, including in the treatment of motor system pain, migraine, digestive system function regulation, and obstetrics and gynecology (1-5). For some patients with obstetric and gynecologic diseases, especially those with reproductive issues, irregular menstruation, dysmenorrhea, and pelvic inflammatory disease, the beneficial effects of acupuncture are clear (6,7). In recent decades, acupuncture has gradually attracted the attention of professionals in China and overseas, and a large number of studies have been carried out. However, even with the increase in research and the improvement in the quality of research design, studies have failed to produce consistent conclusions (8,9). Bibliometric analysis uses statistical methods to qualitatively and quantitatively assess the research trends of a literature database and its characteristics. It can not only help scholars grasp the development trends and research direction of a specific research field, but it can also be used to evaluate the relevance of journals, institutions, and countries in specific research fields. It can also provide a basis for the formulation of clinical guidelines. Visual analysis mainly refers to the use of graphical methods to clearly and effectively display and communicate information. At its core is the use of computer image processing technology to visualize and visually represent data and the interaction relationship between different data (10,11). In the past, acupuncture and obstetrics and gynecology have individually been the focus of quantitative analyses (11,12); however, no report on the application of acupuncture in the field of obstetrics and gynecology currently exists. Therefore, in this study, we aimed to conduct a statistical analysis of relevant literature to understand the current application and research status of acupuncture in obstetric and gynecologic diseases.

## Methods

### Data source

The SCI-EXPANDED database in the Web of Science Core Collection (WOSCC) served as the data source for the literature search. The date of retrieval was November 14, 2020 (WOSCC database updated on November 13, 2020).

### Search strategy

Search strategy included two formulas: #1 WC=Obstetrics

& Gynecology, limited: index=SCI-EXPANDED time span=all years; #2 subject: (ACUPUNCTURE-MOXIBUSTION) OR subject: (ACUPUNCTURE) OR subject: (MOXIBUSTION), limited: index=SCI-EXPANDED time span=all years. The final result was acquired by searching #1 AND #2.

All search results and cited references were exported from the database in plain text format, and the Citespace software was used to analyze the annual publication status, the keywords, and the subject, country/institution, journal, and author distributions. The keywords were used to infer the application of acupuncture in obstetrics and gynecology.

### Statistical analysis

In present descriptive study, all data were expressed as number and percentage. We only show the current status of researches of acupuncture in obstetrics and gynecology.

## Results

### Basic results

A total of 593 relevant research literatures were retrieved, including 323 original papers, 96 reviews, 74 conference reports, 55 letters from readers, and 40 documents classified by editors. The total number of citations was 10,159, the H-index count was 54, and the average number of citations per item was 17.13 (Table 1). With the papers classified by subject, reproductive medicine accounted for the largest proportion of the retrieved literatures (Table 2).

### Annual distribution of literature

The scope of the search was from 1900 to November 14, 2020; however, as the first relevant document was published in 1972, the results cover 1972 to November 14, 2020. Since 2000, more than 10 articles have been published each year, with the highest number of articles (45 articles) published in 2011 (Table 3, Figure 1). Since 1998, the number of citations has increased significantly, with 2019 having the highest number of citations (Figure 2).

### Distribution of countries and institutions

CiteSpace V software was used for map visualization of publication countries and institutions (Figure 3): N=23, E=34 (N represents the number of network nodes, E represents

**Table 1** Search results by document type

Literature type	Records	% of 593
Article	323	54.47
Review	96	16.19
Meeting abstract	74	12.48
Letter	55	9.28
Editorial material	40	6.75
Proceedings paper	8	1.35
Early access	7	1.18
Correction	3	0.51
Book review	1	0.17
News item	1	0.17

In total, 608 records are listed in the table, including some duplicated records.

**Table 2** Top 10 SCI papers by subject distribution

Rank	Major	Records	% of 593
1	Obstetrics & gynecology	593	100
2	Reproductive biology	139	23.44
3	Nursing	26	4.38
4	Pediatrics	25	4.22
5	Geriatrics & gerontology	21	3.54
6	Oncology	12	2.02
7	General internal medicine	9	1.52
8	Public environmental occupational health	9	1.52
9	Women's studies	9	1.52
10	Urology & nephrology	7	1.18

SCI, science citation index.

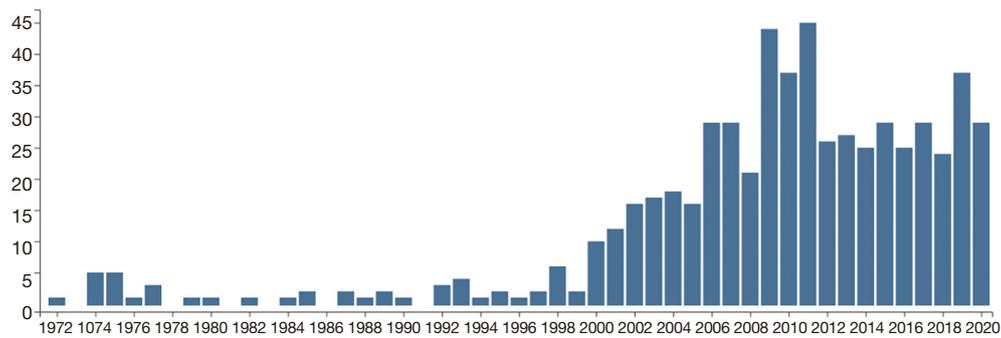
**Table 3** Annual distribution of SCI

Year of publication	Records	% of 593
2020	29	4.89
2019	37	6.24
2018	24	4.05
2017	29	4.89
2016	25	4.22
2015	29	4.89

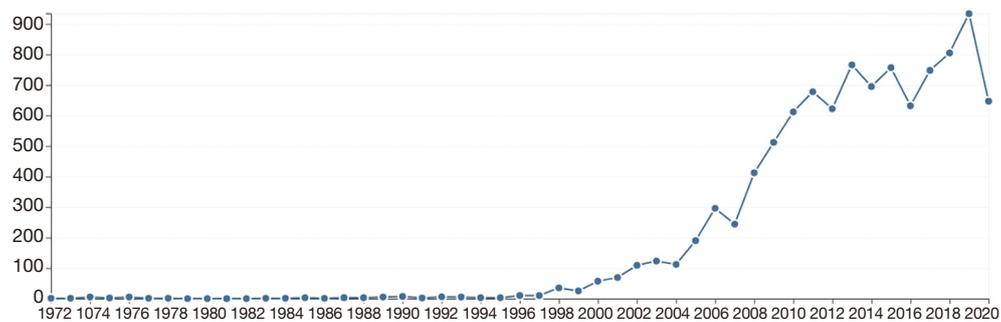
**Table 3** (continued)**Table 3** (continued)

Year of publication	Records	% of 593
2014	25	4.22
2013	27	4.55
2012	26	4.38
2011	45	7.59
2010	37	6.24
2009	44	7.42
2008	21	3.54
2007	29	4.89
2006	29	4.89
2005	16	2.70
2004	18	3.04
2003	17	2.87
2002	16	2.70
2001	12	2.02
2000	10	1.69
1999	2	0.34
1998	6	1.01
1997	2	0.34
1996	1	0.17
1995	2	0.34
1994	1	0.17
1993	4	0.68
1992	3	0.51
1990	1	0.17
1989	2	0.34
1988	1	0.17
1987	2	0.34
1985	2	0.34
1984	1	0.17
1982	1	0.17
1980	1	0.17
1979	1	0.17
1977	3	0.51
1976	1	0.17
1975	5	0.84
1974	5	0.84
1972	1	0.17

SCI, science citation index.



**Figure 1** Annual publication trend. The abscissa is the year, and the ordinate is the number of publications.



**Figure 2** Annual citation trends. The abscissa is the year, and the ordinate is the citation frequency.

the number of connections); institutional visualization maps (*Figure 4*):  $N=73$ ,  $E=42$ . During the search period, the top 5 countries in terms of publication volume were the United States, China, Germany, Australia, and Sweden (*Figure 3* and *Table 4*). The top 5 countries ranked by centrality were the United States, the United Kingdom, Sweden, Germany, and Australia. Although China was ranked second for volume, the centrality was low, probably due to a lack of international cooperation. Based on the volume and centrality of publications, it can be inferred that the United States, China, and Germany were the main research forces in the field during the search period, while the United States, the United Kingdom, and Germany had the closest cooperation. The top 5 institutions in terms of publication volume were the University of Exeter (UK), Kyung Hee University (South Korea), University of Plymouth (UK), University of Gothenburg (Sweden), and Harvard University (USA) (*Figure 4* and *Table 5*).

#### **Author distribution and co-citation**

In the period from 1972 to November 14, 2020, C. A. Smith was the author with the highest number of papers

published (*Table 6*). Visualization maps of co-authorship and co-citations can provide useful information about influential research teams and potential collaborators, and can help researchers to establish cooperative relationships. The visualization maps showing co-authorship (*Figure 5*) and co-citation (*Table 7* and *Figure 6*) connections among authors were generated using the CiteSpace V software. During the search period, C. A. Smith ranked highest for both the number of citations and centrality. For the cluster analysis of author co-citations, the cited authors were identified, and then clustering analysis was performed. Then, the index terms of the cited documents were used to mark the category name. A total of 15 clusters were found in the cited literature (*Figure 7*), and the research categories, identified from the index terms, are listed in *Table 8*.

#### **Distribution of journals**

The 593 retrieved articles were published in 76 journals, among which, 10 journals each published more than 20 articles (*Table 7*). These 10 journals published 55.31% of the total articles (*Table 9*). *Table 10* lists the top 5 journals by centrality and frequency of citations. Based on the results

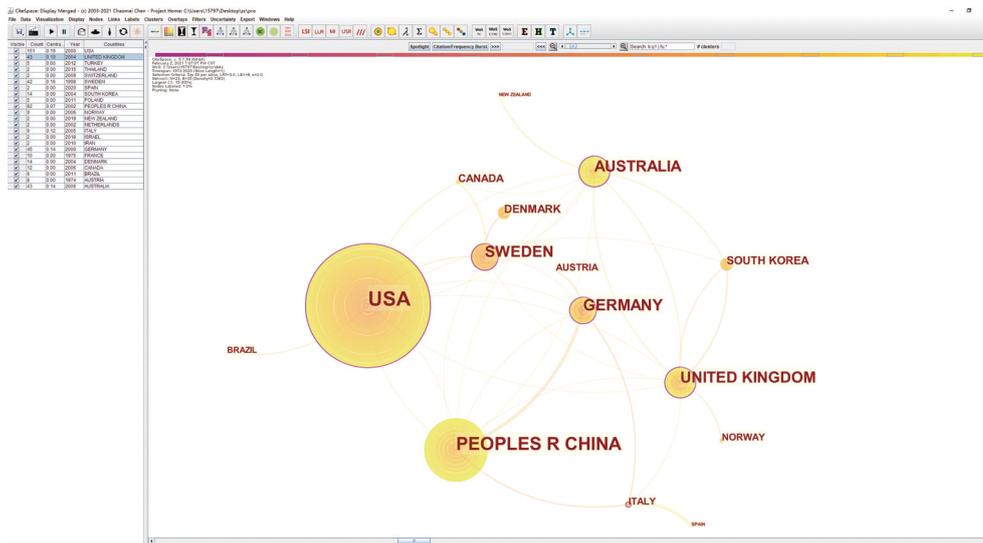


Figure 3 Visualization map of publication countries.

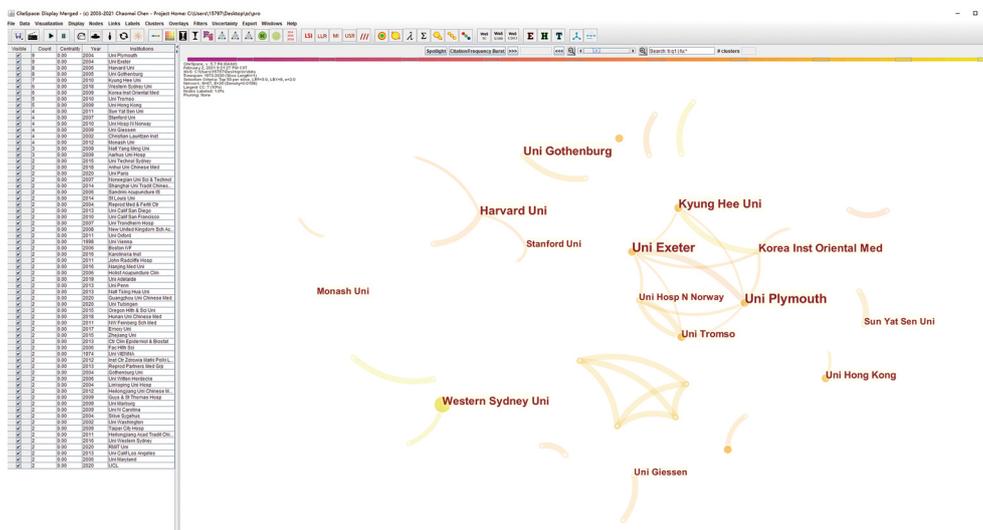


Figure 4 Visualization map of publication institutions.

Table 4 Top 5 countries in terms of publication volume and centrality

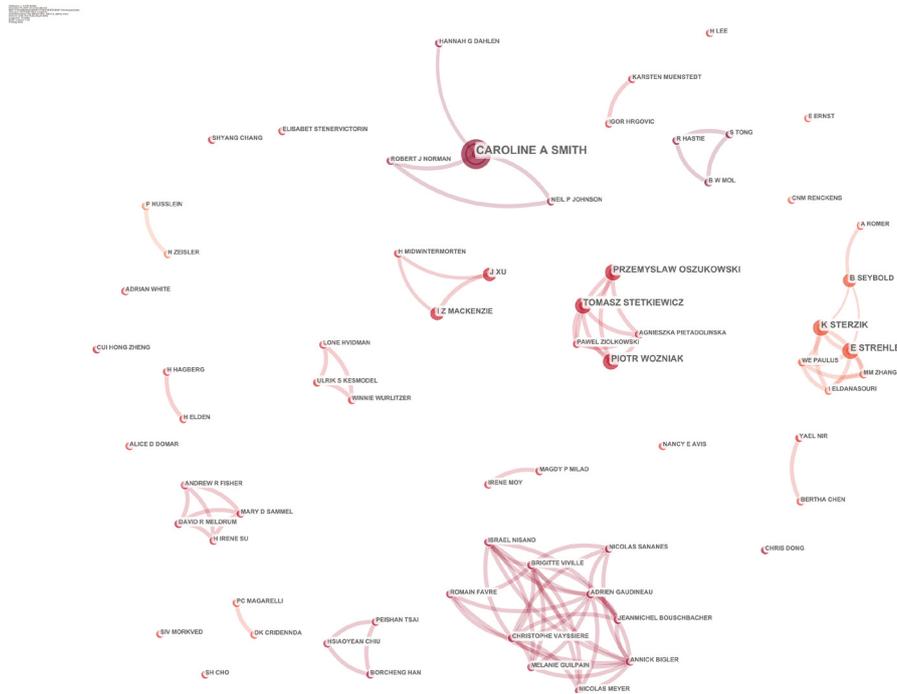
Rank	Publication volume		Centrality	
	Countries	Papers, n (%)	Countries	Centrality
1	USA	151 (25.46)	USA	0.19
2	China	83 (14.00)	United Kingdom	0.19
3	Germany	45 (7.59)	Sweden	0.16
4	Australia	43 (7.25)	Germany	0.14
5	Sweden	42 (7.08)	Australia	0.14

**Table 5** Top 5 institutions for publication volume and Top 3 institutions for centrality

Rank	Publication volume		Centrality	
	Institution	Papers	Institution	Centrality
1	University of Exeter	9	Kyung Hee University	0.01
2	Kyung Hee University	9	Harvard University	0.01
3	University of Plymouth	9	Korea Institute of Oriental Medicine	0.01
4	University of Gothenburg	8		
5	Harvard University	8		

**Table 6** Top 10 authors (43 papers in total)

Rank	Authors	Papers
1	C. A. Smith	7
2	P. Wozniak	4
3	E. Stenervictorin	4
4	I. Gerhard	4
5	K. Sterzik	4
6	M. S. Lee	4
7	E. Strehler	4
8	P. Oszukowski	4
9	M. Hammar	4
10	T. Stetkiewicz	4



**Figure 5** Visualization map showing co-authorship.

**Table 7** Top 5 cited authors

Rank	Authors	Papers
1	Smith C.A.	60
2	Stener-Victorin E.	55
3	Paulus W.E.	51
4	Smith C.	45
5	Dieterle S.	39

of this analysis, *Obstetrics & Gynecology*, *Cochrane Database of Systematic Reviews*, and *American Journal of Obstetrics and Gynecology* were the most influential journals.

**Research hotspots and frontier trends in the field of acupuncture in obstetrics and gynecology**

A keyword co-occurrence map was generated using CiteSpace V software (Figure 8: N=176, E=1,111). The top

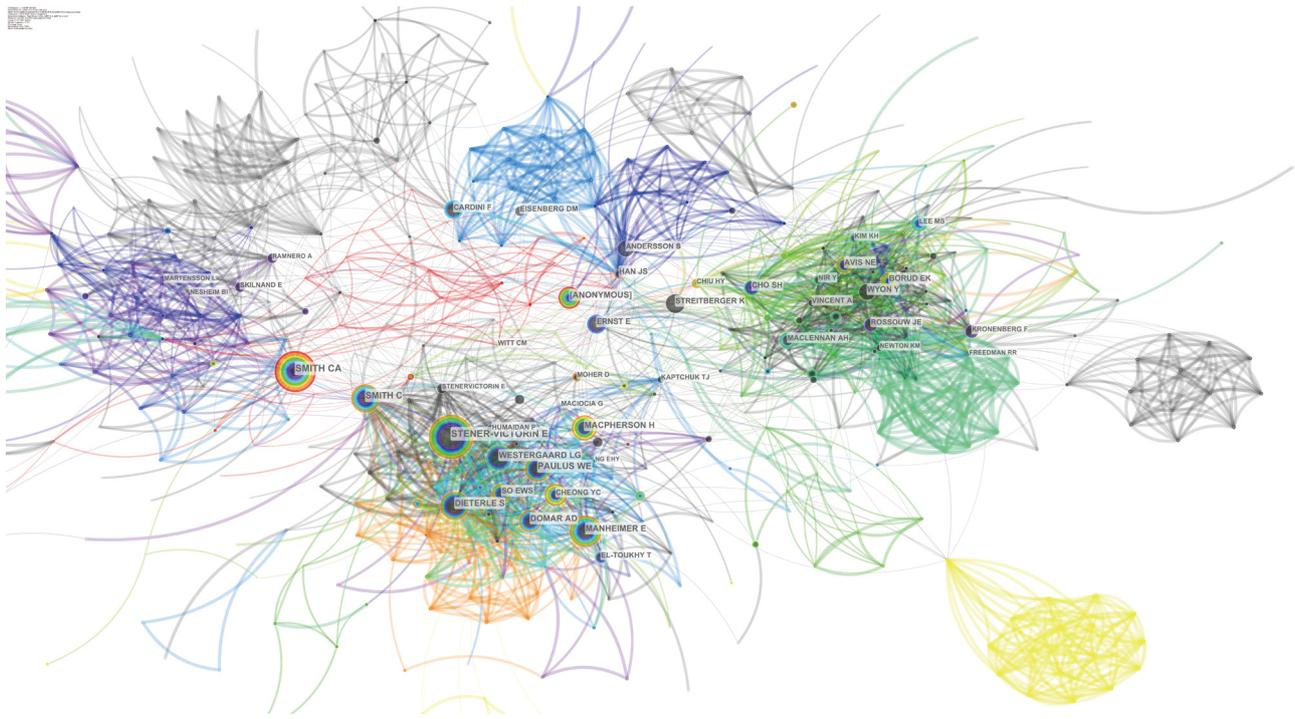


Figure 6 Visualization map of author co-citations.

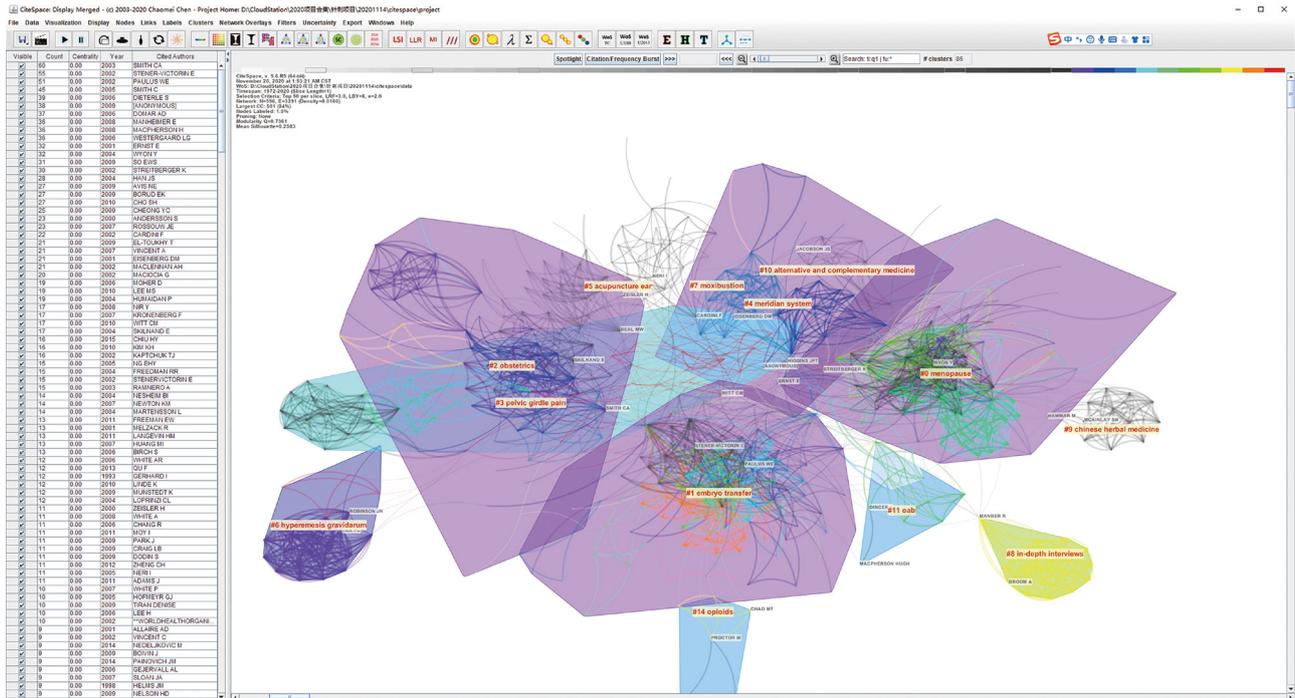


Figure 7 Cited cluster analysis showing the 15 main research areas.

**Table 8** The 15 main research areas among the retrieved papers

Rank	Classification
1	Menopause
2	Embryo transfer
3	Obstetrics
4	Pelvic girdle pain
5	Meridian system
6	Acupuncture ear
7	Hyperemesis gravidarum
8	Moxibustion
9	In-depth interviews
10	Chinese herbal medicine
11	Alternative and complementary medicine
14	Over active bladder
15	Opioids

**Table 9** Top 10 journals by volume

Journals	Records	% of 593	IF [2019]
<i>Fertility and Sterility</i>	72	12.14	6.31
<i>Menopause: The Journal of The North American Menopause Society</i>	39	6.58	3.31
<i>BJOG: An International Journal of Obstetrics and Gynaecology</i>	35	5.90	4.66
<i>Human Reproduction</i>	34	5.73	5.73
<i>Geburtshilfe und Frauenheilkunde</i>	32	5.40	2.38
<i>Acta Obstetrica et Gynecologica Scandinavica</i>	27	4.55	2.77
<i>Obstetrics &amp; Gynecology</i>	24	4.05	5.52
<i>Climacteric</i>	23	3.88	2.57
<i>Archives of Gynecology and Obstetrics</i>	21	3.54	2.28
<i>Maturitas</i>	21	3.54	3.63

IF, impact factor.

**Table 10** Top 5 journals by citations

Rank	Citations		Centrality	
	Journal cited	Citations	Journal cited	Centrality
1	<i>Obstetrics &amp; Gynecology</i>	189	<i>Pain</i>	0.15
2	<i>Cochrane Database of Systematic Reviews</i>	178	<i>American Journal of Chinese Medicine</i>	0.11
3	<i>American Journal of Obstetrics and Gynecology</i>	157	<i>Acta Obstetrica Et Gynecologica Scandinavica</i>	0.1
4	<i>Fertility and Sterility</i>	157	<i>American Journal of Obstetrics and Gynecology</i>	0.09
5	<i>Journal of The American Medical Association</i>	152	<i>Journal of The American Medical Association</i>	0.09

10 keywords in terms of frequency and centrality are listed in *Table 11*. High-frequency keywords were identified using burst detection in CiteSpace, and the results are shown in *Figure 9*. Due to the small number of papers included in this analysis, only 3 keywords were identified: acupuncture, low back pain, and pregnancy.

## Discussion

Acupuncture is a treatment method in TCM. It has a good curative effect and an accepted treatment for a wide range of conditions, including obstetric and gynecologic diseases, motor system pain, and gastrointestinal dysfunction. With the deepening integration of Chinese and Western medicine, an increasing number of international researchers

have begun to use and pay attention to the therapeutic effect of acupuncture. Researchers have conducted in-depth studies on the effects and mechanisms of acupuncture in many fields, and the results are frequently published in professional authoritative journals. Statistical analysis of the published literature can reveal research hotspots and research directions in related fields and give an indication of research prospects. In the present study, our statistical analysis of relevant published research found that the first English-language paper on the application of acupuncture in the treatment of obstetric and gynecologic diseases only appeared in 1972. Research in this field developed slowly until around 2000, when it began to grow rapidly. Furthermore, we found that several countries, research institutions, and researchers are prominent contributors



to the field, with research institutions and researchers in the United States, the United Kingdom, and Germany having the closest cooperation. Unfortunately, despite the prominence of traditional medicine in China, Chinese institutions and researchers have published relatively few papers on acupuncture in English journals, and there is relatively little cooperation between domestic research institutions and researchers.

In terms of the research direction, our statistical results show that current research is mainly focused on 15 topics, among which reproduction, menstrual disorders, and pain are research hotspots. In recent years, acupuncture has drawn particular research attention as a treatment for reproductive issues, with a number of randomized controlled trials having been published, with differing results. A 2017 meta-analysis found that acupuncture may improve women's fertility; however, the authors noted that the evidence of the included studies was relatively weak (13). Meanwhile, a randomized controlled study published in *JAMA* the following year showed that compared with sham-acupuncture, real acupuncture failed to significantly increase the live birth rate of *in vitro* fertilization (IVF) (8). Nevertheless, acupuncture can alleviate anxiety during embryo transfer (14), and it has also been shown to have certain effects on perinatal depression (15,16). Women's pain is another research focus. Some studies have found that acupuncture can reduce lower back pain or pelvic girdle pain in pregnant women as well as pain during childbirth, obtaining high satisfaction (3,17,18). It can also effectively reduce menstrual and fibromyalgia pain in women (19,20).

Based on our in-depth analysis of the literature, we found that the number of papers on acupuncture published in top comprehensive medical journals, including the 4 major comprehensive journals (*New England Journal of Medicine*, *The Lancet*, *JAMA*, and *BMJ*), has increased in recent years. A large number of clinical studies on acupuncture have been published, and in particular, the number of randomized controlled trials is increasing. According to the results of these RCT studies, more evidence will need to be accumulated for the reasonable application of acupuncture in clinical practice. A positive trend in recent years is that Chinese scholars have carried out an increasing number of RCTs, and more and more research results are being published in authoritative journals (4,5,13,15,21). These RCTs designs and results are rigorous and objective, providing solid information for clinicians and researchers.

The current study has some limitations that should be

noted. First, to make it easier for scholars from different countries to access and understand the related research, we mainly analyzed English-language documents, and thus, we may have omitted relevant articles published in Chinese. In the future, we intend to explore the application value of acupuncture in obstetrics and gynecology by exploring literature using a more comprehensive search and time span.

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## Footnote

*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/apm-21-477>). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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