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Current Status of Global Hysteroscopy and Female Infertility Research: A Web of Science Based Bibliometric Analysis Study

Global Histeroskopi ve Kadın İnfertilitesi Araştırmalarının Mevcut Durumu: Web of Science Tabanlı Bibliyometrik Analiz Çalışması

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Abstract

Aim: The aim of this study was to identify trends in the literature on female infertility and hysteroscopy and to quantitatively evaluate them using various bibliometric parameters.

Material and Method: The study data was taken from the Web of Science electronic database for this bibliometric network analysis. The network analysis and bibliometric analysis were carried out by using the Biblioshiny and VOSviewer bibliometric tools.

Results: A total of 1,023 documents were included in the study. The first article was published in 1977. Until 1990, the annual number of articles was irregular. The quantity of publications published annually significantly increased after 2005, peaking in 2020 and 2021 (68 and 67 articles, respectively). The included articles were published in 67 countries. Among these countries, China (n=299), the United States of America (n=237), Italy (n=235), andTurkey (n=156) had the highest number of publications. Especially after 2012, there has been a significant increase in Chines epublications. In addition, 10.07% of the documents had co-authors from other countries. The keywords 'hysteroscopy (n=422), hysterosalpingography office (n=65), hysteroscopy (n=49), and chronic endometritis (n=45) topped the trending topic list.

Conclusion: It is notable that among international publications, Chinese publications have increased significantly, especially in the last decade. Funding support from Chinese institutions may be responsible for this. This study is the first study published on the current status of global hysteroscopy and female infertility research and its results may give an idea to the related field researchers.

Keywords: Bibliometric analysis, hysteroscopy, infertility

Öz

Amaç: Bu çalışmanın amacı, kadın infertilitesi ve histeroskopi literatüründeki eğilimleri belirlemek ve bunları çeşitli bibliyometrik parametreler kullanarak niceliksel olarak değerlendirmektir.

Gereç ve Yöntem: Bu bibliyometrik ağ analizi için çalışma verileri Web of Science elektronik veri tabanından alınmıştır. Ağ analizi ve bibliyometrik analiz Biblioshiny ve VosViewer bibliyometrik araçları kullanılarak gerçekleştirilmiştir.

Bulgular: Çalışmaya toplam 1023 belge dahil edilmiştir. İlk makale 1977 yılında yayımlanmıştır. 1990 yılına kadar yıllık makale sayısı düzensizdi. Her yıl yayınlanan yayınların sayısı 2005'ten sonra önemli ölçüde artarak 2020 ve 2021'de zirve yapmıştır (sırasıyla 68 ve 67 makale). Dahil edilen makaleler 67 ülkede yayınlanmıştır. Bu ülkeler arasında Çin (n=299), Amerika Birleşik Devletleri (n=237), İtalya (n=235) ve Türkiye (n=156) en fazla yayına sahip ülkelerdir. Özellikle 2012 yılından sonra Çin yayınlarında önemli bir artış olmuştur. Ayrıca, dokümanların %10,07'sinin diğer ülkelerden ortak yazarları bulunmaktadır. 'Histeroskopi (n=422), histerosalpingografi ofisi (n=65), histeroskopi (n= 49) ve kronik endometrit (n= 45) anahtar kelimeleri trend konu listesinin başında yer almıştır.

Sonuç: Uluslararası yayınlar arasında Çin menşeyli yayınlarının özellikle son on yılda önemli ölçüde artmış olması dikkat çekicidir. Çin'deki kurumlarca verilen fon desteği bundan sorumlu olabilir. Bu çalışma, küresel histeroskopi ve kadın infertilitesi araştırmalarının mevcut durumu hakkında yayınlanan ilk çalışmadır ve sonuçları bu alandaki araştırmacılar için fikir sağlayabilir.

Anahtar Kelimeler: Bibliyometrik analiz, histeroskopi, infertilite

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INTRODUCTION

The term of 'infertility' defined by the World Health Organization (WHO) as the inability to become pregnant after one year (or more) of unprotected sexual activity.[1] Infertility is divided into two subcategories: primary and secondary. Women who have never given birth before are considered to be suffering from primary infertility. At least one conception occurs in secondary infertility, but it doesn't happen again. [2] The most prevalent type of female infertility worldwide is secondary infertility, which is frequently brought on by infections of the reproductive system. The time of undesirable non-conception, the age of the female partner, and disease-related infertility are the three main variables affecting the spontaneous likelihood of conception. The longer you wait before conception, the lower your probability of getting pregnant on your own. In the majority of examined populations with natural fertility, the fall in female fertility already begins at 25–30 years of age, and the median age at last birth is 40–41 years.[3]

Infertility is a global public health issue that has an impact on an individual's personal, social, and economic life as well as the family as a whole.[4] The prevalence of infertility is estimated to be 9% among couples who are of reproductive age, and female variables account for 20–35% of all infertility cases.[4] A recent meta analysis found that the total pooled prevalence for infertility and primary infertility was 46.25% and 51.5%, respectively.[5]

Infertility brought on by a medical condition may affect either or both genders. Hypogonadotropic hypogonadism, hyperprolactinemia, ciliary disorders, cystic fibrosis, infections, systemic diseases, and diseases connected to lifestyle are the factors that impair fertility in both sexes. Female infertility maybe caused by premature ovarian insufficiency, polycystic ovary syndrome, endometriosis, uterine fibroids, uterine malformation, endometrial atrophy, and endometrial polyps, etc..[3,6]

Hysteroscopy has experienced a significant transformation, moving from its traditional function as a diagnostic tool for examining the uterine cavity to an essential modality that allows simultaneous diagnosis, visualization, and treatment of a wide range of intrauterine illnesses. With in specialist medical settings and clinics devoted to there search and care of female reproductive health, this change is especially important.[6]

An interdisciplinary topic called bibliometrics uses mathematical and statistical methods to objectively assess the distribution of knowledge, particularly literature. We can gain importan t insights by conducting thoroughand objective bibliometric analyses of voluminous literature on a given topic, including: a) the roles played by countries/regions, institutions, journals, and authors within the domain; b) the cooperative efforts among countries, institutions, or authors; c) the distribution patterns of journals; and d) the fundamental knowledge reservoir.[7,8]

Information and communication Technologies are evolving quickly and areused in many aspects of the healthcare industry.[9] In the area of medicine[10-14] and obstetrics[13-16] bibliometric analyses are also frequently published, both from Turkey and globally. In addition, female infertility and hysteroscopy-related articles have been published more frequently in recent years. The characteristics and strengths of the published research on hysteroscopy and female infertility are not well understood, nevertheless.

The demand for greater research on healthcare disciplines, as well as for the synthesis and use of such research in practice, has been prompted by the increasing emphasis on evidence-based practice. In this study, the global trend in research on female infertility and hysteroscopy was examined, and the influence and impact of pertinent publications on the scientific community were evaluated. Therefore, this study's goals were to: (1) as certain the growth research trend of journal publications on hysteroscopy and female infertility; (2) quantitatively evaluate the contribution of the most pertinent literature on hysteroscopy and female infertility, using various bibliometric parameters; and (3) pinpoint key themes in hysteroscopy and female infertility research, using keyword co-occurrence analysis.

MATERIAL AND METHOD

Search Strategies and Inclusion Criteria

In order to ensure a trust worthy coverage of pertinent studies, related research articles on hysteroscopy and female infertility were retrieved from the Web of Science for this study, on August 1, 2023. In this study, "hysteroscopy studies" related to the field of gynecology and obstetrics were included.

The keywords hysteroscopy (Topic) AND infertility (Topic) were selected in the Web of Science search engine. The search language was English. There were no time restrictions. All publications published until 1 August 2023 were included. 1303 publications were reached in the first search. Then, the search was narrowed to only 'research articles' as publication type. As a result of this restriction, 1023 publications were reached.

The current study investigated some main bibliometric parameters such as the number of publications, the most-published fields, countries of collaboration, trend keywords, the number of citations, etc.

Exclusion criteria: Other document types besides research articles were excluded.

Bibliometric Tools

For data visualization and analysis, a variety of bibliometric software packages were used, including VOSviewer [19,20], the Bibliometrix R package (version 4.1.2), and Biblioshiny (version 2.0) (https://www.bibliometrix.org/home/index.php/layout/biblioshiny).[21] Building and visualizing bibliometric

maps can be done using the free computer free wareVOS viewer.[19,20]

The first step in conducting analyses using these bibliometric tools was to search the Web of Science database according to inclusion criteria, then download the results in plaintext format onto computer. The relevant bibliometric software package was then used to import the bibliometric data and conduct thorough analyses.

RESULTS

The data set includes 1,023 documents in this temporal context. The data set shows an impressive annual growth rate of 8.17%, indicating a steady growth of the body of knowledge within the subject area. This literature was produced by 3976 authors. 65 publications in the dataset had a single author. The dataset had an average of 4.9 co-authors per document. International co-authorship was identified in approximately 10.07 percent of the documents.

The initial article was published in 1977. In the years that followed, up until 1990, the frequency of published articles showed sporadic patterns, with some years seeing a dearthor complete lack of articles. However, a clear paradigm shift occurred after 2005, when it became clear that the number of articles published each year had significantly increased. Particularly noteworthy are the years 2020 and 2021, which standout for being the peak of publication activity and manifesting an output of 68 and 67 articles, respectively. A corpus of 30 articles has been published as of the current analysis, which covers the year 2023 (**Figure 1**).

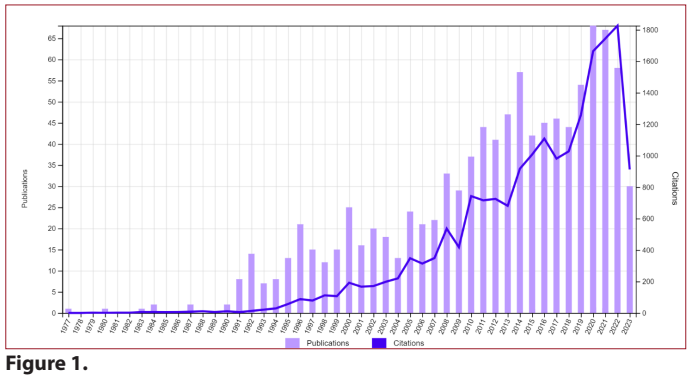

Figure 1.

In order to ruleout any conclusive interpretation of this numerical datum as indicative of a decline in publication frequency, it is essential to recognize that 2023 is still in progress. After removing self-citations, these publications received 15,655 citations out of a total of 18,800. The H-index now stands at 67 and the average number of citations per article is 18.38.

Countries and Affiliations

The entire set of articles under consideration includes contributions from a total of 67 distinct countries. Among them, China had 299 publications, the United States had 237 publications, Italy had 235 publications, Turkey had 156 publications, India had 137 publications, France had 128 publications, Iran had 115 publications, Egypt had 71 publications, Israel had 63 publications, and the United Kingdom had 6 publications. With some countries exhibiting higher levels of research productivity and significant contributions, this distribution highlights the diverse global involvement in scholarly discourse related to the subject.

The United States laid the ground work for later contributions by publishing the first works in the field. However, as time went on after 1990, the range of contributions grew to include contributions from various countries. Beginning in the new millennium, and more specifically after 2000, publications from all participating countries started to show an upward trajectory, which was a sign of a general increase in scholarly output. Notably, the trajectory of Chinese publications underwent a noticeable acceleration after 2012 and reached a notable peak. This quickening growth highlights China's quick rise to prominence in the academic conversation within the targeted field, highlighting the dynamic development of research participation and its impact over time (**Figure 2**).

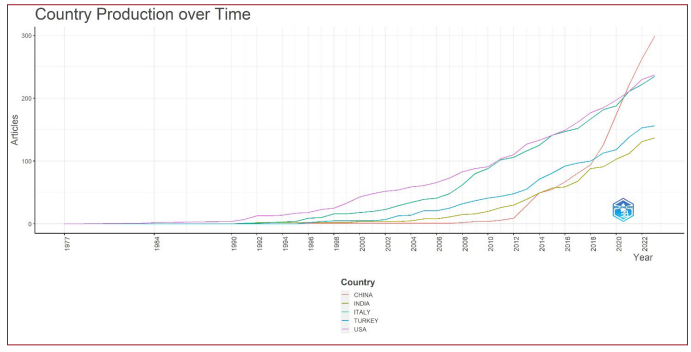

Figure 2.

These publications had 225 funders in total. National Natural Science Foundation of China was the major funder with 22 funds. China National Key Research and Development Programme was the second largest funder with 12 funds.

Leading affiliations in this field of study include Egyptian Knowledge Bank EKB, which has contributed 54 publications (5.279%), UDICE French Research Universities, which has contributed 41 publications (4.008%), Assistance PubliqueHopitaux Paris, which has contributed 31 publications (3.030%), Universite Paris Cite, which has contributed 25 publications (2.444%), Tel Aviv University, which has contributed 22 publications (2.11%), Sackler Faculty of Medicine, which has contributed 21, andAll India Institute of Medical Sciences.

The Word Cloud and Trend Topics

The word cloud diagram that was generated shows how popular particular keywords were within the dataset. Eachword's size and prominence in the diagram reflect how frequently it appears in thedataset. The keyword sand their corresponding frequencies are listed below: (**Figure3 a**)

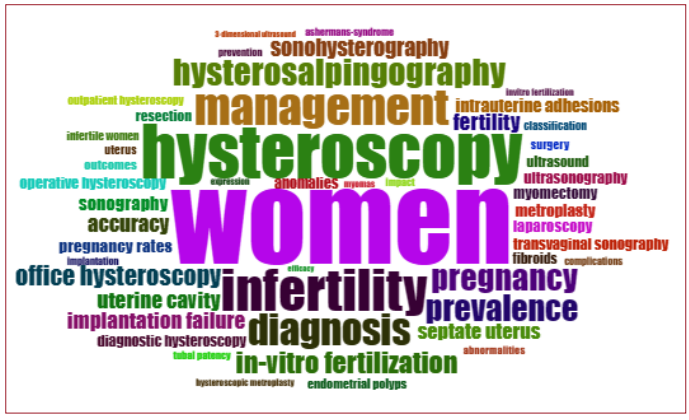

Figure 3a.

"women": 257 occurrences

"hysteroscopy": 154 occurrences

"infertility": 120 occurrences

"management": 105 occurrences

"diagnosis": 90 occurrences

"hysterosalpingography": 78 occurrences

"pregnancy": 75 occurrences

"prevalence": 74 occurrences

"in-vitro fertilization": 63 occurrences

"officehysteroscopy": 57 occurrences

Collectively, these keywords shedlight on the dataset's content and thematic focus. The frequent occurrence of these terms in the dataset's scholarly discourse highlights their importance and relevance. The prevalence of terms like "women," "hysteroscopy," and related terms like "infertility," "pregnancy," and "diagnosis" hints that the research in the dataset may be focused on gynecological and reproductive health, with an emphasis on diagnostic and management strategies.

The keywords 'hysteroscopy (n=422), hysterosalpingography office (n= 65), hysteroscopy (n= 49), and chronic endometritis (n=45) were located at the top of the trending topiclist (**Figure 3b**).

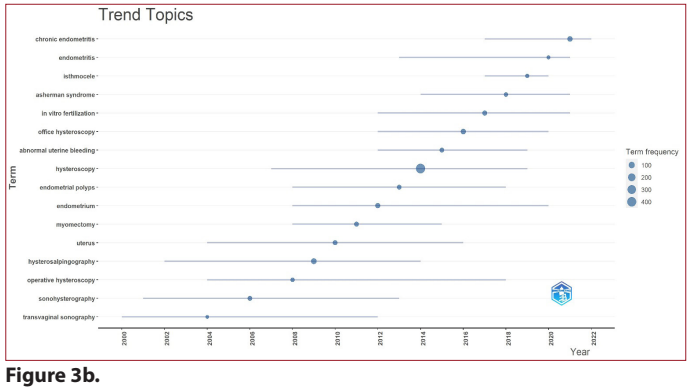

Figure 3b.

In the context of female infertility, the following journals focus exclusively on hysteroscopy: Journal of Minimally Invasive Gynecology (58 papers), Fertility and Sterility (84 articles), and Human Reproduction (50 articles). The number of articles published by the journal Fertility and Sterility on the topic of hysteroscopy in the context of female infertility has quickly increased, especially after 2007. In addition "Fertility and Sterility" journal publications were the most cited publications overall (4461 citations). **Table 1** shows the mostly publishing journals on this topic and also **Figure 4** shows the top sources' production over time.

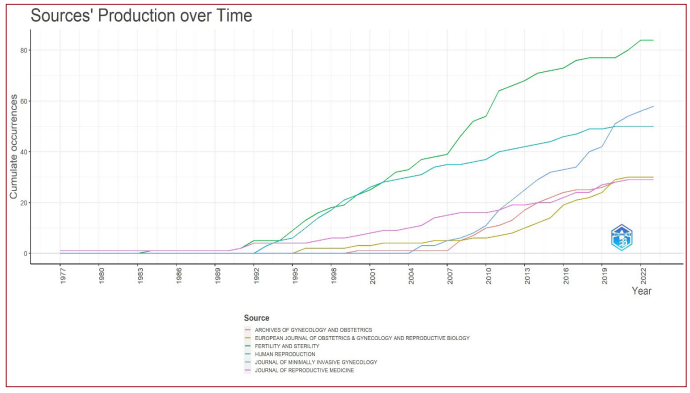

Figure 4.

Table 1. Mostly publishing journals on the topic of hysteroscopy and female infertility and citation number of these articles

Sources	Articles	Number of citations
Fertility and Sterility	84	4461
Journal of Minimally Invasive Gynecology	58	944
Human Reproduction	50	2328
European Journal of Obstetrics & Gynecology and Reproductive Biology	30	651
Archives of Gynecology and Obstetrics	29	337
Journal of Reproductive Medicine	29	393
Journal of Obstetrics and Gynaecology Research	26	202
International Journal of Gynecology & Obstetrics	21	405
Journal of Gynecologic Surgery	20	23
Clinical and Experimental Obstetrics & Gynecology	16	41

Collaboration Mappings

Collaborations between countries and organizations were examined at, according to the analysis done with VOS viewer. As a result, collaboration analys for 67 countries that have worked together on at least 5 publications were shown in **Figure 5a**. Most publications were produced by the nation with the largest circle, while collaborations were denoted by groups of thesamehue. The entire link strength was indicated by the line thickness, which represented the degree of connectivity.

Significant differences in research production and collaboration capacities were discovered through an analysis of countries' intellectual contributions. This data was according to first authorsans the United States had the

most documents (145), citations (4039), and an impressive total link strength (39), all of which were led by the country. With 101 documentsand 1050 citations, Peoples Republic of China displayed a considerably lower total link strength of 12. With 99 documents, 2715 citations, and 49 links overall, Italy displayed a strong scholarly presence. Other notable donors include Egypt (55 papers, 622 citations, total link strength: 8), Turkey (75 documents, 900 citations, total link strength: 5), India (69 documents, 697 citations, total link strength: 7), and France (55 documents, 1120 citations, total link strength: 11).

Figure 5b showed instances of sharedpublications and the linkages between organisations in terms of bibliographic coupling. A noteworthy finding was the existence of 47 groups working together on projects with ten or more publications in common. The information reveals the relationships and cooperative research projects between various organizations. Examples of prominent link strengths with high document counts and citations are Tel Aviv University, Shandong University, and University of Bari, demonstrating strong research collaboration. As a result of strong connections within its constrained scope, Hop Bicetre standsout with a relatively reduced document count but an astonishingly high total link strength.

DISCUSSION

In this study, 1.023 articles on female infertility and hysteroscopy since 1970 using Biblioshiny and VosViewer tools were retrospectively analyzed, and intuitively reflected the publication time distribution, main authors' collaboration network, research points, and development trend of articles in the field of female infertility and hysteroscopy by visual analysis of the knowledge map.

The first publication appeared in 1977, and the years that followed up until 1990 showed erratic article frequencies, with brief intervals when publications were scarceornon existent. After 2005, there was a fundamental change, indicated by a significant increase in annual article outputs. Particularly noteworthy are the years 2020 and 2021, which standout as publication activity peaks and produce, respectively, 68 and 67 articles. The annual growth rate of 8.17%. From the publication trend of articles, it can be seen that the published volume has increased steadily year by year. This shows that the topic of hysteroscopy in female infertility is being paid more and more attention by medical professionals and China has made great contributions in this field. But according to first authors, the intellectual contributions of different nations revealed differences in research production and collaborative qualities. With 145 papers, 4039 citations, and a strong overall link strength of 39, the United States took the top spot. China came in second with 101 documents, 1050 citations, and a weaker link strength of 12. With 99 documents, 2715 citations, and a total link strength of 49, Italy demonstrated a significant scholarly presence. Furthermore, significant contributions came from Egypt (55 papers, 622 citations, link strength: 8), Turkey (75 documents, 900 citations, link strength: 5), India (69 documents, 697 citations, link strength: 7), and France (55 documents, 1120 citations, link strength: 11), revealing distinctive patterns of research productivity and collaboration across countries. In summary, approximately 10.07% of the documents have international co-authorship.

Literature databases (such as PubMed, Scopus, and Web of Science) vary in terms of their scope, emphasis, and tools available. Scopus and Web of Science are multidisciplinary, whereas PubMed concentrate mostly on life sciences and biomedical fields.[22]

Due to its dual characteristics of multidisciplinarity and inclusion of high-quality publications, the Web of Science database was chosen for this study since it was a favor edoption. The Web of Science database is a great option because it integrates with bibliometric tools that can perform both citation analysis and output generation. The desire to eliminate bias and duplication led to the choice to forgochoosing various databases.

The main topics, concepts, ideas, or arguments in a text are condensed into document keywords, which help algorithms find the necessary data quickly and efficiently. They play a crucial part in many activities

Involving documents, including indexing, categorization, grouping, and summarization. Traditional approaches to keyword extraction mostly rely on examining statistical patterns of important phrases included in a document.[23-27] In the current study, the chosen keywords reveal information about the themes and substance of the collection. Their continued inclusion in academic discussions emphasizes how important they are. Notably, wordslike "women," "hysteroscopy," and related wordslike "infertility," "pregnancy," and "diagnosis" point to a potential focus on gynecological and reproductive health research, specifically around diagnostic and management approaches.

The journals that published the most papers were also investigated in this analysis. When choosing journals for publishing, scholars in this discipline can use this information as a reference.

Limitations

Despite its limitations, this study contributed to the bibliometric examination of publications on hysteroscopy and female infertility. Overall, this study's bibliometric and content analysis only touches on a small portion of the scholarly discussion around this issue. The sample does not contain any articles that were published in other databases (such as Pubmed, Scopus, etc.). In addition, only original articles made up the sample. Publications released on or after August 1, 2023, were excluded from the sample. More bibliometric studies are thus necessary to look into the articles in the databases related to hysteroscopy and female infertility.

CONCLUSION

The results of this study will be pertinent to numerous groups of individuals involved in hysteroscopy and female infertility research, including field practitioners, academics, and journal editors. Inparticular, they will inform researchers of the abundance of hysteroscopy and female infertility research worldwide in the hopes of fostering future international research collaborations on the topic. Researchers may find it helpful to know which journals have the best influence when they submit their work on female infertility and hysteroscopy in the future.

ETHICAL DECLARATIONS

Ethics Committee Approval: This study didn't need to be ethically approved as it is free database study.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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