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ABOUT COVER

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Chinese research into ulcerative colitis from 1978 to 2017: A bibliometric analysis

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Abstract

BACKGROUND

Over the last 40 years, with accumulating evidence demonstrating a significant increase in the incidence of ulcerative colitis (UC) in China, the number of studies on UC has been rapidly increasing. But it still lacks a comprehensive meta-analysis of publications regarding UC for the last four decades in China. Thus, a bibliometric analysis of UC is warranted to investigate the trend and distribution of the publications on UC in China in recent years. And it is supposed that the number of the papers related to UC increased by year.

AIM

To investigate the current status of research output from Chinese studies related to UC during the period of 1978 to 2017, with special attention paid to the distribution of publication dates, journals, regions, and research organizations.

METHODS

Publications on UC were searched in the Chinese periodical database SinoMed from January 1978 to December 2017. The search term used for retrieval was "ulcerative colitis". The language of the publications was restricted to English or Chinese. The studies have to be performed in China. Then, a bibliometric analysis was performed on the distribution of publication dates, journals, regions, and research organizations with EndNote, Excel, MySQL, and GraphPad Prism.

RESULTS

A total of 16257 papers matched the search criteria, which included 7561 papers published in core journals, 4641 evidence-based articles, and 4177 publications of randomized controlled trials. These papers were mainly published in *Chinese Journal of Coloproctology*, *World Chinese Journal of Digestology*, *Chinese Journal of Digestion*, *Chinese Journal of Integrated Traditional and Western Medicine on Digestion*,

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and *Modern Journal of Integrated Traditional Chinese and Western Medicine*. In particular, the majority of these organizations were located in Jiangsu, Henan, Shandong, and Guangdong Provinces which are rich areas or have the largest population per province. Most of these studies were conducted by academic institutions.

CONCLUSION

Over the past four decades, the output of research into UC in China has increased significantly, with academic institutions playing a central role in the academic field, but the number and quality of these researches vary substantially among different regions.

Key words: Ulcerative colitis; Bibliometric analysis; SinoMed; Literature research; Core journal; Academic institutions

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Core tip: Ulcerative colitis is a chronic inflammatory disorder of the gastrointestinal tract. This bibliometric analysis indicated a significant increase in the number of Chinese ulcerative colitis publications over the last 40 years. Meanwhile, the numbers of both evidence-based articles and publications of randomized controlled trial were also increased, but the proportions of evidence-based articles and publications of randomized controlled trial were inadequate. In addition, region distribution of these publications was unbalanced, Jiangsu, Henan, Shandong, Guangdong Provinces featured significantly in the research filed, and most of the studies were conducted by academic institutions.

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INTRODUCTION

Ulcerative colitis (UC) is a chronic inflammatory disorder of the gastrointestinal tract, characterized by a tendency of chronic and relapsing mucosal inflammation^[1-4]. The precise etiopathogenesis of UC remains unclear, and it is generally considered as the result of maladjustment of immune responses to intestinal microorganisms in individuals with genetic susceptibility^[5,6]. The primary symptoms of UC include abdominal pain, bloody diarrhoea, weight loss, and fever. The complications include anemia, megacolon, and colitis related colon cancer.

UC was generally considered to be prevalent in Western countries. The highest prevalence of UC was reported in Europe (UC 505 per 100000 in Norway), according to a systematic review of the worldwide incidence and prevalence of inflammatory bowel diseases (IBD) based on population data^[7-9]. However, recent epidemiological studies showed that the incidence of UC is increasing rapidly in China and other newly industrialized countries^[10-12]. Although the prospective population-based epidemiological studies were rare in China, the prevalence of UC was estimated to be 11.6 per 100000 in China according to a multi-center retrospective study^[13-15]. It could be concluded that the incidence of UC has been dramatically increased. These studies demonstrated that UC is a common disease in the 21st century. Furthermore, with the increasing incidence of UC, the corresponding number of studies on UC was increasing steadily.

Bibliometrics is the quantitative analysis of academic literature by comprehensively applying methods of mathematics, philology, and statistics. Through exploring the characteristic information of literatures, bibliometric analysis can reveal the occurrence, history, research status, and future development in certain academic fields. In the field of IBD, a bibliometric analysis has been performed to analyze the 50 top-cited articles focused on IBD^[16]. As the largest developing countries, China has witnessed a dramatic increase in the incidence of IBD during the last four decades. However, there is no comprehensive bibliometric analysis concerning the features of

publications on UC in China.

Therefore, the aim of this study was to quantitatively analyze the Chinese literature on UC over the past 40 years, trying to facilitate a comprehensive understanding of the prior research on UC in China. We hope that our study can shed some light on the development of IBD management for other developing countries in the world.

MATERIALS AND METHODS

The statistical review of the study was performed by a biomedical statistician. Generally, the ethical approval was not required in this study since the data in this study was downloaded from a public database and no patient was enrolled.

Data acquisitions

Publications were explored from the Chinese periodical database SinoMed (<http://www.sinomed.ac.cn/>) which is the most famous database regarding publications from China in the field of biology and medicine. SinoMed is open access and contains both Chinese and English publications. Most of English publications are simultaneously indexed in PubMed. The database was retrieved on April 30, 2018. The search term applied for retrieval was “ulcerative colitis”, which had been searched in the Article Title or Abstract of the literature. The language of the publications was restricted to English or Chinese. The studies have to be performed in China. The publication dates were restricted between 1978 and 2017, since the first consensus about diagnosis and treatment of IBD was held by Chinese Medical Association for digestive diseases in 1978. Publications in 2018 were excluded since there may be accepted research outputs that were not available in the database. The category of core journal, evidence-based article, and randomized controlled trial (RCT) publications are automatically classified and output by the SinoMed database. The search yielded a complete list of papers on UC, and 18948 papers were obtained.

Inclusion and exclusion criteria

The inclusion criteria were as follows: (1) Publications which focused on UC and regarded UC as the main topic; and (2) Papers published by Chinese research organizations, including Hong Kong, Macao, and Taiwan. In addition to the exclusion on period, other exclusion criteria were as follows: (1) Publications which focused on other diseases (*e.g.*, CD, colorectal cancer, melanosis coli, and irritable bowel syndrome); (2) Papers published by foreign research organizations; and (3) Duplicated publications.

Statistical analysis

Publications matching the search criteria of our study were retrieved and reviewed. Multiple characteristics of these publications, including publication dates, journals, regions, and research organizations, were collected. All statistical data were analyzed by applying EndNote X8 (Thomson Reuters, United States), Microsoft Office Excel 2016 (Microsoft, United States), and MySQL 8.0.15 (Oracle, United States). GraphPad Prism 6.01 (GraphPad Software, United States) was applied to draw the charts.

RESULTS

Quantity and quality distribution of publications

A total of 16257 publications during the period from 1978 to 2017 were included. Amongst the publications matching the criteria of our study, 7561 papers were published in core journals, which were classified by the SinoMed database. The first evidence-based article was published in 1990, and 4641 papers met the requirements of evidence-based articles during the period from 1990 to 2017. In 1992, the first paper of RCT was published. Then, a total of 4177 papers of RCT were published for the period of 1992–2017 (Figure 1).

Quantity distribution of publications

The number of papers published per decade was 119 (from 1978 to 1987), 1005 (from 1988 to 1997), 5001 (from 1998 to 2007), and 10132 (from 2008 to 2017), respectively. Amongst them, 55 (from 1978 to 1987), 502 (from 1988 to 1997), 2420 (from 1998 to 2007), and 4584 papers (from 2008 to 2017) were published in core journals.

Quality distribution of publications

Out of the publications, the number of evidence-based articles per decade was 0, 35

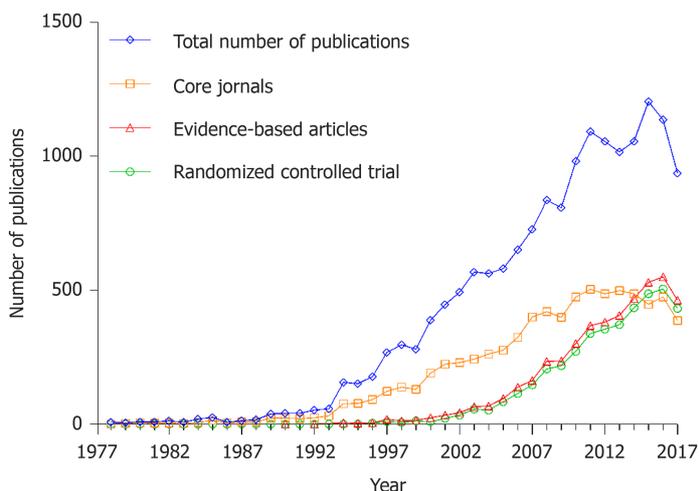


Figure 1 Number of papers focused on ulcerative colitis in China from 1978 to 2017. A total of 16257 papers were published for the period of 1978-2017. Amongst them, 7561 papers were published in core journals, 4641 met the requirements of evidence-based articles, and 4177 were publications on randomized controlled trial. The number and proportion of evidence-based articles and randomized controlled trials were increased significantly. Both the quantity and quality of the literature focused on ulcerative colitis were improving.

(3.48%), 662 (13.24%), and 3944 (38.93%), respectively. The number of RCT publications per decade was 0, 16 (1.59%), 538 (10.76%), and 3623 (35.76%), respectively.

Distribution of journals

Considering the journal distribution of the publications, 16257 papers were published in 1119 kinds of academic journals. Among these journals, *Chinese Journal of Coloproctology* accounted for the largest number of papers on UC (532 papers, 3.27%), followed by *World Chinese Journal of Digestology*, *Chinese Journal of Digestion*, *Chinese Journal of Integrated Traditional and Western Medicine on Digestion*, *Modern Journal of Integrated Traditional Chinese and Western Medicine*. Taken together, these journals published 1489 (9.16%) of the total 16257 papers as presented in **Figure 2A**.

Five hundred and twenty-four journals were classified as core journals by the SinoMed database, which published 7561 papers over the last 40 years. *World Chinese Journal of Digestology* accounted for the largest number of papers (302 papers, 3.99%), followed by *Chinese Journal of Digestion*, *Chinese Journal of Integrated Traditional and Western Medicine on Digestion*, *Modern Journal of Integrated Traditional Chinese and Western Medicine*, and *Hebei Journal of Integrated Traditional Chinese Medicine*. These journals contributed to 1156 (15.29%) papers; these data are presented in **Figure 2B**.

Distribution of organizations

A total of 15683 publications were analyzed in this section; meanwhile, the organizations of 574 publications could not be identified through the papers. A total of 7356 papers published in the core journals were analyzed in this section; while the organizations of 205 publications could not be identified from the papers.

Proportion of publications by academic institutions

Prior to the year 2000, only 1267 (8.08%) papers were published in total, with 651 (8.85%) papers published in core journals. So, we analyzed the papers published during 2000 to 2017 in this section.

From 2000 to 2005, the proportion of papers published by academic institutions fluctuated from 25.47% to 34.63% and those published by academic institutions in core journals fluctuated from 28.57% to 50.20%. During the years of 2006 to 2011, the proportion of papers published by academic institutions ranged between 39.28% and 46.68%, while the proportion of papers published by academic institutions in core journals ranged between 52.39% and 63.35%. Finally, during the years of 2011 to 2017, the proportion of papers published by academic institutions fluctuated from 44.53% to 50.16% and the proportion of papers published by academic institutions in core journals fluctuated from 61.04% to 68.90% (**Figure 3**).

Distribution of regions

A total of 15683 publications were analyzed in this section. These publications were distributed across 23 provinces, 4 municipalities (Beijing, Shanghai, Tianjin, and

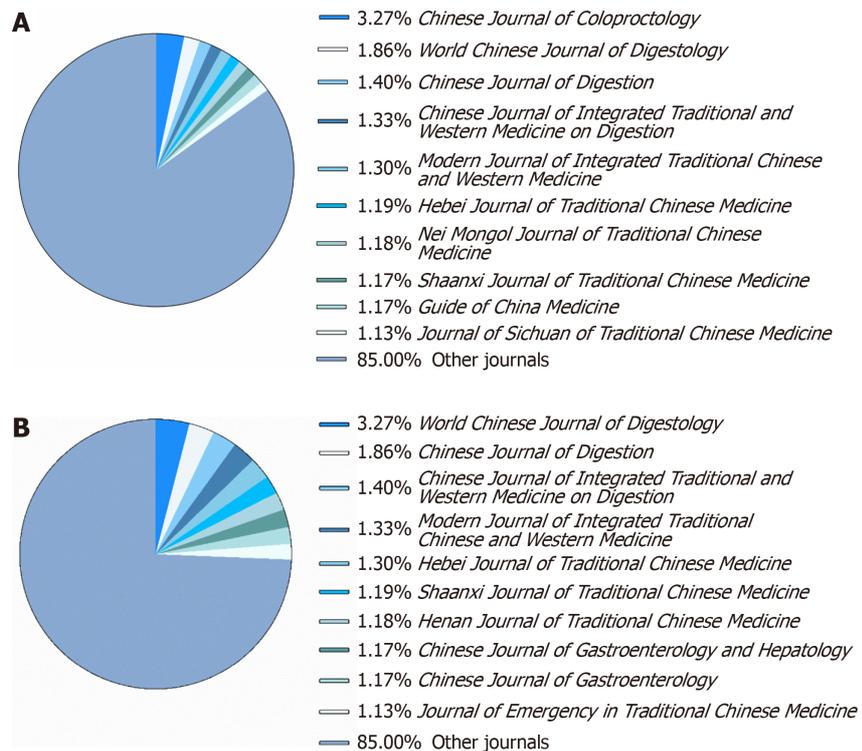


Figure 2 Journal distribution of publications focused on ulcerative colitis. A: Proportion of papers focused on ulcerative colitis (UC) published by each journal; B: Proportion of papers addressing UC published by each core journal. A total of 16257 papers focused on UC were published in 1119 journals. Amongst them, 7561 papers were published in 524 core journals. Papers on UC were mainly published by the *Chinese Journal of Coloproctology*, *World Chinese Journal of Digestology*, *Chinese Journal of Digestion*, *Chinese Journal of Integrated Traditional and Western Medicine on Digestion*, and *Modern Journal of Integrated Traditional Chinese and Western Medicine*.

Chongqing), 5 autonomous regions (Inner Mongolia, Ningxia Hui Autonomous Region, Xinjiang Uygur Autonomous Region, Tibet, and Guangxi Zhuang Autonomous Region), and 2 special administrative regions (Hong Kong and Macao) (Figure 4C). Jiangsu Province accounted for the most publications in this field (1317 publications, 8.40%), followed by Henan Province (1298 publications, 8.28%), Shandong Province (1253 publications, 7.99%), and Guangdong Province (1229 publications, 7.84%) (Figure 4A).

A total of 7356 papers published in core journals were analyzed in this section, while the organizations responsible for 205 publications could not be identified through the papers. The papers published in core journals were distributed in 22 provinces, 4 municipalities, 4 autonomous regions, and 2 special administrative regions (None of the papers were published in Tibet or Taiwan Province) (Figure 4B). Out of these, Jiangsu Province published the most papers in core journal (696 publications, 9.46%), followed by Beijing (586 publications, 7.97%), Guangdong Province (551 publications, 7.49%), and Hebei Province (515 publications, 7.00%) (Figure 4C).

Among the 15683 papers, 15584 (which were published during the period of 1993 to 2017) were analyzed in this section; while only 99 papers were published from 1978 to 1992. From Figure 4D, a total of 4796 papers were published in East China (30.78%). Again, 2606 papers were published in Central China (16.72%), while 2491 papers were published in North China (15.98%). Furthermore, 1658 papers were published in Northeast China (10.64%), while 1638 papers were published in South China (10.51%). Lastly, 1253 papers were published in Northwest China (8.04%), whereas 1142 papers were published in Southwest China (7.33%).

In summary, it is interesting to find that more publications come from rich areas. The number of publications is predominantly dependent on the incidence of IBD. This phenomenon is in line with the opinion that industrialization and economy advance can contribute to the development of IBD.

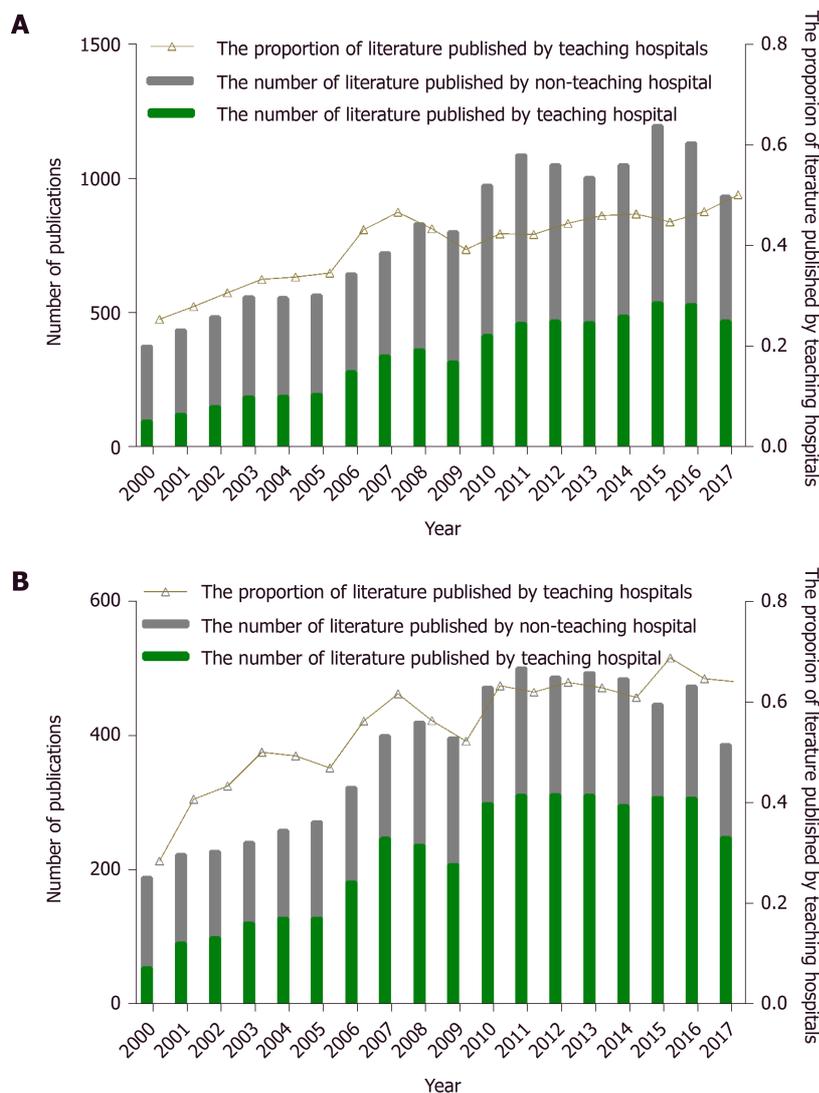


Figure 3 Organization distribution of publications focused on ulcerative colitis. A: Proportion of papers published by academic institutions from 2000 to 2017; B: Papers published by academic institutions in core journals from 2000 to 2017. In recent years, the proportion of papers published by academic institutions fluctuated from 44.53% to 50.16% and the proportion of papers published by academic institutions in core journals fluctuated from 61.04% to 68.90%. The general trend indicated that academic institutions exerted a fundamental role in the research related to ulcerative colitis.

DISCUSSION

The first report about UC in China was published in 1956. However, publications related to UC has been on the rise since the 1970s. Early investigators were focused on observational studies (*e.g.*, case reports, treatment experience, and retrospective literature), which help researchers to have a deeper understanding of the diagnosis and treatment of UC. Since the first consensus on the diagnosis and treatment of IBD was reached in 1978, a large number of studies focused on UC were performed by scholars and doctors in China. Furthermore, the reform and opening up in China provided a strong driving force of economic development, thus providing additional financial support for scientific studies. Consequently, increasing studies were focused on the molecular mechanism and animal studies. Meanwhile, as the number of publications related to UC was increased, the number of evidence-based articles was also increased, suggesting that Chinese scholars started to pay attention to the etiology and pathogenesis of UC. The number and proportion of evidence-based articles and publications of RCT were increased according to the analysis performed in this study. In subsequent studies, the focus should be on prospective studies to improve the rigorousness and quality of the publications.

The papers focused on UC were published in 1119 journals, including 524 core journals. Amongst them, *Chinese Journal of Coloproctology*, *World Chinese Journal of Digestology*, *Chinese Journal of Digestion*, *Chinese Journal of Integrated Traditional and*

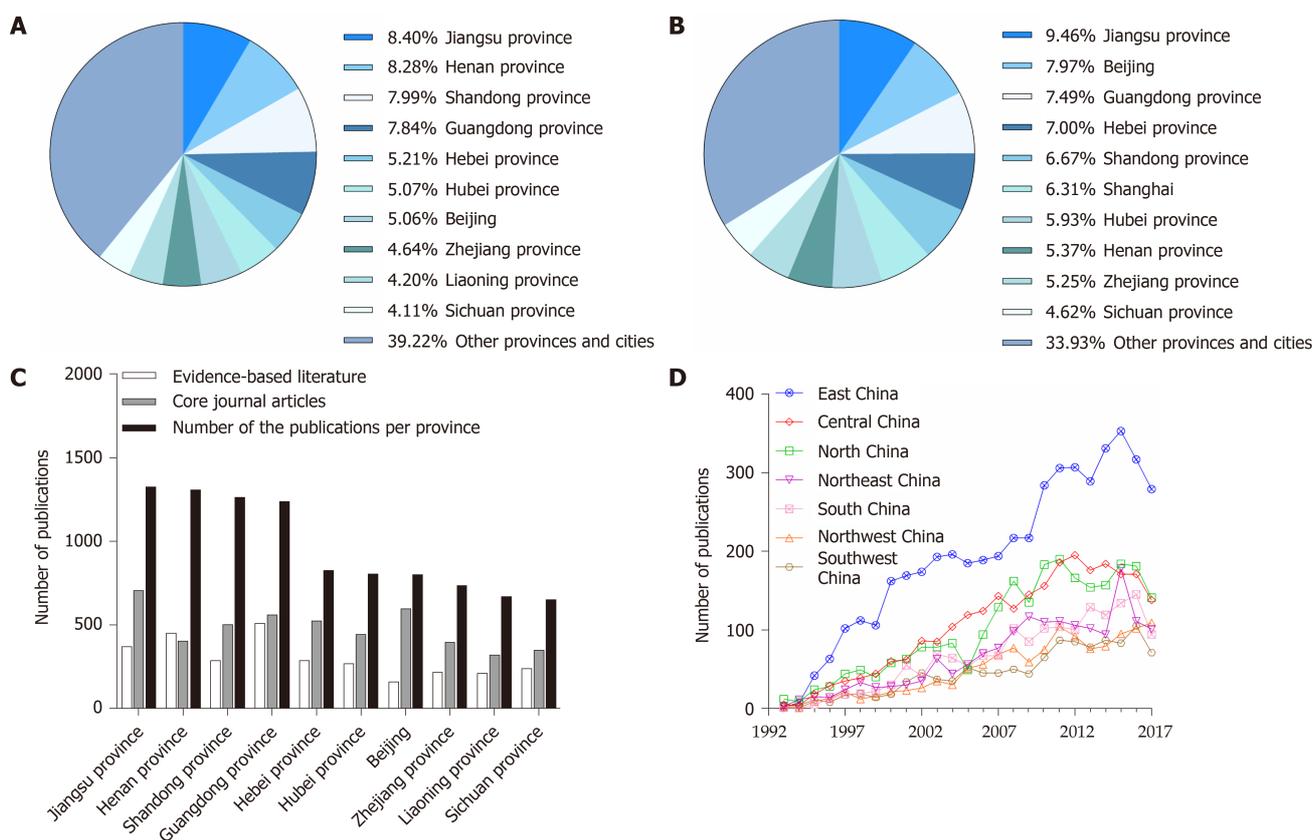


Figure 4 Reginal distribution of publications focused on ulcerative colitis. A: Proportion of publications in each province; B: Proportion of papers published by core journals in each province; C: Province distribution for the literature on ulcerative colitis (UC) in China; D: Regional distribution of the literature focused on UC in China from 1993 to 2017. A total of 15683 papers were analyzed in **Figure 4A-C**. Amongst them, 7356 papers were published in core journals. Jiangsu, Henan, Shandong, and Guangdong Provinces featured significantly in the research filed related to UC. A total of 15584 papers were analyzed in **Figure 4D**. Out of these, the most papers were published in East China.

Western Medicine on Digestion, and *Modern Journal of Integrated Traditional Chinese and Western Medicine* featured significantly in the research filed, and devoted the largest number of publications (1489 publications, 9.16%). Furthermore, with an increasing incidence and prevalence of UC in the past four decades, the researches related to UC also increased. It was observed that amongst clinical departments, department of gastroenterology, department of integrated traditional Chinese and Western medicine, department of general surgery, and department of pediatrics contributed to the largest number of publications on UC^[17-19]. Meanwhile, studies on laboratory testing, imaging, endoscopic, pathology, nursing, and mental health guidance related to UC were also on the rise^[18,20-22]. Since UC is characterized by complexity, unspecific manifestations, relapsing-remission, chronicity, and destructiveness, the management and treatment of UC are challenging both for the physician and the patient. It is also suggested that further studies should be undertaken with regard to the fact that the treatment of UC does not only depend on physicians from gastroenterology doctors, but also on the cooperation of experts from other departments, such as surgeons, radiologists, laboratory doctors, and professor of evidence-based medicine^[23]. Such multidisciplinary collaboration could provide the best opportunity for the accurate diagnosis and treatment of UC patients in China. Moreover, Chinese traditional medicine, and the combination of traditional Chinese and Western medicine were special research methods in China, accounting for about one-third of all the publications^[24-27]. This was indicative of the fact that more attention should be paid to the essence of traditional Chinese medical technology, and the rigidity and rationality of experimental designs. Multi-centric studies exploring the epidemiology and treatment of UC are also warranted to achieve an early breakthrough for the diagnosis and treatment of UC.

According to our research, the research capacity varied greatly among different regions in China. Financial support from government played an essential role in the quantity and quality of publications. The economy in East China, Central China, and North China was prosperous and people in these areas also have easier access to higher education and medical care resource; as a result, both advantages provide a

suitable scientific research condition for scientists. Therefore, among the various subregions, East China, Central China, and North China accounted for the largest number of publications, while only a few studies were conducted in Southwest China and Northwest China, especially in Tibet, Qinghai Province, Hainan Province, and Ningxia Hui Autonomous Region. As per our expectations, Jiangsu Province, Henan Province, Shandong Province, and Guangdong Province were the most fruitful provinces in the UC-related fields and made up the largest number of publications (5097 publications, 32.50%). In addition, many high-quality RCTs were conducted in Beijing, Jiangsu Province, Guangdong Province, Zhejiang Province, and Shanghai. Therefore, regions with strong scientific research capabilities should devote more resources to further explore the pathogenesis and treatment of UC. Meanwhile, the economic development, medical treatment, and education in remote areas should also be improved. More importantly, remote areas should be given access to advanced medical technology from developed regions, thereby narrowing the gap of medical standards in different regions.

Our research demonstrated that the proportion of papers published by academic institutions was more than 44.53% in recent years, and the proportion of papers published by academic institutions in core journals was more than 61.04%, showing that the academic institutions have served as a leading role in studies related to UC. Studies conducted by academic institutions were rather related to the latest international cutting-edge research, and the experiments were designed to be more rigorous, especially for high-quality RCTs and multi-center studies. However, with regard to research capacity, there was a considerable gap between China and developed countries. Therefore, academic institutions should be aware of the latest breakthroughs in international research and explore new research directions in studies related to UC. At the same time, academic institutions should exert a fundamental effect in organizing teaching activities, and promoting the spread of information correlated to UC.

However, this study had some limitations. The data was obtained exclusively from China, and thus did not reflect the research status of UC worldwide. Second, some papers were excluded on account that the full texts of these studies were unavailable, resulting in selection bias which may have influenced our results. However, we included over 16000 studies which were published in the SinoMed, a widely used Chinese database. Therefore, we believed that the data did provide a representative profile of UC in China.

In conclusion, this bibliometric analysis indicated a significant increase in the number of Chinese UC publications over the last 40 years. Moreover, the numbers and the proportions of evidence-based articles and RCT publications were also increased significantly according to the analysis in this study. The *Chinese Journal of Coloproctology*, *World Chinese Journal of Digestology*, *Chinese Journal of Digestion*, *Chinese Journal of Integrated Traditional and Western Medicine on Digestion*, and *Modern Journal of Integrated Traditional Chinese and Western Medicine* were the main journals that published the literature related to UC. Additionally, the regional distribution of these publications was unbalanced, and most of the studies were conducted by academic institutions. The research focused on UC has developed rapidly in China over the years. With the development of science and technology, it is rather promising for scholars to further explore the etiology and pathogenesis of UC, and these explorations may provide novel insights on more effective treatment for UC. Therefore, scholars and physicians should focus on the rigorousness and science of experimental design. Besides, academic institutions should work as a fundamental effect in promoting teaching activities and the cooperation between different departments, to improve the research capabilities of UC in China.

ARTICLE HIGHLIGHTS

Research background

Ulcerative colitis (UC) is a chronic inflammatory disorder of the gastrointestinal tract. Its accurate diagnosis and effective treatment remain a challenge for physicians. Along with the increasing morbidity of inflammatory bowel diseases (IBD) in China, even in Asia, the epidemiologic research and bibliometric analysis of UC in China are crucial in the world range. Thus, a comprehensive study of UC related publications is warranted to investigate the trend and distribution of the publications in China for the last four decades.

Research motivation

A bibliometric analysis of publications focused on UC will provide information about the current status of research outputs related to UC in recent years. There was a bibliometric analysis focused on the 50 top-cited articles in IBD. But no comprehensive bibliometric analysis of UC during four decades was conducted. Such a study contributes to the blank of bibliometric

analysis of UC in China, and the trend of literature and research will be instructive to clinicians and scientists in other countries.

Research objectives

The aim of this study was to demonstrate the trend and distribution of the publications focused on UC in China over the past 40 years. And a bibliometric analysis of the number and proportion of evidence-based articles and randomized controlled trial publications can provide the quality distribution of the publications. Such a study can establish comprehensive information on the UC studies in China, provide the information that scholars should pay attention, and help improve the quality of the studies in future research.

Research methods

We searched the Chinese periodical database SinoMed for the related literature of UC published between January 1978 and December 2017. Papers should focus on UC as the main topic and studies performed in China. And a bibliometric analysis was used to demonstrate the distribution of publication date, journal, region, and research organization of these papers, especially papers published in core journals, evidence-based articles, and randomized controlled trial publications.

Research results

A total of 16257 papers met the searching criteria, including 7561 papers published in the core journals. There were only 4641 evidence-based articles and 4177 randomized controlled trial publications, but the proportion of these papers in all publications was increased. In terms of the regional distribution, a total of 4796 (30.78%) papers have been published in the Eastern area of China. Jiangsu, Henan, Shandong, and Guangdong Provinces have witnessed 5097 (32.50%) papers. In addition, our research found that most of the studies were conducted by academic institutions.

Research conclusions

This bibliometric analysis indicated a significant increase in the quantity and quality of UC research in China for the period from 1978 to 2017. Although the proportion of evidence-based articles and randomized controlled trial publications has increased, the total number was still inadequate. Besides, the regional distribution of the literature was unbalanced, and academic institutions played a leading role in the relevant research of UC. Further research is warranted to investigate the epidemiological surveys for the general population in China, so as to provide information comparing directly an increase in UC incidence and the number of publications.

Research perspectives

The research focused on UC has developed rapidly in China over the years. As the accurate diagnosis and effective treatment of UC remain a challenge for physicians, it is promising for scholars to further explore the etiology and pathogenesis of UC, and thus identify new insights for more effective treatment options. Therefore, scholars should focus on the rigorousness and science of experimental design. Besides, academic institutions should work as a fundamental effect in promoting teaching activities and the cooperation between different departments, to improve the research capabilities of UC in China.

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