Systematic Review and Meta-Analysis

Medicine®

OPEN

Worldwide research productivity in the field of back pain

A bibliometric analysis

Bin Wang, MD, Peng Zhao, MD*

Abstract

Background: This study aimed to show the world research productivity in the field of back pain and to help researchers follow the scientific development and promote the cooperation in this field.

Methods: Web of Science (WoS) database was searched from 1995 to 2016 without other restrictions. The keywords were as follows: "lumbar NEAR pain," "back pain," "dorsalgia," "backache," "lumbago," "back NEAR disorder," and "discitis." The following information of retrieved articles was analyzed: countries/territories, journals, publication year, authors, citation reports, and institutions. Publication activity was further adjusted for countries by gross domestic product (GDP) and population size.

Results: A total of 50,970 articles were retrieved in WoS database from 1995 to 2016. The United States published the biggest number of articles (16,818, 33.00%), followed by England (4,582, 8.99%), Germany (3,871, 7.60%), Canada (3,613, 7.09%), and Australia (3,063, 6.01%). Sweden ranked the first after adjusted for publication, and Netherlands ranked the first after adjusted for GDP. Besides, there was positive correlation between total number of publications and GDP for each country ($P < .05$). Harvard University was the most productive institution (917, 1.80%), Maher CG was the most productive author (229, 0.45%) and Spine was the most popular journal (3605, 7.07%) in the field of back pain research. Moreover, the article titled "Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale" in Pain had the highest citations (1749).

Conclusion: There was a significant increase in annual publications concerning back pain research worldwide. The total number of publications was positively associated with GDP in main productive countries. The United States was the most productive country, Harvard University was the most productive institution, Maher CG was the most productive author and Spine was the most popular journal in the field of back pain.

Abbreviations: GDP = gross domestic product, WoS = Web of Science.

Keywords: back pain, bibliometric analysis, correlation analysis, worldwide research productivity

1. Introduction

Back pain is a common and global symptom that heavily affects the quality of the people's life and even results in work disability.[1,2] Global Burden of Disease Study declared that low back pain was the top cause of years lived with disability in most countries.[3] In view of the high prevalence of the back pain, increasing researchers paid attention to back pain research.[4–8] As a result, a large number of studies have been conducted annually to explore the etiology, prevention, risk factors, and treatments of back pain,[9–12] which make it difficult to get the crucial scientific development in the field of back pain.

As important indicators, the number of published articles and citation reports have been acknowledged and frequently used to assess worldwide research productivity.[13–16] Bibliometric analysis was an important tool to measure scientific outputs of an individual, institution or country using relevant parameters including the number of published articles and citation of published articles.[17,18] Besides, bibliometric analyses could roughly investigate the trend of one specific topic and were frequently used in biomedical fields.[19–21] However, to our knowledge, there was no bibliometric analysis to assess the worldwide research productivity in the field of back pain. Therefore, the aim of this bibliometric analysis was to evaluate the worldwide research productivity, follow the scientific development and promote the cooperation in the field of back pain.

2. Materials and methods

Ethical approval was not necessary for this study because no patient was involved in this study.

2.1. Literatures search

Similar to previous bibliometric analyses,[16–18,21] literature search was conducted in the database of Web of Science (WoS) (Thomson Reuters, New York) on November 15th, 2016. The keywords were "lumbar NEAR pain," "back pain," "dorsalgia," "backache," "lumbago," "back NEAR disorder," and "discitis." The published time was limited from 1995 to 2016, without other restrictions.

Editor: Antonino Bianco.

The authors have no conflicts of interest to disclose.

Department of Cardiovascular, The First Affiliated Hospital of Beijing University of Chinese Medicine, Beijing, China.

** Correspondence: Peng Zhao, The Department of Tuina and Pain, The First Affiliated Hospital of Beijing University of Chinese Medicine, No. 5 Haiyuncang, Dongcheng District, Beijing 100700, China (e-mail: kyushuzhaopeng@hotmail.com).*

Copyright © 2018 the Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

Medicine (2018) 97:40(e11566)

Received: 18 January 2018 / Accepted: 26 June 2018

http://dx.doi.org/10.1097/MD.0000000000011566

2.2. Bibliometrics analysis

Worldwide research productivity was assessed based on a mature methodology used in other bibliometric studies.[22–24] The following information was extracted: total publications, countries, published years, journals, citations, institutions, and authors. The population size and gross domestic product (GDP) of each country were obtained from the World Bank. The top productive countries (the country produced at least 1% of total articles) were classified into high-income, upper-middle-income, lower-middle-income, and low-income countries like previous studies.[25] The publications from top productive countries were further analyzed with respect to GDP and population. Additionally, top 10 productive institutions, top 10 productive authors, top 10 cited articles, and top 5 popular journals were analyzed.

2.3. Statistical analysis

All statistical analyses were performed using SPSS software version 20.0 (SPSS Inc., Chicago, IL). The sum and average were used to analyze total publications, countries' contribution, years' contribution, journals, citations, top productive institutions, top productive authors, and top cited articles. The correlations among number of publications, GDP and population size were detected by Spearman's test as previous studies.[22,25] $P < .05$ was considered to be statistically significant.

3. Results

3.1. The general information

A total of 50,970 articles were retrieved in WoS database from 1995 to 2016. As presented in Table 1, a total of 163 countries contributed to the scientific development of back pain. The United States published the great number of articles (16,818, 33.00%), followed by England (4582, 8.99%), Germany (3,871, 7.60%), Canada (3613, 7.09%), and Australia (3063, 6.01%). The world map of worldwide research productivity demonstrated that North America, West Europe and Australia were main productive regions (Fig. 1). An obvious increase was detected in the number of annual publications worldwide in the field of back pain (Fig. 2).

3.1.1. Main productive countries or regions. The top productive countries were further analyzed (Table 1). There were 23 top productive countries, which published most publications worldwide (92.20%). Furthermore, the results showed the number of publications was significantly correlated with GDP ($P = .003$ and $R = 0.595$). However, no obvious relationship was observed between the number of publications and population size ($P = .308$, $R = 0.222$).

3.1.2. Top 10 productive countries. The top 10 productive countries published 42,074 articles, which account for 82.55% of total publications (Table 1). The top 10 productive countries all were high-income countries except for China, which was an upper-middle-income country. Regarding the production per capita, Sweden had the greatest number of articles (1.73E−04), followed by the Netherlands (1.58E−04), Australia (1.29E−04), Canada (1.01E−04), the United States (5.23E−05), Germany (4.75E−05), France (2.36E−05), Japan (1.77E−05) and China (1.41E−06). Besides, Netherlands ranked the first after adjusted for GDP, which published 3.55991E−09 articles and followed by Sweden (3.43674E−09), Canada (2.33016E−09), Australia (2.28661E−09) and England (1.60842E−09). Among the top 5 countries, the citation report of the United States was unavailable for the limited function of WoS database. As for the other 4 countries, England had the greatest total citations (120,624), followed by Canada (98,440), Germany (69,403), and Australia (68,473) (Table 2). However, Canada had the highest average citations per article (27.25), followed by England

Table 1

Publications of different countries or regions from 1995 to 2016.

Country or Region	Publication	GDP ($)	Population	Level	Publication/GDP($)	Publication/population	% of total publication
USA	16818	17,946,996,000,000	321,418,820	H	9.37093E-10	5.23E−05	32.997%
England	4582	2,848,755,449,421	65,138,232	H	1.60842E−09	7.03E−05	8.990%
Germany	3871	3,355,772,429,855	81,413,145	H	1.15353E−09	4.75E−05	7.595%
Canada	3613	1,550,536,520,142	35,851,774	H	2.33016E−09	1.01E−04	7.089%
Australia	3063	1,339,539,063,150	23,781,169	H	2.28661E−09	1.29E−04	6.010%
Netherlands	2679	752,547,410,447	16,936,520	H	3.55991E−09	1.58E−04	5.256%
Japan	2250	4,123,257,609,615	126,958,472	H	5.45685E-10	1.77E−05	4.415%
China	1927	10,866,443,998,394	1,371,220,000	M	1.77335E-10	1.41E−06	3.781%
Sweden	1693	492,618,068,569	9,798,871	H	3.43674E−09	1.73E−04	3.322%
France	1578	2,421,682,377,731	66,808,385	H	6.51613E-10	2.36E−05	3.096%
South Korea	1450	1,377,873,107,856	50,617,045	H	1.05235E−09	2.86E−05	2.845%
Turkey	1398	718,221,078,309	78,665,830	M	1.94648E−09	1.78E−05	2.743%
Italy	1364	1,814,762,858,046	60,802,085	H	7.51613E-10	2.24E−05	2.676%
Switzerland	1302	664,737,543,617	8,286,976	H	1.95867E−09	1.57E−04	2.555%
Spain	1184	1,199,057,336,143	46,418,269	H	9.87442E-10	2.55E−05	2.323%
Denmark	1085	295,164,313,329	5,676,002	H	3.67592E−09	1.91E−04	2.129%
Belgium	980	454,039,037,374	11,285,721	H	2.15840E−09	8.68E−05	1.923%
Norway	926	388,314,890,979	5,195,921	H	2.38466E−09	1.78E−04	1.817%
Brazil	858	1,774,724,818,900	207,847,528	M	4.83455E-10	4.13E−06	1.683%
Finland	854	229,810,358,212	5,482,013	H	3.71611E−09	1.56E−04	1.676%
Taiwan	657	1,022,000,000,000	23,359,928	H	6.42857E-10	2.81E−05	1.289%
India	614	2,073,542,978,209	1,311,050,527	M	2.96112E-10	4.68E−07	1.205%
Iran	533	425,326,068,423	79,109,272	U	1.25316E−09	6.74E−06	1.046%

GDP = gross domestic product, H = high-income, M = middle-income, U = upper middle income.

Figure 1. World-map distributions of publications concerning back pain from 1995 to 2016.

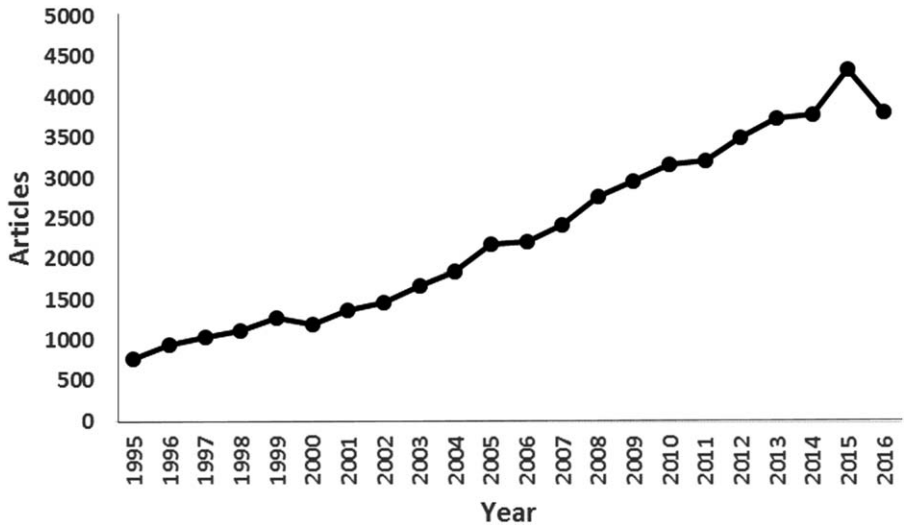

Figure 2. Publications concerning back pain from 1995 to 2016.

(26.33), Australia (22.35), and Germany (17.93). With respect to Hi-index, England ranked the first (137), followed by Canada (131), Australia (110), and Germany (102).

3.1.3. Top 10 productive institutions. The top 10 productive institutions were presented in Table 3. Harvard University was the most productive institution (917), followed by the University of Washington (896), University of Sydney (714), University of Toronto (641), and Vrije University of Amsterdam (550). Among the top 10 productive institutions, 4 were located in the United States, 2 in Canada, 2 in Australia and 1 in Sweden as well as 1 in Netherlands.

3.1.4. Top 10 productive authors. Regarding the top 10 productive authors (Table 4), *Maher CG* ranked the first and published the largest number of publications, with a total of 229 publications (0.45%), followed by *Deyo RA* (192, 0.38%), *Koes BW* (186, 0.37%), *Manchikanti L* (178, 0.35%), and *Lee SH* (168, 0.33%). Besides, 3 authors were from the United States, 3 from the Netherlands, 2 from Australia, 1 from Japan, and 1 from South Korea.

3.1.5. Top 10 cited articles. With respect to the top 10 cited articles (Table 5), *Farrar, JT* study entitled "Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale" published in *Pain* had the highest citations (1749), followed by *Beaton. DE* study (1689), *Vlaeyen. JWS* study (1553), *Lawrence. RC* study (1530), and *Astin. JA* study (1496).

3.2. Top 5 popular journals

The top 5 productive countries in the top 5 popular journals were listed in Table 6. *Spine* was the most popular journal with 3605 articles (7.07%), followed by *European Spine Journal* (1280, 2.51%), *Pain* (1085, 2.13%), *Journal of Manipulative and*

Table 2

Citation report of articles in top 5 productive countries from 1995 to 2016.

Country	USA	England	Germany	Canada	Australia
Publications	NA	4582	3871	3612	3063
Total citations	NA	120,624	69,403	98,440	68,473
Average citations	NA	26.33	17.93	27.25	22.35
Hi-index	NA	137	102	131	110

NA = not available.

Table 3

Top 10 productive institutions from 1995 to 2016.

Institution	Country	Publication	% of total publications
Harvard University	USA	917	1.80%
University of Washington	USA	896	1.76%
University of Sydney	Australia	714	1.40%
University of Toronto	Canada	641	1.26%
Vrije University of Amsterdam	Netherlands	550	1.08%
University of Pittsburgh	USA	515	1.01%
Karolinska Institute	Sweden	495	0.97%
The University of Queensland	Australia	488	0.96%
University of Alberta	Canada	487	0.96%
The University of California, San Francisco	USA	460	0.90%

Physiological Therapeutics (699, 1.37%), and *Spine Journal* (689, 1.35%). The United States was the most productive country in all top 5 popular journals. England and Canada both appeared in the top 5 productive countries in 4 popular journals. The results about top 5 popular journals in top 5 productive countries were showed in Table 7. *Spine* remained the most popular journal in the United States, England, Canada, and Australia, while *Schmerz* was the most popular journal in Germany. In additions, *Pain* appeared in all top 5 productive countries.

4. Discussion

Biomedical research publication has been frequently used as an index for assessing the worldwide scientific productivity in a specific field.[18,20,26] Bibliometric analyses have been utilized to assess the worldwide scientific productivity in several biomedical fields.[13,19,25,27,28] Recently, Huang et al. performed a citation analysis focusing on the back pain, which was published in *Spine*. However, Huang et al group only aimed to obtain the top 100 cited articles, and further analysis was also based on these 100 articles. Therefore, the results and conclusions were limited and not enough to assess worldwide scientific productivity in the field of back pain.[28] Therefore, to the best of our knowledge, our study was the first to assess the worldwide research productivity in the field of back pain from 1995 to 2016. In our study, an obvious increase was observed in the number of annual publications worldwide in the field of back pain. The United States was the most productive country and made major contributions to the development of back pain research. Harvard University was the most productive institution, Maher CG was the most productive author as well as the study conducted by Farrar et al[29] was the most popular article and *Spine* was the most popular journal.

In the study, the United States published the greatest number of publications. Besides, 4 of top 10 productive institutions located in the United States, and 3 of top 10 productive authors were from the United States. Therefore, the United States was leading the back pain research worldwide. It was a pity that we failed to obtain the citation report of the publications from the United States because of the limited functions of WoS. However, we found the United States was the most popular country among the top 5 popular journals, including famous peer-reviewed journals (e.g. *Spine*, *Spine Journal*, and *European Spine Journal*). In slight of this situation, we could roughly think publications from the United States were with relatively higher quality. In addition to the United States, the European countries (e.g., Denmark) also contributed a lot to the development of back pain research. Among the top 10 productive countries, Sweden ranked the first after adjusted for population and the Netherlands was the most productive country after adjusted for GDP. Besides, 2 of top 10 productive institutions located in European countries and 3 of top 10 productive authors were from European countries. Therefore, to some extent, the articles published in the United States and European countries should be fully utilized to improve health policies and health care worldwide.[7,30]

Similar to previous studies,[25,30] we further explored the association among the number of publications, GDP and population size. Significant relationship was detected between the number of publications and GDP, which agreed with the previous studies.[25,30] The positive relationship indicated the country's economy affected a lot on the development of scientific research. Nonetheless, there was no obvious correlation between the number of publications and the population size, which

Table 4

Top 10 productive authors from 1995 to 2016.

Authors	Publication	% of 50968	Affiliation
Maher CG	229	0.45%	Univ Sydney, Sydney Med Sch, George Inst Global Hlth, Sydney, NSW 2006, Australia
Deyo RA	192	0.38%	Oregon Hlth & Sci Univ, Dept Family Med, Portland, OR 97239 USA
Koes BW	186	0.37%	Erasmus MC, Dept Gen Practice, Rotterdam, Netherlands
Manchikanti L	178	0.35%	Pain Management Ctr Paducah, Paducah, KY USA; Univ Louisville, Louisville, KY 40292
Lee SH	168	0.33%	Korea Univ, Coll Med, Dept Orthopaed Surg, Anam Hosp, 126-1 Anamdong 5ga, Seoul 136705, South Korea
Takahashi K	162	0.32%	Chiba Univ, Grad Sch Med, Dept Orthopaed Surg, Chiba 2608670, Japan
Vlaeyen JWS	150	0.29%	Univ Leuven, KU Leuven, Fac Psychol & Educ Sci, Res Grp Hlth Psychol, Leuven, Belgium; Maastricht Univ, Dept Clin Psychol Sci, NL-6200 MD Maastricht, Netherlands
Van Tulder MW	139	0.27%	Vrije Univ Amsterdam, Fac Earth & Life Sci, Dept Hlth Sci, Amsterdam, Netherlands
Hodges PW	135	0.27%	Univ Queensland, Sch Hlth & Rehabil Sci, Brisbane, Qld, Australia
George SZ	134	0.26%	Brooks PHHP Res Collaborat, Gainesville, FL 32610; Univ Florida, Dept Phys Therapy, Phys Therapy Program, Gainesville, FL 32611

Table 5

Top 10 cited articles in back pain from 1995 to 2016.

First author	Year	Title	Journal	Citations
Farrar, JT	2001	Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale	*Pain*	1749
Beaton, DE	2000	Guidelines for the process of cross-cultural adaptation of self-report measures	*Spine*	1689
Vlaeyen, JWS	2000	Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art	*Pain*	1553
Lawrence, RC	1998	Estimates of the prevalence of arthritis and selected musculoskeletal disorders in the United States	*Arthritis and Rheumatism*	1530
Astin, JA	1998	Why patients use alternative medicine - Results of a national study	*JAMA*	1496
Lawrence, Reva C.	2008	Estimates of the prevalence of arthritis and other rheumatic conditions in the United States	*Arthritis and Rheumatism*	1462
Vos, Theo	2012	Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010	*Lancet*	1360
Breivik, H	2006	Survey of chronic pain in Europe: Prevalence, impact on daily life, and treatment	*European Journal of Pain*	1254
Fairbank, JCT	2000	The Oswestry Disability Index	*Spine*	1240
Bressler, NM	1999	Photodynamic therapy of subfoveal choroidal neovascularization in age-related macular degeneration with verteporfin—one-year results of 2 randomized clinical trials —TAP report 1	*Archives of Ophthalmology*	1100

Table 6

Top 5 productive countries in top 5 popular journals from 1995 to 2016.

Spine	*European Spine Journal*	*Pain*	*JMPT*	*Spine Journal*
USA (1434)	USA (168)	USA (408)	USA (343)	USA (352)
Canada (304)	England (142)	England (175)	Canada (126)	Canada (79)
England (304)	Switzerland (136)	Netherlands (133)	Australia (68)	South Korea (34)
Japan (282)	Germany (124)	Canada (132)	Denmark (52)	China (33)
Australia (207)	Netherlands (118)	Germany (119)	England (42)	Turkey (30)

JMPT = *Journal of Manipulative and Physiological Therapeutics*.

Table 7

Top 5 popular journals in top 5 productive countries from 1995 to 2016.

USA	England	Germany	Canada	Australia
Spine (1434)	*Spine* (304)	*Schmerz* (246)	*Spine* (304)	*Spine* (227)
Pain Medicine (424)	*Pain* (175)	*Spine* (132)	*Pain* (132)	*Manual Therapy* (156)
Pain (408)	*Rheumatology* (167)	*European Spine Journal* (124)	*JMPT* (126)	*Pain* (110)
Spine Journal (352)	*European Spine Journal* (142)	*Pain* (119)	*JOR* (108)	*BMC-MD* (90)
JMPT (343)	*Manual Therapy* (106)	*Orthopade* (113)	*Clinical Journal of Pain* (82)	*Physical Therapy* (84)

BMC-MD = BMC musculoskeletal disorders, JMPT = *Journal of Manipulative and Physiological Therapeutics*, JOR = *Journal of Occupational Rehabilitation*.

differed from the previous bibliometric analysis.[25] This difference might be explained that the topic of the current study was a little broader or the distinctly uneven distribution of the publications concerning the back pain. Moreover, 18 of 23 main productive countries were high-income countries. Regarding the 5 middle-income countries, the rapid development of society and economy significantly promoted the advance of the research productivity. In view of their developing economy, we fully believed these middle-income countries would make greater contribution to back pain research in future. On the contrary, several identified factors contributed to the poor research productivity in some countries, such as inappropriate government policy, less fund and loss of outstanding researchers.[25,31] Given that these factors were difficult to change in a short period, these countries should make full use of the high-quality researches from high-income countries to improve health policies and health care in future.[30–32]

China, the second largest economy and with over 1.3 billion people, contributes more and more to the development of worldwide scientific productivity.[25] With the advancement of society and economy, China has increased the influence on back pain research. In this study, as the only one middle -income country, China ranked the eighth in the top 10 productive countries. Besides, China ranked the tenth after adjusted for GDP or population size. Nevertheless, China seldom appeared in top 5 popular journals, which meant that many publications from China were relatively with low quality. Therefore, China government should further increase the research fund and promote the enthusiasm of researchers to publish more high-quality publications concerning back pain in future.

We also discovered the United States was the most productive country in all top 5 popular journals. However, it should be noted that most of these journals were published in the United States. Besides, England and Canada both appeared in the top 5 productive countries in 4 popular journals. Furthermore, *Spine* was the most popular journal in 4 of top 5 productive countries, including the United States, England, Australia, and Canada. *Spine* was also the most popular journal in back pain research. Therefore, *Spine* made a great contribution to the development of back pain research. Given that *Pain* appeared in all top 5 productive countries, this journal was also essential for the

development of back pain research and might be a nice journal to publish new work focusing on back pain.

There were some highlights of our study. First, it was the first bibliometric analysis to evaluate worldwide research productivity in the field of back pain over 20 years. Second, comprehensive information was provided in current study, such as top productive countries, authors, institutions, and journals. Nevertheless, our study was not without limitations. First, only articles published in WoS was included into the analysis. However, lots of articles were published in none WoS-cited journals. Second, it was hard to ensure that all the identified articles indeed focused on back pain research. Third, the citation report of the United States was unavailable for the limited function of WoS; therefore, we could not obtain the direct evidences to demonstrate that publications from the United States were with relatively higher quality. Therefore, more databases (e.g., Google Scholar) should be used to evaluate the worldwide research productivity in the field of back pain and provide more comprehensive information. Besides, the characteristics of top cited articles should be further analyzed to help new researchers design studies in future.

5. Conclusion

There was a significant increase in annual publications concerning back pain research worldwide. The total number of publications was positively associated with GDP in main productive countries. The United States was the most productive country, Harvard University was the most productive institution, Maher CG was the most productive author and *Spine* was the most popular journal in the field of back pain.

Author contributions

All authors have participated sufficiently in the study and approved the final version.
Conceptualization: Peng Zhao.
Data curation: Bin Wang, Peng Zhao.
Formal analysis: Bin Wang, Peng Zhao.
Funding acquisition: Bin Wang, Peng Zhao.
Investigation: Bin Wang, Peng Zhao.
Methodology: Bin Wang, Peng Zhao.
Resources: Bin Wang, Peng Zhao.
Software: Bin Wang, Peng Zhao.
Supervision: Peng Zhao.
Validation: Peng Zhao.
Visualization: Bin Wang, Peng Zhao.
Writing – original draft: Bin Wang, Peng Zhao.
Writing – review & editing: Bin Wang, Peng Zhao.

References

[1] Frymoyer JW. Back pain and sciatica. N Engl J Med 1988;318:291–300.
[2] Lurie JD, Gerber PD, Sox HC. Clinical problem-solving. A pain in the back. N Engl J Med 2000;343:723–6.
[3] Buchbinder R, Blyth FM, March LM, et al. Placing the global burden of low back pain in context. Best Pract Res Clin Rheumatol 2013;27:575–89.
[4] Aufranc OE, Barr JS, Brown T, et al. Orthopedic surgery. N Engl J Med 1957;256:1040–50.
[5] Beeckmans N, Vermeersch A, Lysens R, et al. The presence of respiratory disorders in individuals with low back pain: A systematic review. Man Ther 2016;26:77–86.
[6] Freimann T, Paasuke M, Merisalu E. Work-related psychosocial factors and mental health problems associated with musculoskeletal pain in nurses: a cross-sectional study. Pain Res Manag 2016;2016:9361016.
[7] Pergolizzi JVJr, Raffa RB, Fleischer C, et al. Management of moderate to severe chronic low back pain with buprenorphine buccal film using novel bioerodible mucoadhesive technology. J Pain Res 2016;9:909–16.
[8] Balague F, Mannion AF, Pellise F, et al. Non-specific low back pain. Lancet (London, England) 2012;379:482–91.
[9] Mehrdad RMM, Shams-Hosseini NSM, Aghdaei SM, et al. Prevalence of low back pain in health care workers and comparison with other occupational categories in Iran: a systematic review. Iran J Med Sci 2016;41:467–78.
[10] Singleton J, Edlow JA. Acute nontraumatic back pain: risk stratification, emergency department management, and review of serious pathologies. Emerg Med Clin North Am 2016;34:743–57.
[11] Zhang TT, Liu Z, Liu YL, et al. Obesity as a risk factor for low back pain: a meta-analysis. Clin Spine Surg 2016;331:22–7.
[12] Theroux J, Le May S, Hebert JJ, et al. Back pain prevalence is associated with curve-type and severity in adolescents with idiopathic scoliosis: a cross-sectional study. Spine 2017;42:E914–9.
[13] Crockett MT, Browne RF, MacMahon PJ, et al. 100 classic papers of interventional radiology: a citation analysis. World J Radiol 2015;7:79–86.
[14] Kusumastuti S, Derks MG, Tellier S, et al. Successful ageing: a study of the literature using citation network analysis. Maturitas 2016;93:4–12.
[15] Liu XL, Gai SS, Zhang SL, et al. An analysis of peer-reviewed scores and impact factors with different citation time windows: a case study of 28 ophthalmologic journals. PLoS One 2015;10:e0135583.
[16] Madhugiri VS, Sasidharan GM, Subeikshanan V, et al. An analysis of the citation climate in neurosurgical literature and description of an interfield citation metric. Neurosurgery 2015;76:505–12. discussion 513.
[17] Khalil GM, Gotway Crawford CA. A bibliometric analysis of U.S.-based research on the behavioral risk factor surveillance system. Am J Prev Med 2015;48:50–7.
[18] Mahon NA, Joyce CW. A bibliometric analysis of the 50 most cited papers in cleft lip and palate. J Plast Surg Hand Surg 2015;49:52–8.
[19] Ibrahim M. Bibliometric analysis of the Journal of Pakistan Medical Association form 2009 to 2013. J Pak Med Assoc 2015;65:978–83.
[20] Moodley J, Singh V, Kagina BM, et al. A bibliometric analysis of cancer research in South Africa: study protocol. BMJ Open 2015;5:e006913.
[21] Rymer BC, Choa RM. A worldwide bibliometric analysis of published literature in plastic and reconstructive surgery. J Plast Reconstr Aesthet Surg 2015;68:1304–8.
[22] Fan G, Zhou Z, Zhang H, et al. Global scientific production of robotic surgery in medicine: a 20-year survey of research activities. Int J Surg (London, England) 2016;30:126–31.
[23] Fan X, Gao Y, Ma B, et al. Chinese academic contribution to burns: a comprehensive bibliometrics analysis from 1985 to 2014. Burns 2016;42:1463–70.
[24] Ruegsegger N, Ahmad SS, Benneker LM, et al. The 100 most influential publications in cervical spine research. Spine 2016;41:538–48.
[25] Fan G, Han R, Zhang H, et al. Worldwide research productivity in the field of minimally invasive spine surgery: a 20-year survey of publication activities. Spine 2015;42:1717–22.
[26] Sweileh WM, Al-Jabi SW, Sawalha AF, et al. Bibliometric analysis of medicine-related publications on poverty (2005–2015). Springerplus 2016;5:1888.
[27] Cheng T, Zhang G. Worldwide research productivity in the field of rheumatology from 1996 to 2010: a bibliometric analysis. Rheumatology (Oxford, England) 2013;52:1630–4.
[28] Huang W, Wang L, Wang B, et al. Top 100 cited articles on back pain research: a citation analysis. Spine 2016;41:1683–92.
[29] Farrar JTJr, Lamoreaux YJ, Werth L, et al. Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. Pain 2001;94:149–58.
[30] Luo X, Liang Z, Gong F, et al. Worldwide productivity in the field of foot and ankle research from 2009-2013: a bibliometric analysis of highly cited journals. J Foot Ankle Res 2015;8:12.
[31] Liang Z, Luo X, Gong F, et al. Worldwide research productivity in the field of arthroscopy: a bibliometric analysis. Arthroscopy 2015;31:1452–7.
[32] Sweileh WM, Sawalha AF, Al-Jabi SW, et al. A bibliometric analysis of literature on malaria vector resistance: (1996–2015). Globalization Health 2016;12:76.