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A 10-Year Bibliometric Study of Pakistan Journal of Pharmaceutical Sciences

Ishtiaq Ahmed
Inter State Gas System (ISGS), Pakistan, ishtiaqlodhi@yahoo.com

Midrar Ullah
National University of Science and Technology - Pakistan

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A 10-Year Bibliometric Study of Pakistan Journal of Pharmaceutical Sciences

Abstract:

Purpose

This study aims to carry out a bibliometric evaluation of articles published in Pakistan Journal of Pharmaceutical Sciences (PJPS) from 2006 to 2015. Bibliometric study determines publication pattern and identifies research trends in a field.

Design/Methodology/Approach

All articles published in PJPS during ten years were analysed using MS Excel.

Results

A total of 951 authors contributed 1172 articles to PJPS from 2006 to 2015. Eighty-six percent authors contributed only one article each. M. Saeed Arayne and Najma Sultana were the leading principal authors with 18 and 10 articles respectively. Ninety-seven percent articles were written by more than one author. Most of the first authors (47%) were from Pakistan followed by authors from India (11%), China (6%) and Iran (5%). The host institution (University of Karachi) and province (Sindh) are ranked first in term of the contribution. The average number of citations per article was 28.67% and the average length of the articles was 6.34 pages.

Limitations

Only principal authors (first authors) were considered for the most dynamic authors, most productive institutions, geographical distribution of contributors and origin of authors within Pakistan.

Practical implications

An awareness program is needed for the faculty/researcher belonging to less contributing area i.e. Baluchistan and Azad Jammu & Kashmir. Also signing of MoUs with foreign universities will enhance contribution from abroad.

Originality/Value

The result of this study will help in designing/planning a policy/procedure for a pharmaceutical journal and a support to understand the state of pharmaceutical research in Pakistan.

KEYWORDS: Bibliometric study; Pharmaceutical Research; Citations; Author Patterns; Pakistan.

INTRODUCTION

The term bibliometrics was derived from two Greek words Biblion (book) and Merton (to measure). Pritchard (1969) introduced this word in his paper "Statistical bibliography or bibliometrics" and defined it as "the application of mathematics and statistical methods to books and other media of communication" (p. 348)). Therefore, bibliometrics is a kind of research approach used in the field of Library and Information Science to measure and analyze the productivity of literature in a specific field or journal (Ullah, Butt & Haroon, 2008).

Journals are the most up-to-date medium of scholarly communication. The researchers prefer to publish their research articles in the journals. The Faculty of

Pharmacy, University of Karachi in Pakistan has been publishing Pakistan Journal of Pharmaceutical Sciences (PJPS), a peer reviewed journal of international repute, since 1988. Initially PJPS was published biannually and the frequency was converted to quarterly in 2005 and bi-monthly in 2013. PJPS publishes original research articles, review articles, case reports and short communications from all over the world in the field of Pharmaceutical Sciences (Faculty of Pharmacy, University of Karachi, 2017). It is one of the four Health Sciences journals recognized by the Higher Education Commission of Pakistan with "W" category (Higher Education Commission, 2017). It is among the five Pakistani journals indexed for MEDLINE and 12 Pakistani journals indexed in ISI Web of Knowledge (National Library of Medicine, 2017; Thomas Reuters, 2017). The journal impact factor of PJPS was 1.103 in 2011, however, dropped to 0.581 in 2015 (Thomson Reuters, 2017).

PJPS is the only journal from Pakistan in the field of Pharmaceutical Sciences that is indexed in MEDLINE as well as ISI web of knowledge. Therefore, it was important to carry out a bibliometric study of PJPS as no such study of PJPS has been carried out so far.

The objective of this study was to carry-out a bibliometric study of PJPS from 2006 to 2015 to identify year-wise distribution of articles; authors' pattern such as amount of productivity, most dynamic authors, collaborative authorship, institutional affiliation and geographic region; number of citations; and size of papers in term of pages.

LITERATURE REVIEW

Zainab, Anyi and Anuar (2009) identified about 189 articles from literature on bibliometric studies of single journals. Anyi, Zainab and Anuar (2009) reviewed 82 bibliometric studies on single journals published between 1998 and 2008. Out of these

82 studies 19 were published in the field of health sciences. Bojo, Carabantes, Veiga and Martiniz (2004) carried out a bibliometric study of *Spanish Journal of Chemotherapy,* from 1996 to 2000. Bojo, et al found that a small group of authors contributed majority of papers to the journal. Kulkarni, Poshett and Naewade (2009) examined the articles published in the *Indian Journal of Pharmaceutical Education and Research (IJPER)* from 1996 to 2006. Kalkurni et al found increase in the number of articles from 1996 to 2006. Most of the references (70%) were from journals. About one third articles had single author. Average length of article was 4.74 page. The host country and region contributed most of the papers to the journal.

Nasir, Ahmed, Asrar and Gilani (2015) evaluated the research output of Pakistani authors in the field of Pharmacy and Pharmacology using bibliometric parameters. Nasir, et al found that authors from Pakistan contributed 0.25% to the international journals indexed in the ISI Web of Knowledge database from 1975 to 2014.

In Pakistan, a few bibliometric studies of single journals have been published in the field of health sciences (Ullah, Butt & Haroon, 2008; Ibrahim & Jan, 2015; Khan, et al, 2015; Ullah, et al, 2016). These studies observed a growth of articles per volume. The host institution, country and region contributed maximum papers. Most of the articles were contributed by multiple authors. Academic institutions were the main source of contribution to the journals.

METHODOLOGY

All original research articles, review articles, reports and short communications published in the Pakistan Journal of Pharmaceutical Sciences (PJPS) from 2006 to 2015 were included in the study. All available articles on the journal website (http://www.pjps.pk/) were downloaded. Volume 19 issue 04, volume 20 issues 01

and 02 were not available online along with 23 other articles from different volumes, therefore, print copies of these issues were obtained from medical libraries in Rawalpindi and Islamabad.

The bibliographic details such as year, volume number, issue number, number of articles published in an issue, number of authors in an article, name of principal author, Principal author's institutional affiliation, country of origin of Principal author, name of region in case of principal author was from Pakistan, number of citations in an article and number of pages per article were recorded in 12 sheets of MS Excel. The data from the main sheet was analyzed and reported in frequency and percentages.

RESULTS AND DISCUSSION

The results of data analysis are described in the following sections. Some interesting trends are noted in the research published in PJPS.

Quantitative Progress of Articles

Table 1 summarizes the year-wise distribution of all 1172 articles published in PJPS

Table 1: Quantitative Progress of Articles

Volume	Year	No. of Articles	Percentage
19	2006	61	5.20
20	2007	59	5.03
21	2008	76	6.48
22	2009	75	6.40
23	2010	80	6.83
24	2011	91	7.76
25	2012	131	11.18
26	2013	187	15.96
27	2014	191	16.30
28	2015	221	18.86
Total		**1172**	**100.00**

during ten years i.e., 2006 to 2015.

Table 1 shows average 117.2 articles per year are published in PJPS ranging from 59 to 221. The results show a significant increase in the number of articles published in last four years as 730 out of 1172 articles are published from 2012 to 2015. Only 442 articles are published during six years (2006-2011). Table 1 also shows a gradual increase in the number of article published from 2006 to 2015. The trend of gradual increase in the number of articles published in health sciences journals per year was also reported in the previous studies (Ullah, Butt & Haroon, 2008; Ibrahim & Jan, 2015; Ullah, et al, 2016).

Authors Productivity

Table 2 presents number of articles published by authors as a first author.

Table 2: Authors Productivity

No. of Articles	No. of Authors	Percentage
1	815	85.70
2	99	10.41
3	17	1.79
4	14	1.47
5	1	0.11
6	2	0.21
7	1	0.11
10	1	0.11
18	1	0.11
Total	951	100.00

Table 2 depicts that total 951 authors contributed 1172 articles to PJPS from 2006 to 2015. Most of the authors (815) contributed only one article as a first author to the journal. Ninety-nine authors contributed two articles each which is the second highest number in the list. Only six authors contributed five or more articles to the journal. The most prolific author contributed 18 articles to the journal as a first author.

Lotka's law was also tested which says that the number of authors making 'n' contributions is about $1/n^a$ of those making one contribution, where 'a' is often nearly '2'.

Table 3: Expected Authors vs Observed Authors			
No. of Articles	No. of Authors Observed	No. of Authors Expected at a=2	No. of Authors Expected at a=3
1	815	815	815
2	99	204	102
3	17	91	30
4	14	51	13
5	1	33	7
6	2	23	4
7	1	17	2
10	1	8	1
18	1	3	0

Table 3 shows that there is a huge difference and Lotka's law do not apply even if the 'a' value enhances to 3.

Most Dynamic Authors

Table 4 portrays the list of authors who had contributed four or more research papers to PJPS as a first author.

Table 4: Most Dynamic Authors

Rank	Author's Name	No. of Papers
1	M. Saeed Arayne	18
2	Najma Sultana	10
3	Mansoor Ahmad	7
4	Fazli Khuda	6
4	Jude e Okokon	6
5	Huma Ikram	5
6	Arun Rasheed	4
6	Aziz-ur-Rehman	4
6	Azra Riaz	4
6	Haroon Khan	4
6	Jehan Bakht	4
6	Mahmood Ahmad	4
6	Muhammad Imran Qadir	4
6	Muhammad Khalid Khan	4
6	Naveed Akhtar	4
6	Niaz Ali	4
6	Sajid Bashir	4
6	Syed Muhammad Shahid	4
6	Saima Khaliq	4
6	Mohammad Perwaiz Iqbal	4

Table 4 reveals that M. Saeed Arayne (University of Karachi) is the most dynamic first author who contributed 18 research papers, followed by Najma Sultana (University of Karachi) with 10 research papers. Mansoor Ahmad (University of Karachi) gets the third rank in the list with seven research papers as first author.

Table 5: Authorship structure									
Year	1-Auth	2-Auth	3-Auth	4-Auth	5-Auth	6-Auth	7-Auth	8-Auth	9-12 Auth	Total Articles
2006	3	10	25	15	5	1	2	0	0	61
2007	1	8	24	12	9	2	1	2	0	59
2008	2	21	16	14	11	8	2	0	2	76
2009	3	12	19	18	10	9	2	0	2	75
2010	2	10	17	23	12	9	5	2	0	80
2011	2	10	15	19	12	16	13	2	2	91
2012	3	13	22	24	18	23	19	4	5	131
2013	3	16	37	39	33	25	19	8	7	187
2014	3	17	38	29	36	31	20	7	10	191
2015	8	26	36	39	32	33	19	15	13	221
Total	**30**	**143**	**249**	**232**	**178**	**157**	**102**	**40**	**41**	**1172**
%	**2.6**	**12.2**	**21.2**	**19.8**	**15.2**	**13.4**	**8.7**	**3.4**	**3.5**	**100**

Authorship Structure

Table 5 summarizes the authorship structure of the PJPS articles.

Table 5 shows that 3-author articles are the highest in all categories with 249 (21.2%) articles. Four-author articles amounted to 232 (19.8%) and five-author articles amounted to 178 (15.2%) attaining second and third position in the list respectively. In this regard our results are in line with the previous studies (Ullah, Butt & Haroon, 2008; Ullah, et al, 2016) which also revealed that most of the articles are written by three, four or five authors in health sciences journals. The overall contribution came from multi-authors are 1142 articles out of total 1172 articles. However, single-author articles are low amounted to 30 (2.6%) only as compared to Ullah, Butt and Haroon (2008) and Ullah, et al (2016) who reported 10% and 6% contribution from single authors respectively.

Amount of Collaboration

Subramanyam (1983) defined a formula to understand the degree of collaboration which is C = Nm/Ns+Nm. In this formula "C" stands for degree of collaboration, "Ns" stands for total single-author articles and "Nm" for total multi-author articles.

Table 6: Amount of Collaboration			
Year	No. of Single Authored Articles (Sa)	No. of Multiple Authored Articles (Ma)	Collaboration (C)
2006	3	58	0.95
2007	1	58	0.98
2008	2	74	0.97
2009	3	72	0.96
2010	2	78	0.98
2011	2	89	0.98
2012	3	128	0.98
2013	3	184	0.98
2014	3	188	0.98
2015	8	213	0.96

This formula is applied on the data collected for the study which is presented in the Table 6. It indicates that degree of collaboration ranged between 0.95 and 0.98 when calculated year-wise. The average degree of collaboration is 0.97 which shows high degree of collaboration.

Most Productive Institutions

Table 7 depicts the most productive institution, which generates the maximum number of authors who added articles to PJPS.

Table 7 reveals that the most prolific institution is the University of Karachi, Pakistan, the host institution which publishes the journal under the study. The number of authors affiliated to this institute is 164 (13.99%). The second most productive institution is the Gomal University, D. I. Khan, Pakistan, with 31 (2.65%) authors

followed by the University of Peshawar, Peshawar, Pakistan with 24 (2.04%) authors.

Table 7 shows that 271 institutions have only one time appearance in the journal.

Rank	Institution Name	Frequency of Occurrence	% of N*
Table 7: Most Productive Institutions' Rank List			
Rank	Institution Name	Frequency of Occurrence	% of N*
1	University of Karachi, Pakistan	164	13.99
2	Gomal University, Pakistan	31	2.65
3	University of Peshawar, Pakistan	24	2.05
4	Bahauddin Zakariya University, Multan, Pakistan	20	1.71
5	University of the Punjab, Pakistan	19	1.62
6	Quaid-i-Azam University, Pakistan	18	1.54
7	Islamia University Bahawalpur, Pakistan	17	1.45
7	King Saud University, Saudi Arabia	17	1.45
7	Government College University, Faisalabad, Pakistan	17	1.45
8	Government College University, Lahore, Pakistan	16	1.37
9	University of Benin, Nigeria	15	1.28
10	University of Uyo, Nigeria	13	1.11
10	University of Dhaka, Bangladesh	13	1.11
11	Federal Urdu University of Arts, Science & Technology, Pakistan	12	1.02
12	University of Veterinary & Animal Sciences, Pakistan	11	0.94
12	Kerman University of Medical Sciences, Iran	11	0.94
12	Krupanidhi College of Pharmacy, India	11	0.94
13	Kind Abdul Aziz University, Saudi Arabia	10	0.85
13	University of Sargodha, Pakistan	10	0.85
14	Three Institutions	9	0.77
15	Three Institutions	8	0.68
16	Six Institutions	7	0.60
17	Eight Institutions	6	0.51
18	Nine Institutions	5	0.43
19	14 Institutions	4	0.34
20	28 Institutions	3	0.26
21	63 Institutions	2	0.17
22	271 Institutions	1	0.09
*Total (1172) occurrences of 424 institutions			

Geographical Distribution of Contributors

Addresses of the authors' institutions were used to record the authors' country of origin. Table 8 shows the country of origin of all authors and their ranks with respect to their contributions.

Rank	Country	Frequency	Percentage
	Table 8: Geographical Distribution of Contributors		
1	Pakistan	556	47.44
2	India	134	11.43
3	China	76	6.48
4	Iran	62	5.29
5	Malaysia	48	4.10
6	Saudi Arabia	47	4.01
7	Nigeria	46	3.92
8	Bangladesh	37	3.16
9	Egypt	35	2.99
10	Turkey	19	1.62
11	Thailand	12	1.02
12	Two countries (Korea, UAE)	9 each	0.77 each
13	Three countries (South Africa, Nepal, Jordan)	6 each	0.51 each
14	Three countries (Brazil, Indonesia, Tunisia)	5 each	0.43 each
15	Two countries (Algeria, Ethiopia)	4 each	0.34 each
16	Three countries (Italy, Libya, USA)	3 each	0.26 each
17	11 countries (Argentina, Czech Republic, Germany, Lebanon, Mexico, Palestine, Poland, England, Jamica, UK, Morocco)	2 each	0.17 each
18	10 countries	1 each	0.09 each

Table 8 shows that majority of the papers 556 (47.44%) were contributed by the authors from Pakistan. Authors from neighboring countries of Pakistan such as India, China and Iran contributed 134 (11.43%), 76 (6.48) and 62 (5.29%) articles respectively. Malaysia, Saudi Arabia and Nigeria shared 48, 47 and 46 articles respectively. Thirty-four countries contributed less than 10 articles to PJPS.

Origin of Authors within Pakistan

Table 9 presents contribution of authors from different areas of Pakistan.

Table 9 reveals that the authors from the host province i.e., Sindh contributed the maximum number of articles (244 or 43.88%). It is followed by Punjab, Khyber Pakhtunkhwa and Islamabad with 162 (29.14%), 100 (17.99%) and 34 (6.12%) respectively. Authors from Azad Jammu and Kashmir (AJK) and Baluchistan contributed only eight articles each. The contribution from Baluchistan and AJK is very low. These are the less developed areas as compared to other areas in Pakistan. Therefore, these areas lack infrastructure and facilities for research. Our results are in line with the previous studies (Ullah, Butt & Haroon, 2008; Kalkarni, et al, 2009) which also found that the host countries, region and institutions contribute more to the journal.

Table 9: Origin of Authors within Pakistan

Rank	Region	Frequency	Percentage
1	Sindh	244	43.88
2	Punjab	162	29.14
3	Khyber Pakhtunkhwa	100	17.99
4	Islamabad	34	6.12
5	Azad Jammu Kashmir	8	1.44
5	Baluchistan	8	1.44
	Total	556	100.00

Citing Range per Article

All 1172 articles have 31602 citations. The average number of citations is 28.68 per article. The maximum number of citations is 309 whereas the least number is four. The range of citations per article along with percentage in the journal under study is presented in Table 10.

Table 10: Citations Range per Article

No. of citations	No. of articles	Percentage
01 - 10	60	5.1%
11 - 20	346	29.5%
21 - 30	392	33.4%
31 - 40	198	16.9%
41 - 50	100	8.5%
51 - 60	29	2.5%
61 - 70	15	1.3%
71 - 80	6	0.5%
81 - 90	7	0.6%
91 - 100	2	0.2%
> 100	17	1.5%
Total	**1172**	**100.00%**

Table 10 indicates that one third of the total articles (1172) have the highest number of citations ranging between 21 to 30, followed by 346 (29.5%) articles ranging between 11 to 20 and 198 (16.9%) articles ranging between 31 to 40 citations. Seventeen (1.5%) articles have more than 100 citations. Our results reveal that the average references per articles in PJPS are higher than identifies in the previous studies (Jan, 2011).

Length of Article in Term of Pages

The 1102 articles cover a total number of 6983 pages. The average length per article is 6.34 pages. Table 11 presents the data on page length of articles.

Table 10: Length of Articles in term of Pages

Page range	No. of articles	Percentage
1 - 5	472	40.3%
6 - 10	655	55.9%
11 - 15	40	3.4%
16 - 20	2	0.2%
> 20	3	0.3%
Total	**1172**	**100.0%**

Table 11 shows that most articles (655 or 55.9%) are between 6-10 pages in length, followed by 472 (40.3%) articles between 1-5 pages and 40 (3.4%) articles are between 11-15 pages in length. Only five articles have length of 16 or more pages. The length of the articles varies substantially according to the discipline and types of research in previous studies (Jan, 2011). In case of our study, the average number of pages per article closely matches with the previous studies conducted by Jena (2006) and Dhiman (2000) who noted down the average page lengths of 6.45 and 6 pages per article respectively. However, in the field of Pharmaceutical Sciences, Kulkarni et al. (2009) observed 4.74 average page lengths per article.

LIMITATIONS OF THE STUDY

Only principal authors (first authors) were considered for the most dynamic authors, most productive institutions, geographical distribution of contributors and origin of authors within Pakistan.

CONCLUSION

The number of articles published in PJPS has significantly increased from 2006 to 2015. PJPS is among four health sciences journals from Pakistan indexed in both MEDLINE and ISI web of knowledge databases. Therefore, more articles need to be published in the journal to provide maximum coverage to the research studies carried out in Pakistan.

The contribution from areas in Pakistan other than the host province is less and need to be balanced. Contribution from the institutions other than the University of Karachi is comparatively low and requires due attention to attract researchers from other institutions as well. Most of the authors contributed single article to the journal, therefore, the authors need to be encouraged to contribute more papers to the journal.

International contribution needs to be enhanced to improve the impact factor of the journal.

RECOMMENDATIONS

1. The frequency of PJPS may be converted as monthly from bi-monthly to accommodate more articles as most of the prominent journals in the field of health sciences are published monthly.

2. Researchers from less developed areas in Pakistan may be provided more opportunities to contribute to PJPS. Workshops and trainings may be provided to the researchers from these areas.

3. Articles covering international issues and topics of global interest should be published regularly to attract international readers and researchers.

4. For international collaboration, memorandum of understanding (MOU) should be signed with popular international universities and institutes of Pharmacy and Pharmaceutical Sciences.

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