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Pakistan Journal of Pharmaceutical Sciences: A Bibliometric Assessment from 1998-2012.

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ABSTRACT

Background: Bibliometric assessment of journal literature helps the policy makers to formulate policies regarding the related subject and to know the latest trends of publications. The pharmaceutical sciences are combination of various academics fields and technologies of pharmaceutical products related to design, action, delivery and nature of drugs. The aim of this study is to evaluate the research productivity of Pakistan Journal of Pharmaceutical Sciences (PJPS).

Research Methods: This is retrospective study on research items published in PJPS during 1998 – 2012 carried out at Libraries of King Saud bin Abdulaziz University for Health Sciences, Saudi Arabia during March to September 2017. The data was collected from the website of respective journal. Spreadsheet of Microsoft Excel was prepared for statistical analysis.

Results: PJPS published 722 articles contributed by 2504 authors with an average of 4.06 authors per article during the years 1998 – 2012. Male authors (67%) were dominated in writing research items. Majority of articles (97%) were written by multi-authors, single author share was very small (3%). Pharmacognosy found to be the most preferred area of research. The contribution from the researchers of 32 countries produced 329 (45.5%) articles revealed that the journal has international recognition.

Conclusion: PJPS creates a credible place for imparting the knowledge of pharmaceutical sciences research from all around the world, providing a platform to scientists and researchers to share their information to another one for saving a life.

Key words: Pharmaceutical science; Bibliometrics; Research Productivity

Introduction:

Pakistan Journal of Pharmaceutical Sciences (PJPS) is a peer reviewed multi-disciplinary pharmaceutical sciences journal, started its publication from 1988 by the Faculty of Pharmacy, University of Karachi as a biannual journal, frequency changed as quarterly in 2005, and now PJPS is being published as bi-monthly from January 2013. Journal publishes the original articles, review articles, and case report on biological, pharmaceutical and medicinal research from the researchers all over the world. PJPS is indexed in various databases; e.g; ASCI Database, AsiaNet, CAB Abstracts, CABI, Chemical Abstracts, EBSCO, EMBASE, EMRmedex, ESSCI, EVISA, GDPBM, MEDLINE/PubMed, SCImago, SCOPUS, Scribd, WebStatDomain and WorldCat. PJPS is recognized by Higher Education Commission with “W” category and awarded Impact Factor 1.103 by Thomson Reuter in 2011. (<http://www.pjps.pk/>)

Research is carried out for enhancement of existing knowledge, provide solutions to specific problems, and improve processes and practices. Since research findings have significant value for society, research has attained an important place in all fields of knowledge (Naseer & Khalid; 2009). The word bibliometrics was originated by Pritchard (1969), which substituted the earlier term “*statistical bibliography*” which was used for the same concept. Mahapatra (2002) defined Bibliometrics as “*the quantitative analysis of the characteristics, behaviour and productivity of all aspects of written communication, library staff and information users*”(P.4). The Oxford English Dictionary (2012) defines bibliometric as “*the branch of library science concerned with the application of mathematical and statistical analysis to bibliography; the statistical analysis*

of books, articles, or other publications". Bibliometric studies have been extensively used to examine the publications and pattern of research in different branches of medical sciences (Haq & Al Fouzan; 2017). Research publications in a journal embodiment of the scholarly thought with the objective to transmit innovative idea or information to any specific field of knowledge towards the further development of a subject (Warriach & Ahmad; 2016). An academic journal provides significant channels for dissemination of research results (Smita & Vaishali; 2013). Bibliometric studies provides useful indicators of trends, scientific productivity, emphasis of research in various fields, and re-searcher preferences for publication. It considers organization, classification, and quantitative evaluation of publication patterns as well as provide an analysis of macro-communication (Alhaider, Ahmed & Gupta; 2015). Pharmaceutical literature reflects the scientific development and research productivity of the pharmaceutical sciences, the analysis of published items helps for the growth of the profession and to overcome its weaknesses. The aim of this study is to provide the bibliometric analysis of publications appeared in *PJPS* during 1998-2012.

Objectives of the Study

The present study was conducted to investigate the following characteristics of articles published in *PJPS* during 1998-2012.

1. To find out the number of original articles.
2. To examine the chronological distribution, authorship pattern, gender wise distribution and geographical affiliation of contributors.
3. To arrange subject wise distribution of articles to highlight the strong and weak areas of research.

Research Method

This retrospective study on the research items published in *Pakistan Journal of Pharmaceutical Sciences (PJPS)* during 1998 to 2012, was carried out at King Saud bin Abdulaziz University for Health Sciences Riyadh, Saudi Arabia during of December 2016 to March 2017. The data of *PJPS* was collected and downloaded from the website of respective journal (<http://www.pjps.pk/>). Microsoft Excel Spreadsheet was prepared to manage and organize the data. Research publications were analyzed based on chorological and geographical productivity

of articles, authorship patterns, gender wise distribution of authors and segregation of sub-specialties.

Results:

Figure-1 & Table-1 revealed that PJPS produced 722 articles in 45 issues of 15 volumes published from 1998 to 2012 with the average of 16.04 articles per issue. The average annual growth rate was recorded 11.55%. The publication frequency of PJPS was twice in a year from 1998 to 2004 with the average 8.35 articles per issue, whereas the frequency of publications was changed from six-monthly to quarterly from 2005. During 2005 to 2012, PJPS published 605 articles with the average of 19.51 articles per issue. Publication of articles range varies from minimum 6 articles to maximum 42 articles in different issue.

Figure 1: Year Wise Distribution of Articles

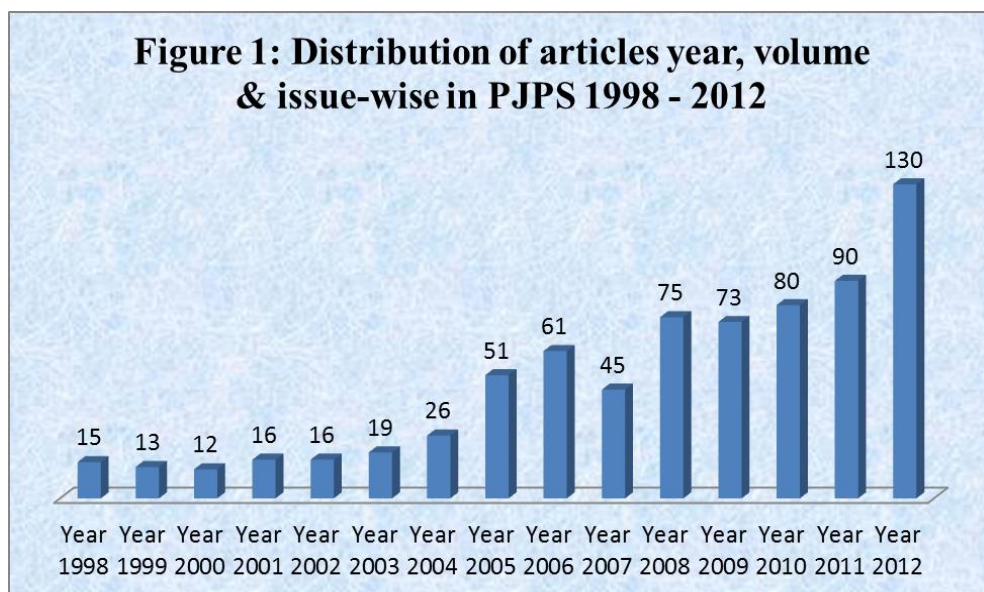


Table 1: Chronological Distribution of Articles

Year	Vol:	All Issue 1	All Issues 2	All Issues 3	All Issues 4	Total articles with %	Average articles per volume	Annual Growth
1998	11	8	7			15 (2.08%)	7.5	
1999	12	7	6			13 (1.80%)	6.5	-15.38%
2000	13	6	6			12 (1.66%)	6	-8.3%
2001	14	9	7			16 (2.22%)	8	25%
2002	15	7	9			16 (2.22%)	8	0.00%
2003	16	9	10			19 (2.63%)	9.5	15.78%
2004	17	12	14			26 (3.60%)	13	26.92%
2005	18	12	14	14	11	51 (7.06%)	12.75	49.01%
2006	19	15	16	15	15	61 (8.45%)	15.25	16.39%
2007	20	16	14	NA	15	45 (6.23%)	11.25	-35.55%
2008	21	15	17	20	23	75 (10.39%)	18.75	40.0%
2009	22	20	19	20	14	73 (10.11%)	18.25	-2.73%
2010	23	20	20	21	19	80 (11.08%)	20	8.75%
2011	24	16	22	23	29	90 (12.47%)	22.5	11.11%
2012	25	42	29	31	28	130 (18.01%)	32.5	30.76%
Articles published in all issues		214	210	144	154	722 (16.04 articles per issue) 11.55% Average annual growth rate		
Publication per issue & %		29.64%	29.09%	19.94%	21.33%			

NA* means: Not Accessible or Available.

Figure-2 & Table-2, illuminated that 722 articles contributed by 2941 authors with the average of 4.06 authors per article. Gender wise distribution of all authors showed that male authors (n=1972; 60.05%) were dominated as compared to females (n=969; 32.95%). Gender wise sharing as principal author was also led by male (n=488; 67.59%), whereas female researcher as first author counted 234 (32.41%).

Figure 2: Authors contribution with gender specification

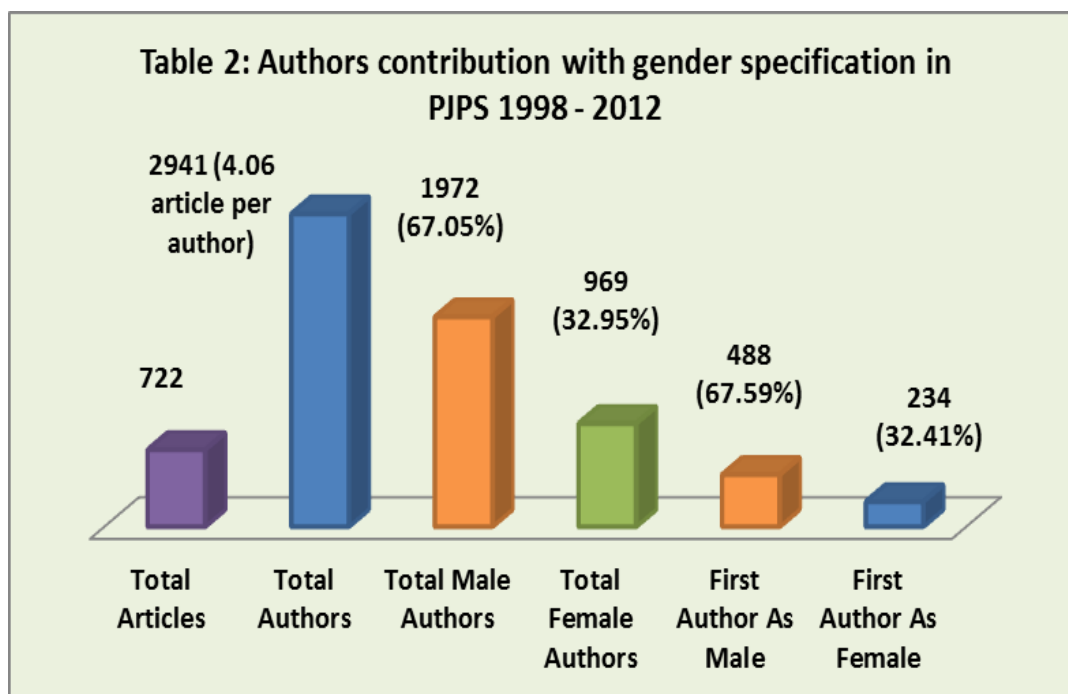


Table 2: Authors contribution with gender specification in PJPS from 1998 – 2012.

Years	Total Articles	Total Authors	Total Male Authors	Total Female Authors	First Author As Male	First Author As Female
1998	15	49	22	27	8	7
1999	13	40	19	21	6	7
2000	12	44	21	23	4	8
2001	16	59	30	29	10	6

2002	16	69	49	20	11	5
2003	19	83	50	33	13	6
2004	26	93	65	28	17	9
2005	51	192	122	70	37	14
2006	61	200	134	66	47	14
2007	45	165	93	72	22	23
2008	75	279	198	81	48	27
2009	73	288	208	80	57	16
2010	80	336	220	116	51	29
2011	90	423	317	106	65	25
2012	130	621	424	197	92	38
Total	722 (16.04) Articles per issue & (48.13) Articles per volume	2941 (4.06 authors per article)	1972 (67.05% out of 2941 authors	969 (32.95% out of 2941 authors	488 (67.59% out of 722 articles	234 (32.41% out of 722 authors

Figure-3 and Table-3 described the authorship pattern that majority of articles (n=181; 25%) were produced by three authors pattern, followed by 161 (22.3%) articles written by four and 108 (14.9%) articles contributed by two authors pattern. Single author counted only in 21 (2.9%) articles, large number of articles (n=701; 97.1%) were the result of collaborative efforts.

Table 3: Author ship pattern in all issues in PJPS 1998 – 2012

Authorship Pattern	All Issues 1998	All Issues 1999	All Issues 2000	All Issues 2001	All Issues 2002	All Issues 2003	All Issues 2004	All Issues 2005	All Issues 2006	All Issues 2007	All Issues 2008	All Issues 2009	All Issues 2010	All Issues 2011	All Issues 2012	No of articles written by Authors
Single Author	0	1	0	1	0	0	2	0	3	1	2	3	2	2	4	21 (2.9%)
Double Authors	4	4	4	1	1	4	2	4	12	8	22	11	11	9	11	108 (14.9%)
Three Authors	4	4	1	6	3	4	11	23	23	17	14	18	14	15	24	181 (25%)
Four Authors	6	1	3	4	6	3	7	11	15	8	14	18	23	19	23	161 (22.3%)
Five Authors	1	3	3	3	4	2	1	8	5	6	11	10	11	12	18	98 (13.5%)
Six Authors	0	0	1	0	2	3	1	4	2	1	8	9	12	18	24	85 (11.7%)
Seven Authors	0	0	0	1	0	2	1	1	1	3	2	2	5	10	17	45 (6.2%)
Eight Authors	0	0	0	0	0	0	1	0	0	1	0	0	2	2	5	11 (1.5%)
Nine Authors	0	0	0	0	0	1	0	0	0	0	2	1	0	2	2	8 (1.1%)
Ten Authors	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	4 (0.5%)
Above Ten Authors	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	722 (100%)
Total Articles	15	13	12	16	16	19	26	51	61	45	75	73	80	90	130	
%	2.08%	1.80%	1.66%	2.22%	2.22%	2.63%	3.60%	7.06%	8.45%	6.23%	10.39%	10.11%	11.08%	12.47%	18.01%	

City wise geographical distribution of authors affiliations with various medical institutes located in 19 different cities of Pakistan produced 394 (54.5%) articles placed in Table – 4. Majority of research (n=259; 35.87%) was created by the authors affiliated with Karachi, the largest city of Pakistan in term of population, followed by Lahore (n=28; 3.88%), Dera Ismail Khan (n=25, 3.46%), Bahawalpur, Multan and Peshawar each city produced 14 (1.94%) article each and Islamabad 13 (1.8%). Twenty seven articles (3.73%) produced in the 12 cities of Pakistan.

Table 4: City Wise Affiliation of Article Produced by Pakistani Authors

S.No		Total Published Articles	%
1	Karachi	259	35.87%
2	Lahore	28	3.88%
3	Dera Ismail Khan (DIK)	25	3.46%
4	Bahawalpur	14	1.94%
5	Multan	14	1.94%
6	Peshawar	14	1.94%
7	Islamabad	13	1.80%
8	Faisalabad	6	0.83%
9	Jamshoro	6	0.83%
10	Quetta	3	0.42%
11	Mansehra	2	0.28%
12	Rawalpindi	2	0.28%
13	Sargodha	2	0.28%
14	Abbottabad	1	0.14%
15	Gujrat	1	0.14%
16	Hyderabad	1	0.14%
17	Khairpur	1	0.14%
18	Kohat	1	0.14%
19	Swat	1	0.14%
20	Total articles with %	394 (54.57%)	

Table-5 showed that authors affiliated with 32 countries produced 329 (45.5%) articles, India garbed the largest proportion with 88 (12.1%) publications, respectively Iran 48 (6.6%),

Bangladesh 37 (5.1%), Nigeria 35 (4.8%), Malaysia 18 (2.4%), Saudi Arabia 11 (1.5%) and Turkey 10 (1.3%). Twenty six articles (3.60%) contributed the authors belonged to 18 different countries of the world.

Table 5: Authors affiliated with International organizations

S.No	Country	Published Articles	%
1	India	88	12.19%
2	Iran	48	6.65%
3	Bangladesh	37	5.12%
4	Nigeria	35	4.85%
5	Egypt	30	4.16%
6	Malaysia	18	2.49%
7	Saudi Arabia	11	1.52%
8	Turkey	10	1.39%
9	China	8	1.11%
10	Jordan	4	0.55%
11	Thailand	4	0.55%
12	UAE	4	0.55%
13	Indonesia	3	0.42%
14	Libya	3	0.42%
15	Algeria	2	0.28%
16	Germany	2	0.28%
17	Morocco	2	0.28%
18	Nepal	2	0.28%
19	Poland	2	0.28%
20	South Korea	2	0.28%
21	Tunisia	2	0.28%
22	UK	2	0.28%
23	Argentina	1	0.14%
24	Brazil	1	0.14%
25	Ethiopia	1	0.14%
26	France	1	0.14%
27	Jamaica	1	0.14%
28	Oman	1	0.14%
29	Palestine	1	0.14%
30	Sri Lanka	1	0.14%

31	Swat	1	0.14%
32	USA	1	0.14%
	Total articles published with %	329	45.57%

Table 6: Classification of published articles by specialties

S. No	Sub Specialties	Number of Articles	%
1	Pharmacognosy	247	34.21%
2	General Pharmacology	138	19.11%
3	Pharmaceutical Chemistry	115	15.93%
4	Microbiology	68	9.41%
5	Biochemistry	51	7.06%
6	Pharmaceutics	29	4.01%
7	Pharmacodynamics	22	3.04%
8	Clinical Pharmacy	11	1.52%
9	Pharmacokinetics	10	1.39%
10	Toxicology	8	1.11%
11	Neurology	4	0.55%
12	Oncology	4	0.55%
13	Ophthalmology	3	0.42%
14	Histology	2	0.28%
15	Immunology	2	0.28%
16	Pathology	2	0.28%
17	Urology	2	0.28%
18	Hematology	1	0.14%
19	Hepatology	1	0.14%
20	Pharmacokinetics	1	0.14%
21	Endocrinology	1	0.14%
		722	

Total 722 publications published during 15 years (1998-2012) in PJPS were distributed in 21 subspecialties of pharmacology. Pharmacognosy found to be the most favorite area (n=247; 34.%) for conducting research, followed by General Pharmacology (n=138; 19.11%) and Pharmaceutical Chemistry (n=115, 15.93%). Good number of articles also written on the subject of Microbiology (n=68; 9.41%), Biochemistry (n=51; 7.06%), Pharmaceutics (n=29; 4.01%), Pharmacodynamics (n=22; 3.04%), Clinical Pharmacy (n=11; 1.52%) and Pharmacokinetics (n=10; 1.39%). There is dire need to pay attention on Toxicology, Neurology, Oncology,

Ophthalmology, Histology, Immunology, Pathology, Urology, Hematology, Hepatology, Pharmacokinetics, and Endocrinology.

Discussion

Number of studies had been conducted on bibliometric analysis of journal literature. A Scientometric analysis on the pharmaceutical research published in Saudi Arabia during 2001-2010 was conducted by Alhaider, Ahmed & Gupta (2015) based on data retrieved from Scopus database. Total 1386 papers were written with annual growth rate 14.21%. The global share of Saudi Arabia in pharmaceutical research was 0.50%. The research collaboration of Saudi scientists with Egypt (n=247; 43.95%) was higher, followed by USA (n=88; 15.66%) and Pakistan (n=19; 3.38%). Most of research was carried out on Cancer, Cardiology and Diabetes. College of Pharmacy, King Saud University was the most productive organization with 505 papers and H.Y. Aboul-Enein was most productive researcher with 85 papers. The research productivity of top 15 countries was also assessed, and USA discovered to be on the top with 152027 documents, almost one fourth (24.49%) share of the total research followed far behind by China with 46388 publications on pharmacology during 2001 to 2010.

A bibliometric study conducted by Ibrahim and Jan (2015) on 913 original articles with 19153 citations published in *Journal of Pakistan Medical Association (JPMA)* during 2009 to 2013. Study illustrated that there were 27 (3%) articles written by single author and remaining 886 (97%) articles were the result of collaborative efforts. Geographical affiliation of first authors revealed that 658 (72%) articles were produced by authors belonged to Pakistan, the share of researchers associated with the organization located at Sindh province (n=481; 52.7%) was on the top. International contributors produced 255 (28%) articles, in which Iran stood first with 101 (11.1%) publication. Subject wise distribution of articles showed that *Community Medicine* (n=140; 15.3%) was the favourite area for researchers followed by *Medicine* (n=134; 14.7%), only 41 (4.5%) articles were written on *Pharmacology*.

A recent study scrutinized on 1199 research articles produced by 3798 contributors published in *Pakistan Journal of Medical Sciences (PJMS)* from 2001 to 2010 examined by Baladi & Umedani (2017). Male authors (80.30%) and collaborative research activities 87.77% were dominated. *Community Medicine* was the most interested area of research followed by *Oncology* and *General Medicine*, few articles (n=19; 1.58%) were found on *Pharmacology*. Geographical affiliation of the authors revealed that 39% contributors belonged to Pakistan, Karachi was in leading position, whereas overseas contributions

disclosed that researchers from 32 countries published their research in *PJMR* among them Iran (355 authors, 29.61%) was on top followed by Turkey (7.09%).¹¹

A bibliometric study was carried out by Ullah, Butt and Haroon (2008) on 572 articles with 9968 citations published in *Journal of Ayub Medical College* from 1997-2006. Majority of articles (92%) were written by multi-author. Total 403 authors contributed these articles, Muhammad Tayyab and Waris Qidwai found to be the most productive authors with seven articles each and Ayub Medical College and Hospital Complex, Abbottabad (35.49%) was the most productive organization. Half of the articles (51.57%) were written by the authors affiliated with North West Frontier Province followed by Punjab. Subject wise distribution of articles exposed that *Internal Medicine* (n=167; 29.2%) was the most interested area of research, followed by *Pathology* (n=72; 12.59%) and some articles on *Pharmacology* (n=17; 2.97%) were also found. Study suggested that researchers should be encouraged to cite their local literature, which would help to increase the authority of national medical journals.

An article on “Medical Education and Research in Pakistan” published in *The Lancet* (Ghaffar, Zaidi, Qureshi, & Hafeez; 2013). described that there was 88 medical colleges in Pakistan produced 171450 doctors. Medical productivity varies from 2 to 521 publications per college per year, most of the publications were not indexed in PubMed. Few colleges generated 100 or more publications. Paper stated that the aim of research is to help in decision making process to improve the health of the population, but research carried out in Pakistan rarely helps the health policy makers. Out of 88 colleges, 22 published their own research journal, only Ayub Medical College Journal was indexed in PubMed.

Conclusion

Bibliometric evaluation supports to develop the bibliographic control of a published literature, a measuring instrument to calculate the growth of publication and highlights the weak and strong areas of research. Growing trends of publication is evident by this fact that out of all articles, 448(62%) papers were published during 2008 to 2012. The contribution of female authors and collaborative research efforts are also accelerated. Papers from international community proved the authenticity and popularity of *PJPS* in global academic milieu.

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