

## Research Publication Trend in Pharmaceutical Sciences: A Bibliometric analysis during 2013-2017

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**Abstract-***The present study aims to analyse the research output performance on Pharmaceutical Science subject. A total of 1913 research articles published in Web of Science database were analysed to find out the performance of Pharmaceutical Science professionals from all over the world in terms of growth during the period 2013-2017 (last five years). Annual growth rate, global publication shares, prolific author in the field, high productive Institutions, Journals, etc are studied in this article. This study reveals that maximum numbers of funding agencies are from China. The average number of publications per year is 382; a greater number of articles were published during 2016. In the country wise contribution of documents, USA contributed 30.21% of the total publication. Among journals Acta Pharmaceutica Sinica B journal ranked first with 162 articles and among the funding agencies National Natural Science Foundation of China stands first with 4.6% funding.*

**Keywords:** Bibliometric, Pharmaceutical Science, Research Publications, Publication Trend,

### 1. Introduction

Pharmacy is the base of health sciences. This profession is responsible for the treatment of a patient by preparing, dispensing and appropriate use of medication, which provides services to achieve optimal therapeutic outcomes. A pharmacist's job is to prepare, mix, compound or dispense drugs and medicines, ointments, powder, pills, tablets and injections on the prescription of a medical practitioner, dentist or veterinarian. In detail, they are concerned with production of pharmaceutical products, development of the methods or processes of production and quality control. Those in research concern themselves with synthesis of new drugs (what is commonly referred to as molecules), new processes, clinical testing of the effects of such drugs on animals and humans, and obtaining the required license from the drug control authorities (Ritu, Mueen & Gupta, 2014).

Prior to 1922, pharmacology as a distinct scientific discipline did not exist in India, exception to Portuguese controlled Goa. Calcutta School of Tropical Medicine that started in 1921, established a full chair for the first time on pharmacology. Prof. Ram Nath Chopra, a student of Professor Walter E. Dixon of Cambridge, was selected as the first Professor. Trends in

medical education were fast changing in India, and soon pharmacology was recognized as an essential part of teaching discipline in medical colleges. From about 1925 to the beginning of 1940, there was hardly any emphasis on pharmacological teaching and research in India except in the two post-graduate research centres at the School of Tropical Medicine, Calcutta and the Haffkine Institute, Bombay. During World War II, India was in the grip of drug “famine” because of the almost complete cutting off of supplies from Europe and other countries. This focused the attention of the Indian administrators on the pharmacologists, who were involved in teaching and research in the country and they were given the responsibility of the procurement, production, the development of drugs urgently needed for the injured in the war. For the first time the importance of pharmacology was felt. At that time, Indian professionals involved in rather ill-equipped pharmacology without proper infrastructure, rose to the occasion with the help of chemists and developed substitutes and indigenous replacements for many of the drugs commonly used in the treatment of war injuries and for the prevention of such diseases such as cholera, smallpox, and other diseases. So, one can assume that the war has played an important role in the development of pharmacological teaching and research and in the progress and development of the pharmaceutical industry. Since then a number of teaching and research institutes have come up in the country for studying pharmacology. There are at present over 225 programs in pharmacy conducted by different universities in India. The main courses in pharmacy are the 2 years in Pharmacy (D.Pharm), 4 years Bachelor of Pharmacy (B.Pharm), 2 years Master of Pharmacy (M.Pharm), Pharma D and Ph.D programmes. There are about 245 pharmacy colleges in India. As pharmacology is the base of medical care and the present analysis can be of the great value for the policy makers in the research and development of this field. (Har & Gupta, 2009).

Bibliometrics is a type of research method used in library and information science. It utilizes quantitative analysis and statistics to describe patterns of publication within a given field or body of literature. Researchers may use bibliometric methods for evaluation of a particular literature.

## **2. Review of Literature**

Few Scientometric studies have been published in the area. Reddy and Mahesh Kumar (2006) provided a Scientometrics analysis of world papers published by 57 countries in 10 major sub – specialities appearing in three leading international journals during the ten-year period. Dotson et al. (2011) analysed changes in the authorship and characteristics of articles in pharmacy journals during the 20-year period. In the field of Bibliometrics of country output in pharmacology only a few studies have been carried out on India. Ahila et al., 2011; Gupta, Ritu & Kumar, 2018; Chaman, Kumar & Biradar, 2017; Li,G et al., 2010 analysed the research output performance on Pharmacology & Biomedicine. A total of 22,065 research articles published in Web of Science were analyzed to find out the performance of scientists from all over the world in terms of growth during the period 1999-2010 (12 years). Annual growth rate, global publication shares and rank among 15 countries of the world, authorship pattern, high productive Institutions, Journals, etc were discussed. Bagalkoti & Hosamani, 2014; Biradar, & Vijayalaxmi, 1997; Kannappanavar B.U, Chidanandswamy and Vijayakumar M (2004) highlighted the authorship trend and collaborative research in chemistry in India during 1996-2000. The study found that team research is preferred in the field of chemistry rather than solo research. The degree of collaboration is calculated and found to be 0.76. The degree of collaboration varies from year to year and is found to be 0.72 to 0.83. Average number of authors per paper has increased from 7.52 to 8.39. Ann Barrett,

Melissa Helwig, and Karen Neves (2016) described the literature of hospital pharmacy and identifies the journals most commonly cited by authors in the field, the publication types most frequently cited, the age of citations, and the indexing access to core journals. The study also looks at differing citation practices between journals with a wide audience compared to a national journal with a focus on regional issues and trends in the field and found that, Three-quarters of all cited items were published within the last 10 years (71%), and journal articles were the most heavily cited publication type (87%).

### 3. Objectives

The following are the objectives of the study, to find out the year wise publication;

- To know the Annual growth rate of pharmacy literature.
- To analyse the authorship pattern of contribution.
- To find out author productivity in Pharmaceutical Science literature.
- To examine the chronological-wise distribution of articles/publications.
- To study the most prolific contributions of journal.
- To investigate the geographical distribution of articles;
- To find out the communication channels used by the authors.

### 4. Methodology

Database analysis is the major techniques employed by the investigator for the present study. The data was collected from the Web of Science database in the month of May 2017. All the articles published on Pharmaceutical Science field from last five years of 2013 to 2017 analysed and presented in the tabular format. It includes the information regarding the pattern of authorship, year of publication, geographical location of the author and their affiliated institutes, name of the journal, languages of publication and type of articles. These data were analysed and presented in different tables and figures as shown below.

### 5. Data Analysis and Interpretation

#### 5.1 Document wise distribution of publications

The Web of Science database have extracted all the details such as author(s), year of publication, type of article, name of top prolific journal(s), etc. of all articles published from 2013 to 2017 were recorded for the following analysis.

**Table 1 – Document wise distribution of publications**

Document Types	Records	% of 1913
Article	1205	62.990
Review	604	31.573
Editorial Material	87	4.548
Proceedings Paper	23	1.202
Book Chapter	8	0.418
Meeting Abstract	7	0.366
Book Review	7	0.366
Letter	2	0.105

We have different type of communications in different publications; Table 1 reveals that, document wise distribution of Pharmaceutical Science literature. It can be noted that out of

1913 research output, majority 63% of publication output is in article form in the journals, followed by Reviews (31%), Editorial Material (4%), Proceedings Paper (1%), Book Chapter, Meeting Abstract, Book Reviews and Letters (less than 1%) are meagre publications in the field of Pharmaceutical Science subject. Journal articles holds first place as usual compared to other fields.

### 5.2 Language wise distribution of publications

Table 2 shows that majority of the articles published in English language (94%), followed by Japanese language with 3% and Portuguese with 0.62%. Remaining languages such as Chinese, Spanish, Russian, German, Turkish, Polish and French language contributions to this Pharmaceutical Science study is less than 1%. Again, it is proved that English is the universal language of the world.

**Table 2 - Language wise distribution of publications**

Languages	Records	% of 1913
English	1804	94.302
Japanese	64	3.346
Portuguese	12	0.627
Chinese	7	0.366
Spanish	6	0.314
Russian	4	0.209
German	4	0.209
Turkish	2	0.105
Polish	2	0.105
French	2	0.105

### 5.3 Author wise distribution of publications

Ranking list of authors help professionals in many ways, example for deciding popularity, to select reading materials, to decide acquisition policy and so on. It can be observed from the Table 3 that the author Wang J, Liu Y and Liu X got the first rank with 8 (0.41%) articles. Shi J G and Li Y shared second rank with 7 (0.36%) articles, Wang L, Li L shared the third rank with 6 (0.31%) articles, Zhang L and Wang Y shared fourth rank with 5 (0.26%) articles on Pharmaceutical Sciences studies. Anonymous publications are six (0.31%) in numbers

**Table 3 - Author wise distribution of publications**

Authors	Records	% of 1913	Rank of Author
Wang J	8	0.418	1
Liu Y	8	0.418	
Liu X	8	0.418	
Shi J G	7	0.366	2
Li Y	7	0.366	
Wang L	6	0.314	3
Li L	6	0.314	
Anonymous	6	0.314	
Zhang L	5	0.261	4
Wang Y	5	0.261	

#### 5.4 Institution wise distribution of publication

Table 4 - presents data on the number of documents on Pharmaceutical Science subject contributed by various universities and different research organizations in the world. Out of the total of 1913 contributions, the highest number i.e., 42 (2.19%) were contributed by Chinese Academy of Medical Sciences and stood 1<sup>st</sup> rank among the institutions, followed by Chinese Academy of Sciences got 2<sup>nd</sup> rank by publishing 40 (2.09%) articles. USFDA secured 3<sup>rd</sup> rank by publishing 39 (2.03%) articles. Peking Union Medical College came in 4<sup>th</sup> rank by publishing 38 (1.98%) articles, 5<sup>th</sup> rank got by University of Copenhagen with 23 (1.20%) articles. 22 (1.15%) articles are published by University College London and stood 6<sup>th</sup> rank. 7<sup>th</sup> rank is shared by GlaxoSmithKline and Eli Lilly Co by publishing 18 (0.94%) articles each. University of Sydney and Rutgers State University contributed 17 (0.88%) articles and stood 8<sup>th</sup> place among the institutions during the study period. 240 (87.59%) publications are from different R&D organisations and occupied first place in this study, 34 (12.40%) publications are from two universities in the world.

**Table 4 - Institution wise distribution of publications**

Organizations	Records	% of 1913	Rank
Chinese Academy of Medical Sciences	42	2.19	1
Chinese Academy of Sciences	40	2.09	2
US FDA	39	2.03	3
Peking Union Medical College	38	1.98	4
University of Copenhagen	23	1.20	5
University College London	22	1.15	6
GlaxoSmithKline	18	0.94	7
Eli Lilly Co	18	0.94	
University of Sydney	17	0.88	8
Rutgers State University	17	0.88	

#### 5.5 Funding agency wise distribution of publications

Table 5 shows that the National Natural Science Foundation of China leads the table with its 4.6% of publications being featured in the funding agency followed by the National Institutes of Health with 1.46% publications and NIH with 1.25%. Less than 1% of articles are funded by the remaining funding agencies such as National Science Foundation, European Union, Welcome Trust, Fundamental Research Funds for the Central Universities, NIGMSNIHHHS, National Basic Research Program of China and NSFC agencies.

**Table 5 - Funding Agency wise distribution of publications**

Funding Agencies	Records	% of 1913
National Natural Science Foundation of China	88	4.600
National Institutes of Health	28	1.464
NIH	24	1.255
National Science Foundation	19	0.993
European Union	16	0.836
Welcome Trust	12	0.627
Fundamental Research Funds for The Central Universities	10	0.523
NigmsNihHhs	9	0.470
National Basic Research Program of China	9	0.470
NSFC	7	0.366

## 5.6 Source wise Ranking of publications

Table 6- shows the subject wise distribution of articles. 36% of the articles are published in the subject of Pharmacy & Pharmacology, next place is taken by Multidisciplinary Chemistry and third place is taken by the Medicinal Chemistry (5.75%). General Internal Medicine and Analytical Chemistry related articles are 4.8% and 4.1% respectively. Molecular Biology Biochemistry, Public Environment Occupational Health and Education Scientific Disciplines contributed 3% articles. 2% articles are in the Applied Microbiology Biotechnology and Experimental Medicine Research subjects.

**Table 6 - Subject wise Distribution of Articles**

Web of Science Categories	Records	% of 1913
Pharmacy&Pharmacology	698	36.487
Multidisciplinary Chemistry	225	11.762
Medicinal Chemistry	110	5.750
General Internal Medicine	92	4.809
Analytical Chemistry	79	4.130
Molecular Biology&Biochemistry	67	3.502
Public Environmental Occupational Health	62	3.241
Education Scientific Disciplines	60	3.136
Applied Microbiology&Biotechnology	56	2.927
Experimental Medicine Research	52	2.718

## 5.7 Year wise distribution of publications and citations

The growth of the Pharmaceutical Science research publication during 2013–2017. In the year 2016 is the highest (30%) number of articles are published, followed by 2015 with 25% articles and these two years are the most productive years in relation to the number of publications. The less productive years are 2013–2014 with average of 17% publications. More and more number of publications started appearing gradually in the journals. Highest citations are received by the year 2016, followed by the year 2015. It is found from the study that, there is a relation between number of publications and its citations, because highest publications got highest citations in this study. Lowest citations got by the year 2013. Very less difference is available between the publication and citations is in the year 2017.

**Table 7 -Year wise distribution of publications and citations**

Publication Years	Records	% of 1913	Citations	Percentage
2017	180	9.409	186	12.23
2016	583	30.476	599	39.40
2015	494	25.823	485	31.90
2014	325	16.989	211	13.88
2013	331	17.303	39	2.56

## 6 Findings

- Journal articles holds first place as usual compared to any other fields.
- Majority of the articles published in English language (94%).



- Most prolific author in the pharmaceutical sciences subject is shared by Wang J, Liu Y and Liu X and got the first rank by contributing 8 (0.41%) articles each during the study period.
- Out of the total of 1913 contributions, the highest number i.e., 42 (2.19%) were contributed by Chinese Academy of Medical Sciences and stood 1<sup>st</sup> rank among the institutions,
- Leading funding agency in the Pharmaceutical Sciences is National Natural Science Foundation of China with its 4.6% of publications being funded by this agency during the study period.
- Among the nations, USA contributed & leading with 30.21% of the articles.
- Acta Pharmaceutica Sinica B journal holds the first rank by publishing 8.46% articles and published the majority number of articles compared to any other journals, in the field of Pharmaceutical Sciences.
- 36% of the articles are published in the subject of Pharmacy & Pharmacology.
- Highest (30%) number of articles published and highest number of citations (39.40%) received in the year 2016.

## 7. Suggestions

It is suggested that, a greater number of nations as well as funding agencies should come forward in providing financial assistance to the researchers as in this study it is depicted that, very smaller number of authors got financial assistance from the funding agencies. If assistance comes from the government/learned organizations and pharmaceutical companies, then this Pharmaceutical Science subject will grow very fast, and which is essential to improve the health condition of human being.

## 8. Conclusion

The result of the study helps the pharmacy college librarians in selection and in acquisition of journals in the field of Pharmaceutical Sciences. It also helps them in proper organization and management of this literature for better use by the scholars in the field. In general, the study reveals the growth of literature and current trend in the field of Pharmaceutical Sciences.

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