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RESEARCH PRODUCTIVITY OF THE TOP FIVE PHARMACY INSTITUTIONS BASED ON THE NIRF RANKING 2022

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Abstract

The current study is being used to evaluate the research output of the top five pharmacy institutions based on the NIRF ranking 2022. The rationale for choosing this topic is that pharmacy is a domain that is continually expanding and will continue to grow in the near future. It is simply a profession that has stepped forward to help the people of society. Thousands of people were capable of saving their lives as a result of this during the Covid 19 pandemic. The Scopus database was chosen for the present study because of its wide coverage. A total of 18,209 documents were found for a period of five years from 2017 to 2021 and were used for analysis. The MS Excel and VOS Viewer software were used to analyze the data, and bibliographic tools and techniques were used to further explore the data. This study attempts to analyze the research output of the top five pharmaceutical institutions based on their publication growth, preferred publication format, prolific authors, international collaborations, and preferred sources. The finding revealed that BITSP published the most publications (40.75%) with an average of 1484 publications per year. The author from Panjab University, S. Thakur, has the most publications with 707 among all the top five pharmacy institutions. Panjab University has the highest international collaboration among all top institutes. This study will be useful for students and researchers in identifying India's top higher education institutions in the field of pharmacy.

Keywords: Bibliometric, VOSviewer, NIRF, Pharmacy, Collaboration

Introductions

The expansion of the Indian pharmaceutical industry on a global scale was driven by an enthusiastic and entrepreneurial endeavour. The Government of India established the various pharmacy institutions to become a centre of excellence for advanced study, research, and development in pharmaceutical sciences. The Ministry of Education, Government of India, uses the National Institutional Ranking Framework (NIRF) to rank institutions of higher education in India. On September 29, 2015, the MHRD approved the Framework and the Minister of Human Resource Development announced it. Institutions have been ranked in 11 categories, including overall, university, college, engineering, management, pharmacy, law, medical, architecture, dental, and research. In order to determine rankings, the Framework takes into account a variety of factors, such as available resources, existing research, and the perspectives of many stakeholders. The criteria were divided into five groups, each with a different weight. Different institutions have different weightings. In the first round of rankings, about 3500 institutions took part willingly (NIRF, n.d.). These institutions highlight their research in specific areas and findings that are made available to the general public in an effort to increase their influence and help research communities around the world.

In recent years, the research community has developed a strong interest in bibliometric evaluations of research productivity. In the field of library and information science, bibliometric study is a crucial topic of investigation (Broadus, 1987; Rawat et al., 2021; Vellaichamy & Jeyshankar, 2015). It is frequently used to accumulate the most important findings from a collection of bibliographic materials (Martínez-López et al., 2018; Parida et al., 2022; Patel et al., 2021a). In order to explain a statistical method for valuing all areas of knowledge, Pritchard first used the word "bibliometrics" in 1969 (Hood & Wilson, 2001; Mokhtari et al., 2019; Nayak et al., 2021; Patel and Singh, 2022; Pritchard, 1969).

The present study evaluates the research productivity of the top five pharmacy institutions selected through the NIRF ranking 2022 and and presents bibliometric evaluations of these top five pharmacy institutions in terms of publications during the period from 2017 to 2021 as reflected in the Scopus database. Table 1 represents the top five institutions with their scores. A brief overview of the top five institutions is given below.

Table 1: Top five Pharmacy NIRF Ranking Institutions

NIRF	Name	State/ UT	Year of Establish-ment	RPC Score	Courses		
					UG	PG	PhD
1	Jamia Hamdard (JH)	New Delhi	1972	82.43	Yes	Yes	Yes
2	National Institute of Pharmaceutical Education and Research, Hyderabad (NIPERH)	Telangana	2007	57.88	-	Yes	Yes

[Table Contd.

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NIRF	Name	State/ UT	Year of Establish-ment	RPC Score	Courses		
					UG	PG	PhD
3	Panjab University (PU)	Chandigarh	1944	78.42	Yes	Yes	Yes
4	National Institute of Pharmaceutical Education and Research, Mohali (NIPERM)	Punjab	1998	61.57	-	Yes	Yes
5	Birla Institute of Technology & Science - Pilani (BITSP)	Rajasthan	1950	60.61	Yes	Yes	Yes

* RPC Score = Research and Professional Practice Score

Objectives of the study

- To draw a research productivity trend lines for all top pharmacy institutions;
- To find the most preferred document forms preferred by top pharmacy institutions;
- To examine the most contributive authors from top pharmacy institutions;
- To check the international collaboration of top pharmacy institutions; and
- To find the top publishing sources for top pharmacy institutions.

Methodology

This study, which examines the top five institutions of pharmacy according to the National Institutional Ranking Framework (NIRF) 2022, is descriptive in nature and uses bibliometric analysis. Due to its extensive scope, the researchers chose to collect data from the Scopus database (Scopus, n.d.). To analyze the data across multiple dimensions, researchers used a number of indicators, including publication patterns, preferred publication format, prolific authors from pharmaceutical institutions, general author collaboration, most collaborating institutions, international collaborations, and leading sources.

Data Extraction

The data was extracted using Elsevier's Scopus citation and abstracting database, which produces peer-reviewed literature (Patel et al., 2021b; Singh et al., 2021). The search string was (AF-ID("Jamia Hamdard" 60025589) OR (AF-ID("National Institute of Pharmaceutical Education and Research Hyderabad" 60110421)) OR ((AF-ID("Panjab University" 60018526)) OR ((AF-ID("National Institute of Pharmaceutical Education and Research Mohali" 60001411)) OR ((AF-ID("Birla Institute of Technology and Science Pilani" 60000414)) AND (LIMIT-TO (PUBYEAR,2021) OR LIMIT-TO (PUBYEAR,2020) OR LIMIT-TO (PUBYEAR,2019) OR LIMIT-TO (PUBYEAR,2018)

OR LIMIT-TO (PUBYEAR, 2017))) on July 29, 2022. A total of 18209 records were found during the data extraction.

Data Analysis

After extracting the data, it was analyzed and visualized using MS Excel software and VOS Viewer (version 1.6.16) for better representations of the results.

Results and Discussion

Publications Pattern

The top five pharmacy NIRF ranking institutions (JH, NIPERH, PU, NIPERM, and BITSP) published 18209 publications from 2017 to 2021. BITSP published the most with 7421 publications (40.75%) with 1484 average publications per year, followed by PU, which published 6881 publications at 37.79% with 1376 average publications per year, and JH, which published 2597 publications at 14.26% with 519 average publications per year. NIPERH and NIPERM published the least number of publications, with 3..44% (125 average publications per year) and 3.75% (136 average publications per year) of the total output, respectively. Figure 1 shows the research productivity of the top five pharmacy institutions. JH, PU, and BITSP have increasing trends, while NIPERH and NIPERM have slight fluctuations across the study period. NIPERH and NIPERM publication trends are nearly identical to each other.

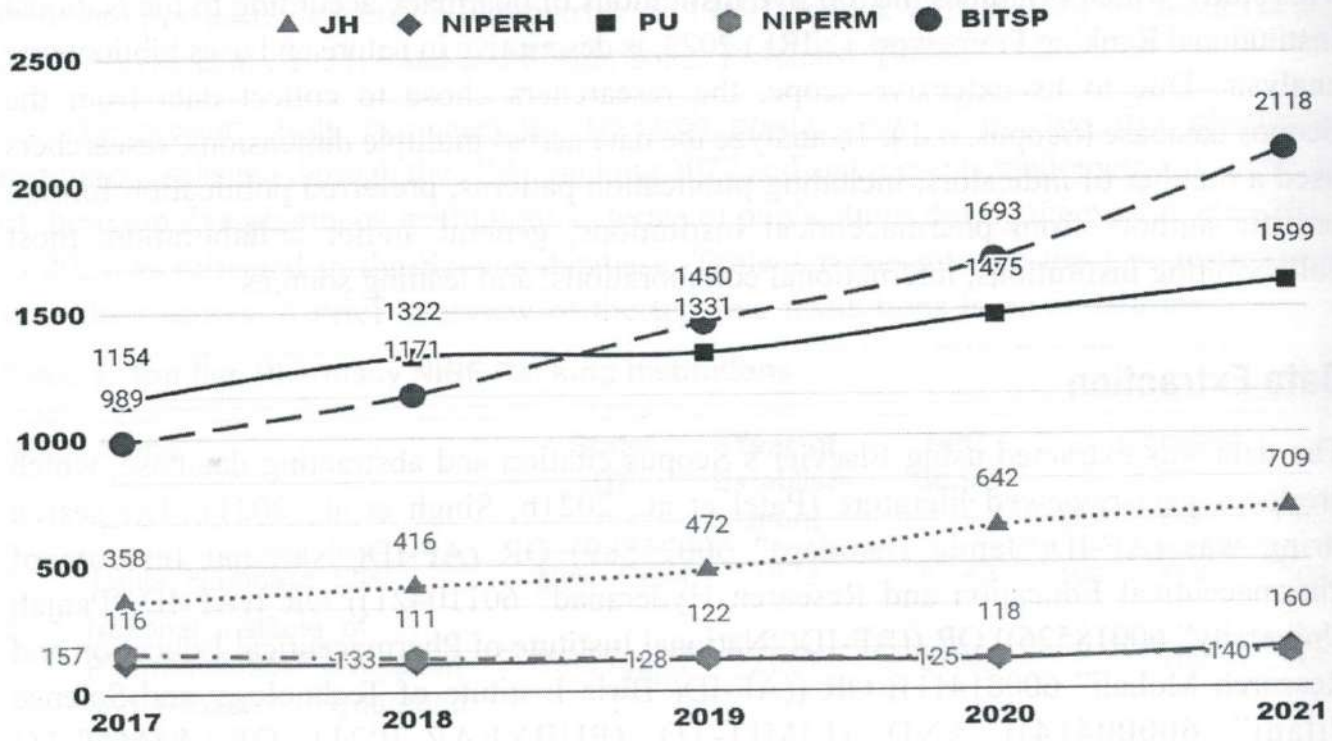

Figure 1: Publication trends

Preferred form of Publication

The research output of the top five pharmacy NIRF ranking institutions accumulated a total of 18209 publications during 2017-2021. These publications have several types of documents, such as articles, reviews, book chapters, conference papers, letters, editorials, notes, books, erratums, and others. Most of these publications were published in English and other languates. The articles have the highest contribution of total publications from all these institutions, followed by reviews, letters, erratum, notes, and others. PU has the highest number of articles with 5072, followed by BITSP (4403 articles), JH (1732 articles), NIPERM (551 articles) and NIPERH (460 articles). BITSP has the most conference papers with 2199, followed by PU (784 conference papers), JH (105 conference papers), and others.

Table 2: Documents' Types

Doc. Type	JH	NIPERH	PU	NIPERM	BITSP
Article	1732	460	5072	551	4403
Review	436	128	496	77	423
Book Chapter	217	23	359	31	280
Conference Paper	105	0	784	2	2199
Letter	31	2	32	5	13
Editorial	21	5	34	5	39
Note	18	0	21	2	14
Book	16	1	21	3	5
Erratum	9	6	45	5	27
Short Survey	5	2	8	2	7
Retracted	3	0	2	0	1
Data Paper	2	0	6	0	7

Most Authors of Pharmacy Institutions

Table 3 depicts the list of the top 20 authors affiliated with the top five pharmacy NIRF ranking institutions in the study. These top authors may be responsible for NIRF's ranking through publication growth. The author from Panjab University, S. Thakur, has the most publications with 707 among all the top five pharmacy institutions, followed by S. Kumar with 704 publications, T. Huang with 624 publications, W. S. Hou with 621 publications, and all others from Panjab University. The top 20 authors from Panjab University have at least 550 publications, while all the other top 20 authors have less than 130 publications. The top authors from JH are S. Beg (114 publications), J. Ali (111 publications), and F. J. Ahmad (98 publications); from NIPERH are C. Godugu (101 publications), N. Shankaraiah (75 publications), and A. Kamal (69 publications); from NIPERM are S. Jain (89 publications), P. V. Bharatam (77 publications), and U. C. Banerjee (53 publications); and from BITSP are S. Goel (125 publications), D. Sriram (106 publications), and G. Singhvi (98 publications).

Table 3: Most Authors

JH's Authors	TP	NIPERH's Authors	TP	PU's Authors	TP	NIPERM's Authors	TP	BITSP's Authors	TP
Beg, S.	114	Godugu, C.	101	Thakur, S.	707	Jain, S.	89	Goel, S.	125
Ali, J.	111	Shankaraiah, N.	75	Kumar, S.	704	Bharatam, P.V.	77	Sriram, D.	106
Ahmad, F.J.	98	Kamal, A.	69	Huang, T.	624	Banerjee, U.C.	53	Singhvi, G.	98
Kesharwani, P.	86	Singh, S.B.	49	Hou, W.S.	621	Kushwah, V.	50	Dubey, S.K.	93
Baboota, S.	85	Khan, W.	37	Evdokimov, O.	620	Bansal, A.K.	49	Chamola, V.	86
Najmi, A.K.	82	Alvala, M.	33	Salur, S.	619	Singh, I.P.	36	Ghosh, B.	77
Parvez, S.	74	Nanduri, S.	33	Wang, Y.	613	Laha, J.K.	35	Sahoo, P.K.	73
Abdin, M.Z.	66	Shastri, N.R.	33	Zhang, Z.	590	Singh, S.	33	Kotkunde, N.	62
Rahman, M.	66	Naidu, V.G.M.	32	Milosevic, J.	584	Garg, P.	28	Sangwan, K.S.	60
Kamal, A.	61	Khurana, A.	30	Mohanty, G.B.	584	Roy, I.	28	Singh, S.K.	55
Aqil, M.	60	Kumar, A.	29	Castilla-Valdez, H.	580	Sangamwar, A.T.	28	Routroy, S.	54
Vohora, D.	60	Arifuddin, M.	28	Piccolo, D.	578	Bansal, D.	26	Javed, A.	53
Ahmad, S.	58	Saifi, M.A.	27	Riccardi, C.	578	Sharma, S.S.	26	Gupta, A.K.	49
Iqbal, Z.	55	Sigalapalli, D.K.	27	Rodozov, M.	578	Katiyar, S.S.	25	Das, D.	46
Akhtar, M.	51	Tokala, R.	25	Bahinipati, S.	577	Kumar, V.	25	Krishna, V.S.	46
Kohli, K.	46	Angeli, A.	23	Choi, Y.	577	Chakraborti, A.K.	22	Biswas, S.	45
Hasnain, S.E.	45	Babu, B.N.	23	Hadjiiska, R.	577	Singhal, S.	21	Singh, A.P.	44
Imam, S.S.	45	Supuran, C.T.	23	Singh, J.B.	577	Tikoo, K.	19	Mishra, B.	41
Wajid, S.	45	Chavan, R.B.	22	Abbrescia, M.	576	Tikoo, K.B.	19	Saha, R.N.	40
Talegaonkar, S.	44	Pooladanda, V.	21	Li, W.	576	Ghai, B.	17	Kumar, A.	39

Overall Authors' Collaboration

Figure 2 depicts the overall authors' collaborations of the top five pharmacy NIRF ranking institutions. This is an overlay picture of collaboration made by VOSviewer visualisation software. After putting in the parameters such as 50 minimum documents of an author and at least 300 citations, the researchers found the top 127 author threshold. Among these thresholds, 53 thresholds are highly connected to each other. The authors, A.Kumar, S.Kumar, S.Singh, V.Kmar, S.Beg, and others, have the highest total link strengths. The overlay visualisation shows the total link strengths in the scaling pattern. In the figure, there are a total of 8 clusters, with several colours, containing 53 items, 208 links, and 1208 total link strengths. Cluster 1 contains 11 items including M.Alvala, B.N.Babu, C.Godugu, A.Kamal, and others; Cluster 2 contains 9 items including J.K. Laha, S.S. Sharma, U.C. Banerjee, P.Garg, and others; Cluster 3 contains 8 items including S.Beg, F.J.Ahmad, M.Aquil, S.S.Imam, and others; Cluster 4 and 5 contains 6 items each; Cluster 6 and 7 contains 5 items each; Cluster 8 contains 3 items.

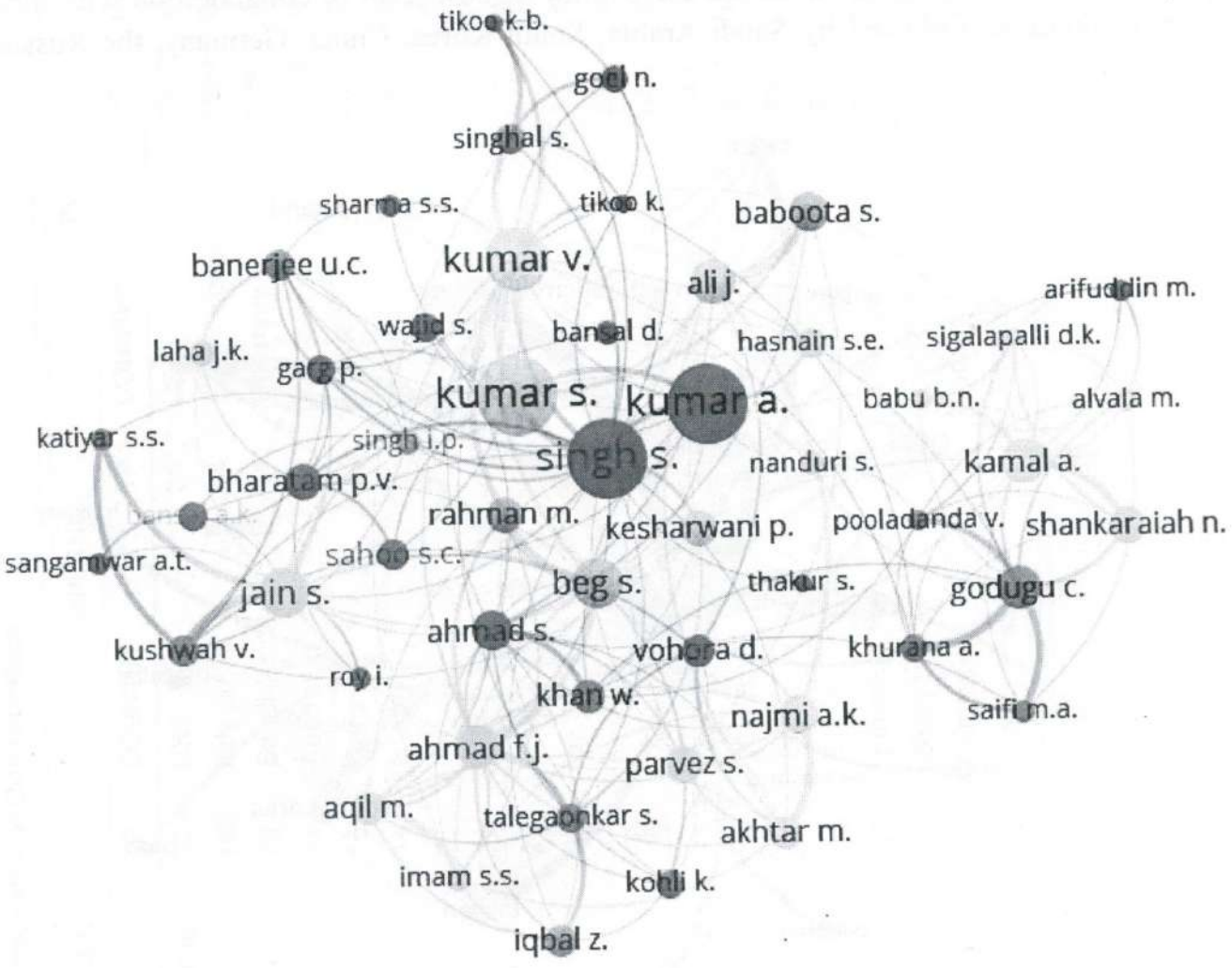

Figure 2: Most Authors' Collaborations

International Collaborations

Table 4 collects the international collaboration of the top five pharmacy NIRF ranking institutions. There are 145 international collaborations among these top institutions. Panjab University has the highest international collaboration among all top institutes. It collaborated with 1300 publications with the USA and was followed by South Korea with 1084 publications, Germany with 1061 publications, China with 1059 publications, the Russian Federation (USSR) with 995 publications, and others. Jamia Hamdard College of Pharmacy highly collaborated with Saudi Arabia (507 publications), while all four institutions highly collaborated with the USA. There are many more international collaborations such as the UK, Malaysia, Italy, Australia, Canada, France, Czech Republic, Singapore, and others.

Overall, countries' collaboration

The top five institutions have 145 international collaborations, which are visualized through VOSviewer software. Only 32 out of 145 countries fulfilled the criteria of minimum 50 publications. The United States has the overall highest level of collaboration with these top institutions, followed by Saudi Arabia, South Korea, China, Germany, the Russian

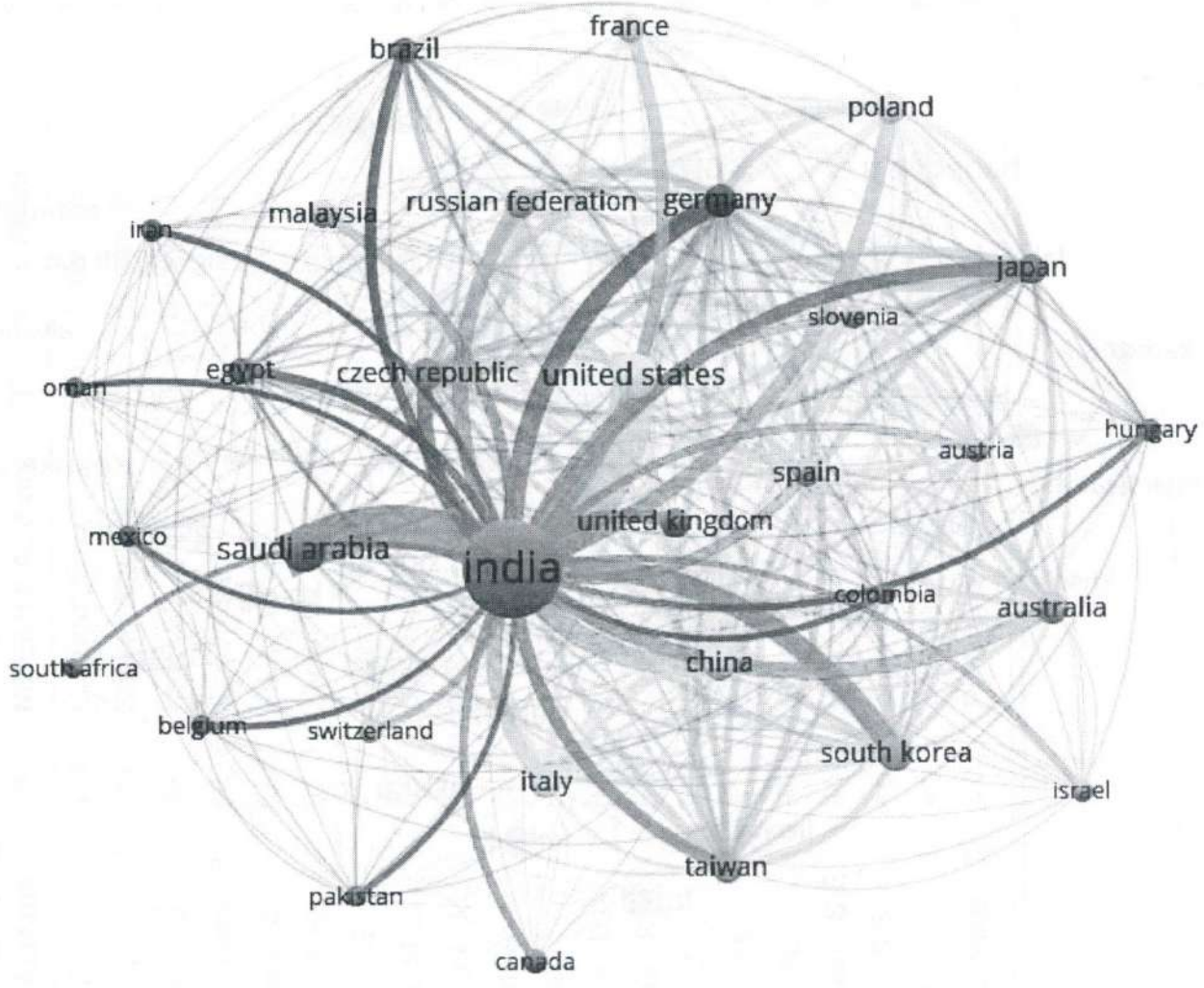

Figure 3: International Collaborations

Table 4: International Collaboration

JH		NIPERH		PU		NIPERM		BITSP	
COUNTRY	**TP**	**COUNTRY**	**TP**	**COUNTRY**	**TP**	**COUNTRY**	**TP**	**COUNTRY**	**TP**
Saudi Arabia	507	USA	30	USA	1300	USA	50	USA	474
USA	145	Italy	24	South Korea	1084	Germany	10	Germany	142
Malaysia	70	Saudi Arabia	24	Germany	1061	Australia	8	UK	125
UK	64	Australia	18	China	1059	UK	8	Australia	115
Australia	46	Canada	14	USSR	995	China	7	Canada	103
China	44	Israel	9	Poland	989	Nigeria	5	France	101
UAE	36	Poland	7	Czech R.	962	Saudi Arabia	5	Singapore	101
South Korea	31	Chile	6	Italy	954	France	4	UAE	84
Oman	29	France	6	France	925	New Zealand	4	China	82
France	26	UK	5	Brazil	902	Malaysia	3	Saudi Arabia	74
Italy	21	Iraq	4	UK	899	Mexico	3	Norway	72
Singapore	20	Ireland	4	Austria	846	South Korea	3	Italy	65
South Africa	19	Malaysia	4	Switzerland	846	Brazil	2	Brazil	63
Canada	16	USSR	3	Mexico	825	Brunei D.	2	Japan	63
Germany	16	Brazil	2	Pakistan	820	Ireland	2	Malaysia	54
Egypt	15	China	2	Hungary	800	Jordan	2	Taiwan	48
Japan	15	Finland	2	Ukraine	799	South Africa	2	South Korea	47
Poland	15	Kyrgyzstan	2	Finland	793	Switzerland	2	Spain	46
Portugal	15	Singapore	2	Spain	777	Austria	1	Turkey	43
Czech R.	13	South Africa	2	Thailand	774	Canada	1	USSR	39

Federation, and others. As per the total link strength, the United States also topped, followed by China, Germany, South Korea, the Russian Federation, the Czech Republic, and others. Belgium, Colombia, South Africa, and others have 50-60 overall collaborations. The size of the circle shows the collaborations of publication and the thickness of the lines shows the number of links between countries, such as the India-United States 733 links, India-Saudi Arabia 721 links, India-South Korea 340 links, India-China 328, India-Germany 303 links, and other connecting lines.

Top Preferred Sources

The Journal of Drug Delivery Science and Technology is the top preferred source by authors of Jamia Hamdard with 45 publications, followed by Bioorganic Chemistry with 43 publications. Whereas Bioorganic Chemistry is the top preferred source with 35 publications, followed by the European Journal of Medicinal Chemistry with 35 publications by authors of the National Institute of Pharmaceutical Education and Research Hyderabad. The Journal of High Energy Physics and Physics Letters Section B Nuclear Elementary Particle and High Energy Physics, with 254 and 180 publications, respectively, are considered the top preferred sources by the authors of Panjab University. The top preferred sources for authors of the National Institute of Pharmaceutical Education and Research, Mohali, are the International Journal of Pharmaceutics and the Journal of Pharmaceutical and Biomedical Analysis, with 17 publications each. Materials Today Proceedings, with 175 publications, is the top most preferred source by the authors of Birla Institute of Technology & Science-Pilani followed by Advances in Intelligent Systems and Computing, with 101 publications.

Conclusion

To promote institutions and universities in India, the government established the National Institutional Rating Framework (NIRF). Students and researchers will benefit from this initiative in terms of teaching, learning and presentation. To maintain the high status of the school, it is necessary to raise the level of quality. It is well known how NIRF affects pharmaceutical research outcomes (publications). The institute's publications increased after India's ranking exercise. Therefore, based on our research results, open access is the most effective way to make research papers from all universities available to the public. This study recommends that needs assessments for individuals, departments, and organizations be included in the new NIRF assessment criteria. These five pharmacy institutions performed plenty of research. In response to the increased demand for subject-level appraisals, this study will be useful for students and researchers in identifying India's top higher education institutions in the field of pharmacy.

Table 5: Top Preferred Sources

JH		NIPERH		PU		NIPERM		BITSP	
SOURCE TITLE	**TP**	**SOURCE TITLE**	**TP**	**SOURCE TITLE**	**TP**	**SOURCE TITLE**	**TP**	**SOURCE TITLE**	**TP**
Journal Of Drug Delivery Science And Technology	45	Bioorganic Chemistry	35	Journal of High Energy Physics	254	International Journal of Pharmaceutics	17	Materials Today, Proceedings	175
Bioorganic Chemistry	43	European Journal Of Medicinal Chemistry	30	Physics Letters Section B Nuclear Elementary Particle And High Energy Physics	180	Journal of Pharmaceutical And Biomedical Analysis	17	Advances in Intelligent Systems And Computing	101
Scientific Reports	39	Chemistryselect	24	Materials Today Proceedings	162	New Journal of Chemistry	16	Lecture Notes in Computer Science, Artificial Intelligence And Bioinformatics	82
Current Pharmaceutical Design	31	Bioorganic And Medicinal Chemistry Letters	17	Physical Review D	162	AAPS Pharmscitech	15	ACM International Conference Proceeding Series	62
International Journal Of Biological Macromolecules	28	Journal Of Pharmaceutical And Biomedical Analysis	17	European Physical Journal C	130	ACS Omega	14	Aip Conference Proceedings	51
European Journal Of Medicinal Chemistry	27	Organic And Biomolecular Chemistry	15	Aip Conference Proceedings	118	Bioorganic Chemistry	14	Communications In Computer And Information Science	47
Advances In Intelligent Systems And Computing	22	Bioorganic And Medicinal Chemistry	12	Physical Review Letters	117	Molecular Pharmaceutics	14	Iop Conference Series Materials Science And Engineering	47
Archiv Der Pharmazie	22	Journal Of Drug Delivery Science And Technology	12	Physical Review C	103	European Journal Of Medicinal Chemistry	13	Lecture Notes In Mechanical Engineering	47
Nanoformulation Strategies For Cancer Treatment	21	New Journal of Chemistry	12	Advances In Intelligent Systems And Computing	76	International Journal of Biological Macromolecules	12	IEEE Sensors Journal	42
Biomedicine and pharmacotherapy	20	Asian Journal of Organic Chemistry	11	Journal of Instrumentation	52	Journal of Organic Chemistry	12	Lecture Notes In Civil Engineering	42

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