J Data Sci. Info. Citation Studies., 2024; 3(1):69-89.
https://www.jcitation.org

Research Article

Bibliometrics Research in India: A Quantitative and Qualitative Assessment of Publications during 2014-23

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ABSTRACT

Background: The present study investigates publications characteristics and trends in bibliometrics research in India using bibliometric methods. **Materials and Methods:** The study is based on quantitative analysis of publications contributed by India in the area of bibliometric research in 2014-23. The data for the purposes has been sourced from the Scopus database using a pre-defined search strategy. The indicators used for publications analysis include type of publication, citation count, author count, institutional affiliation count, country of origin, funding bodies, etc. Data analysis and visualization has been conducted using Microsoft Excel. **Results:** A total of 3402 publications were published across 1134 journals, with 5954 authors from 1238 organizations contributing to the research. India has shown a significant growth in publications, with an average annual growth rate of 36%, compared to the world's 21.35%. External funding supported 14.17% of India's research output, while international collaboration accounted for 24.98%. The leading organizations include Symbiosis International Deemed University, Malaviya National Institute of Technology Jaipur and Banaras Hindu University. The most impactful organizations are Malaviya National Institute of Technology Jaipur, South Asian University and National Institute of Industrial Engineering, Mumbai. The most prolific authors are S. Kumar, B.M. Gupta and G. Pratap. Core journals in bibliometrics research include Library Philosophy and Practice, Scientometrics and Journal of Scientometric Research. **Conclusion:** The study concludes that India has the potential to become a global leader in bibliometrics research through increased productivity, collaborations and leveraging diverse expertise.

Keywords: Bibliometrics Research, India, Publications, Citation, Collaboration.

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Received: 27-09-2023;
Revised: 30-11-2023;
Accepted: 14-02-2024.

INTRODUCTION

The field of library and information science has seen the evolution of several quantitative study terminologies over the years. These include librametry, bibliometrics, scientometrics, informetrics, webometrics and altmetrics. Bibliometrics, as defined by Alan Pritchard in 1969, involves applying mathematical and statistical methods to analyze books and other communication media (Pritchard, 1969). It has grown to encompass various aspects of scientific information analysis and plays a crucial role in decision-making processes in research, science and technology.

Bibliometrics has been a research method in library and information science for five decades, but has seen significant growth with the advancement of computer technology and the internet (Hertzel, 2003). The field has evolved to include analysis of research-related documents, counting books, articles, publications, citations and the evaluation of research impact (Bellis, 2009, Jovanoviv, 2012). Bibliometrics methods involves monitoring research, assessing scientific contributions, analyzing dissemination processes and understanding key players and trends within the field. The methodologies applied range in complexity and are used to support decision-making in research priorities, funding allocation and scientific excellence (Zuccala, 2016). These methods have spread beyond the information and library science domain due to the abundance of data, accessibility and analytical tools available (Rousseau, 2017). Bibliometric methods are now widely used in scientific specialties, research evaluation and ranking institutions worldwide (Provalis, 2020, Ellegard, 2015). Researchers from various disciplines have contributed to interdisciplinary approaches in bibliometric studies, focusing on both informational and non-informational parameters of science (Mejia, 2022).

The advancement of bibliometric research is attributed to high-powered computer technology, the internet, readily available software for text data analysis and the increased interest

DOI: 10.5530/jcitation.3.1.8

Publishing Partner : EManuscript Tech. [www.emanuscript.in]

from governments and institutions in evaluating research impact (Beck, 2008, Powell, 2004). Bibliometric methods are now established as scientific specialties and are integral in research evaluation methodology, especially in scientific and applied fields (Thelwell, 2008).

The field has seen a shift towards interdisciplinary approaches, with researchers from various disciplines such as mathematics, computer science, sociology, psychology and management contributing to studies in bibliometrics. The focus of bibliometric studies has shifted towards non-informational parameters of science, leading to the evolution of bibliometrics as a distinct scientific discipline with specific research profiles and sub-fields (Gupta, 2014).

LITERATURE REVIEW

The global output on bibliometric research has grown significantly in the last three decades. Studies have been conducted to assess its global output, including citation analysis, co-author cooperation network and co-word network. Some of the notable studies include Milojević and Leydesdorff (2013), Siluo and Qingli (2017), Maltseva and Batagelj (2020), Derrick (2012), Mejia *et al.* (2021) and Kirtania (2023). These studies have contributed to discussions on theory, regional publication patterns, databases and tools in bibliometric research. They have also analyzed trends, patterns and influential papers in the field.

While many bibliometric studies have assessed global literature on bibliometrics research, there have been limited assessments at the national level, particularly in India. Basu and Garg, Garg and Tripathi and Santra, Majhi and Bhowmick have conducted studies specifically focused on bibliometric research in India. These studies have examined Indian bibliometric studies, publication output, citation impact, author collaboration, authorship patterns and state-wise production.

However, these previous studies were not comprehensive in terms of literature coverage and did not effectively cover the last ten years (2014-2023). Therefore, the present study aims to analyze Indian literature in bibliometrics research comprehensively. The main objectives of the study are to study the characteristics and trends of research, analyze overall research output and citation profiles, identify main scholars and institutions involved, study collaborative relationships and linkages, analyze significant keywords to identify sub-fields, study communication channels and examine characteristics of high-cited papers in the field.

MATERIALS AND METHODS

The Scopus database is considered as one of the most optimal and comprehensive databases to source publications data on a given topic for conducting bibliometric studies. For the purpose of this study Scopus database was used to retrieve publications data on the topic of 'bibliometric research studies in India from 2014 to 2023'. The following pre-defined search strategy was defined for the purpose. It combined five keywords, namely bibliomet* OR scientomet* OR informetr* OR webometric* OR "altmetri*" representing the whole gamut of bibliometric research with the help of boolen operators and suffixed these to "Keywords" tag and "Journal title" tags. A total of 3402 documents were retrieved and downloaded from the Scopus database. From each record, information related to authors, organizations, subject category, collaboration, funding and keywords were downloaded. Using Microsoft Office Excel, publication data were further organized by broad subject area, organizations, author, journal wise and keywords and accordingly documented, tabulated and analyzed.

(KEY (bibliomet* OR scientomet* OR informetr* OR webometric* OR "altmetri*") OR SRCTITLE (bibliomet* OR scientomet* OR informetr* OR webometric* OR "altmetri*")) AND PUBYEAR>2013 AND PUBYEAR < 2024 AND (LIMIT-TO (AFFILCOUNTRY, "India"))

Publications Analysis

Overall Picture

The global publications output that appeared in the area of bibliometrics research during 2014-23 comprised in all 37766 papers and the publications output count for India during the period was 3402 papers. India registered a 36% annual average growth in bibliometrics research output vis-a-vis 21.39% growth registered for the global output in the subject during 2014-2023 (Table 1). However, a comparative analysis of India's growth computed on a five-year data presents a different view. India registered a 19.44% growth in bibliometrics research during 2014-2023, *i.e.* in the first half of the 10-year study period, but it rose to 43.94% during 2019-2023, in the latter half of the study period. Moreover, compared to a 25.73% growth in the global output growth during 2019-2023, in the latter half period of this study, India's registered a much faster growth rate of 43.94% during the corresponding period. This implies that bibliometrics research in India is growing at a faster rate in comparison to the global growth rate.

China leads in global research in the area of bibliometrics. It contributed the largest global share (23.54%) during 2014-23. United States ranks second with a global share of 13.43%, followed by India (9.01%), Spain (7.51%), United Kingdom (5.90%) and Brazil (5.45% 0, Germany (4.07%), Italy (3.84%), Australia (3.60%) and Canada (3.24%) India registered a significant jump in its global share from 5.13% in 2014-18 to 10.39% in 2019-23.

Bulk of the bibliometrics research (95%) by document type has appeared as articles (68.4%), reviews (17.84%) and conference papers (8.88%). The remaining 5% output constitutes letters, book chapters, editorials, notes, erratum and short surveys.

By source publication type, journals account for the largest publication share (89.36%) of bibliometrics research, followed by

Table 1: Distribution of Bibliometrics Research Output by Publication Year during 2014-23.

Year	Global	Indian							
	TP	TP	TC	CPP	ICP (Citations)	%ICP	Funded Paper	% Funded Papers	%TP
2014	1531	95	841	8.85	4	4.21	7	7.37	6.21
2015	1910	98	1461	14.91	18	18.37	3	3.06	5.13
2016	1862	68	953	14.01	7	10.29	2	2.94	3.65
2017	2216	91	1316	14.46	15	16.48	9	9.89	4.11
2018	2386	156	1576	10.1	23	14.74	18	11.54	6.54
2019	3357	266	2888	10.86	34	12.78	33	12.41	7.92
2020	4027	386	4913	12.73	81	20.98	72	18.65	9.59
2021	5556	616	9619	15.59	138	22.37	109	17.67	11.11
2022	6613	591	5999	10.13	204	34.46	99	16.72	8.95
2023	8308	1035	25651	24.8	326	31.5	130	12.6	12.5
2014-18	9905	508	6147	12.1	67	13.19	39	7.68	5.13
2019-23	27861	2894	49070	9.03	783	27.11	443	15.34	10.39
2014-23	37766	3402	55217	16.23	850	40.3	482	23.02	9.01
Growth Rate	21.39%	36%							
2014-18	12.23%	19.44%							
2019-23	25.73%	43.94%							

TP=Total papers; TC=Total citations; CPP=Citations per paper; ICP=International Collaborative papers.

conference proceedings (6.64%), book series (2.56%) and books (1.44%). By language, English accounts for the largest publication share (99.91%), followed by Croatian, Polish and Spanish (0.03% share each).

Bibliometrics research in India published in 2014-23 was partly funded by Indian and foreign agencies in science and technology. Table 2 lists top 17 Indian and foreign funding agencies that were involved in contributing funds for bibliometrics research in India and in addition have been instrumental in supporting authors to publish 14 or more are papers These 17 agencies had supported research which culminated to 482 papers, accounting for a 14.17% share of the total country output (3402). 8 of the 17 agencies were from India which supported research in 301 papers, four were from the USA which supported research in 117 papers, two were from China which supported research in 122 papers and one each from agencies in South Korea (16 papers), France (17 papers) and Europe (31 papers). Their citation performance ranged from 3.22 to 12.65 CPP.

International Collaboration

Bibliometrics research collaboration at international level accounts for a 24.98% share (850 papers) of the total output by the country in 2014-23. These 850 collaborative papers received a total of 18369 citations since their publication, averaging the citation performance to 21.61 citations per paper.

Role of Foreign Countries

India collaborated with 99 foreign countries in bibliometrics research**.** The USA has been the largest collaborating partner of India in the area of bibliometrics research in 2014-23 accounting for a 26.12% share, followed by Malaysia (14.35% share) and U.K. (13.65% share). The top six collaborating countries together accounted for 83.06% share. The remaining 9 countries out of total 15 listed in Table 3 accounted for a meagre 36.47% share. In terms of citation performance of the research output by collaborative countries, Australia leads the ranking with a 62.84 citation impact per paper, being the highest followed by South Africa (49.47 CPP), Malaysia (48.98 CPP), USA (42.57 CPP) and Brazil (42.14 CPP) (Table 3).

A network collaboration map of India with top 25 foreign countries is depicted in Figure 1. Collaborative links between individual countries fluctuated from 14 to 24. Further categorization grouped these top 25 foreign countries with India into four clusters, with a total of 258 internal links and total link strength of 2,215. Within this network visualization, each node represents a country, with its size reflecting its research productivity. The connecting lines depict collaborative relationships between countries and the thickness of these lines signifies the intensity of collaboration, as shown in Figure 1.

Table 2: List of External Funding Agencies contributing to India's Bibliometrics Research.

Sl. No.	Name of the external funding agency	TP	TC	CPP
1	Nat Natural Science Foundation of China.	104	482	4.63
2	Department of Science and Technology, India.	82	1037	12.65
3	University Grants Commission, India.	53	647	12.21
4	Council of Scientific and Industrial Research, India.	50	527	10.54
5	National Institute of Health, USA.	42	185	4.40
6	National Science Foundation, USA.	41	146	3.56
7	Department of Biotechnology, India.	33	256	7.76
8	European Commission.	31	176	5.68
9	Indian Council of Social Science Research.	23	211	9.17
10	Indian Council of Agricultural Research.	22	89	4.05
11	Science and Engineering Research Board.	20	107	5.35
12	Indian Council of Medical Research.	19	200	10.53
13	Ministry of Education, India.	19	151	7.95
14	National Key Research and Development Program of China.	18	58	3.22
15	Conselho Nacional de Desenvolvimento Científico e Tecnológico.	17	119	7.00
16	National Research Foundation of Korea.	16	100	6.25
17	U.S. Department of Health and Human Services.	14	100	7.14
	Total funded papers.	482	5318	11.03
	India's total papers.	3402	55217	16.23
	Share of top 17 funded agencies papers in total funded papers.	14.17	9.63	

TP=Total papers; TC=Total citations; CPP=Citations per paper.

Table 3: Contribution of Leading Foreign Countries in India's Bibliometrics Research.

Sl. No.	Name of the foreign country	TP	TC	CPP	%TP
1	USA	222	9450	42.57	26.12
2	Malaysia	122	5975	48.98	14.35
3	U.K.	116	3190	27.50	13.65
4	Australia	88	5530	62.84	10.35
5	Saudi Arabia	85	851	10.01	10.00
6	China	73	918	12.58	8.59
7	Italy	58	1386	23.90	6.82
8	Canada	31	294	9.48	3.65
9	UAE	37	183	4.95	4.35
10	Germany	35	1112	31.77	4.12
11	South Korea	27	372	13.78	3.18
12	Brazil	28	1180	42.14	3.29
13	France	46	1452	31.57	5.41
14	South Africa	34	1682	49.47	4.00
15	Thailand	14	88	6.29	1.65
	Total	850	18369	21.61	

TP=Total papers; TC=Total citations; CPP=Citations per paper.

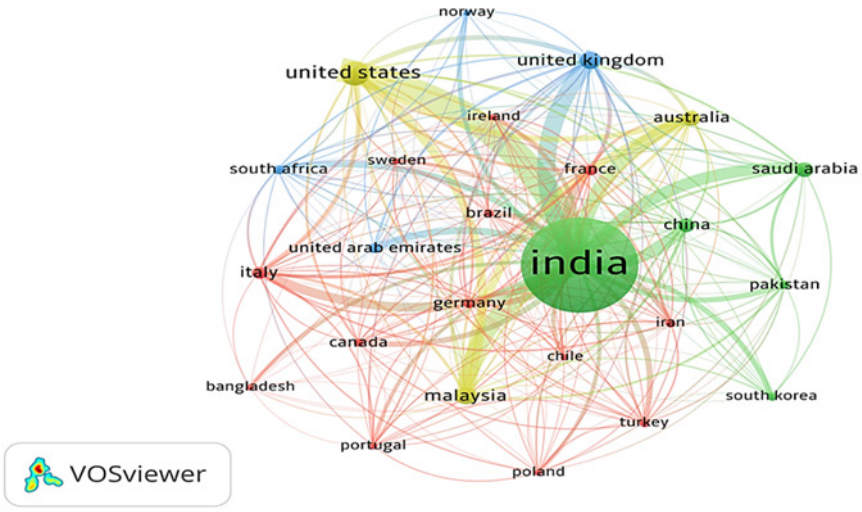

Figure 1: Collaboration network of the top 25 foreign countries with India on India's Bibliometrics Research.

Role of Foreign Organizations

More than 600 foreign research organizations were involved in collaborative research with India in the area of bibliometrics in 2014-23. Table 4 lists top 19 foreign organizations which contributed 9 to 61 collaborative papers with India were analysed on select indicators. Together these 19 organizations contributed 337 papers and 23932 accounting for a 39.65% and more than 100.0 share in total output by India in the subject under study. Their citation performance ranged from 2.76 to 213.13 CPP.

Among top 19 organizations, five are from Malaysia, three each from the USA, Australia, Saudi Arabia and one each from UK, France, Belgium, South Africa and Lebanon. Swinburne University of Technology Sarawak Campus, Malaysia contributed the most (n=61) publications and University of Akron, USA registered the highest citation impact (213.13 CPP).

Table 4: Top Foreign Organizations Contributing to India's Bibliometrics Research.

Sl. No.	Name of the foreign organization	TP	TC	CPP	%TP
1	Swinburne University of Technology Sarawak Campus, Malaysia.	61	5313	87.10	7.18
2	Swinburne University of Technology, Australia.	38	4323	113.76	4.47
3	Swinburne Business School, Australia.	26	3682	141.62	3.06
4	Georgia State University, USA.	28	4090	146.07	3.29
5	American University, Kogod School of Business USA.	19	711	37.42	2.24
6	Imam Abdulrahman Bin Faisal University, Saudi Arabia.	17	47	2.76	2.00
7	University of Akron, USA.	16	3410	213.13	1.88
8	Sunway University, Malaysia.	16	369	23.06	1.88
9	NEOMA Business School, France.	13	526	40.46	1.53
10	UCSI University, Malaysia.	12	77	6.42	1.41
11	London Metropolitan University.	12	232	19.33	1.41
12	Universiti Teknologi MARA, Malaysia.	11	92	8.36	1.29
13	Prince Sattam Bin Abdulaziz University, Saudi Arabia.	11	64	5.82	1.29
14	University of Johannesburg, South Africa.	10	424	42.40	1.18
15	University of Technology Sydney, Australia.	10	254	25.40	1.18
16	KU Leuven, Belgium.	10	125	12.50	1.18
17	King Saud University, Saudi Arabia.	9	53	5.89	1.06
18	University of Malaya, Malaysia.	9	67	7.44	1.06

Sl. No.	Name of the foreign organization	TP	TC	CPP	%TP
19	Lebanese American University.	9	73	8.11	1.06
	Total of top 19 foreign organizations	337	23932	69.57	7.18
	India's total international collaborative papers	850	18369	16.23	
	Share of top 19 foreign organizations India's total international collaborative papers	39.65%			

TP=Total papers; TC=Total citations; CPP=Citations per paper.

The network collaborative linkages involving foreign and Indian organizations were the largest (*n*=61) between "Swinburne University of Technology Sarawak Campus, Malaysia and Malaviya National Institute of Technology Jaipur". The other organization pairs are: "Swinburne University of Technology, Australia and Malaviya National Institute of Technology Jaipur" (*n*=32), "Swinburne Business School, Australia and Malaviya National Institute of Technology Jaipur" (*n*=21), "Georgia State University, USA and Malaviya National Institute of Technology Jaipur" (*n*=27), "American University, Kogod School of Business USA and Malaviya National Institute of Technology Jaipur" (*n*=16), "University of Akron, USA and Malaviya National Institute of Technology Jaipur" (*n*=12), "NEOMA Business School, France and International Management Institute" (*n*=7), "Sunway University, Malaysia and Indian Institute of Management, Nagpur" and "UCSI University, Malaysia and APJ Abdul Kalam Technological University" (*n*=6 each), "University of Technology Sydney, Australia and Palpara Vidyamandir, West Bengal" (*n*=4).

Role of Foreign Authors

More than 750 foreign and Indian authors collaborated for bibliometrics research in 2014-23. A list of top 18 foreign collaborating authors ranked on the basis of their research productivity is given in Table 5. The foreign authors individually contributed 5 to 39 papers and together they contributed 189 papers and received 15263 citations, accounting for a 22.24% share in productivity and a 83.52% share in citations.

Table 5: Top Foreign Authors Contributing to India's Research.

Sl. No.	Name of the author	Affiliation of the author	TP	TC	CPP	% TP
1	W.M. Lim	Swinburne University of Technology Sarawak Campus, School of Business Malaysia.	39	4965	127.31	4.59
2	N. Donthu	Georgia State University, Department of Marketing, USA.	28	4090	146.07	3.29
3	H.K. Baker	American University, Kogod School of Business, Department of Finance and Real Estate, Washington, DC, USA.	17	464	27.29	2.00
4	J.M. Merigo	University of Chile, Department of Management Control and Information Systems, School of Economics and Business, University of Chile, Santiago, Chile.	10	401	40.10	1.18
5	Vijay Pereira	NEOMA Business School, Reims Campus, France.	10	341	34.10	1.18
6	A. Gunasekaran	University of Massachusetts Darmouth, Charlton College of Business, USA.	9	677	75.22	1.06
7	B. Chaurasia	Bhawani Hospital and Research Center, Department of Neurosurgery, Birgunj, Nepal.	7	30	4.29	0.82
8	J.W. Goodell	University of Akron, Department of Management, College of Business, Akron, O.H., USA.	7	284	40.57	0.82
9	M.K. Hassan	University of New Orleans, Department of Economics and Finance, USA.	7	146	20.86	0.82
10	M.R. Rabbani	Kingdom University, Department of Finance and Accounting, Riffa, Bahrain	7	68	9.71	0.82

Sl. No.	Name of the author	Affiliation of the author	TP	TC	CPP	% TP
11	S. Ahmad	Imam Abdulrahman Bin Faisal University, New Central Library, Saudi Arabia.	6	11	1.83	0.71
12	S. Kraus	Free University of Bozen-Bolzano, Faculty of Economics and Management, Bolzano, Italy.	6	418	69.67	0.71
13	D. Mukherjee	University of Akron, Department of Management, College of Business, Akron, USA.	9	3126	347.33	1.06
14	A. Paltrinieri	Università Cattolica del Sacro Cuore, Department of Economics and Business Administration, Italy.	6	59	9.83	0.71
15	M.I. Tabash	Al Ain University, College of Business, UAE.	6	9	1.50	0.71
16	M. Kamali	University of Aveiro, Department of Environment and Planning, Center for Environmental and Marine Studies, Portugal.	5	136	27.20	0.59
17	D.Q. Malsen	USN School of Business, University of South Eastern, Norway.	5	22	4.40	0.59
18	A. Waris	Imam Abdulrahman Bin Faisal University, Deanship of Library Affairs, Saudi Arabia.	5	16	3.20	0.59
		Total of 18 foreign authors.	189	15263	990.48	22.24
		India's total international collaborative papers.	850	18369	16.23	
		Share of top 18 foreign authors in India's total international collaborative papers.	22.24%	83.52		

TP=Total papers; TC=Total citations; CPP=Citations per paper.

Among top 18 foreign authors, 7 are from the USA, 2 from Saudi Arabia, Italy and Bahrain and one each from Nepal, Portugal, Malaysia Chile, Norway and France. W.M. Lim (Swinburne University of Technology Sarawak Campus, Malaysia) contributed the most papers (*n*=39) and D. Mukherjee (University of Akron, USA) registered the largest citation impact (347.33 CPP).

In terms of author-to-author collaborative linkages between Indian and foreign authors, the author pair "W.M. Lin and S. Kumar" registered the highest number of collaborative linkages (*n*=39). The other author pairs are "N. Donthu and S. Kumar" (*n*=28), "H.K. Baker and S. Kumar" (*n*=16), "N. Donthu and D. Pattnaik" (*n*=11), "W.M. Lin and N. Pandey" and), "N. Donthu and N. Pandey" and "H.K. Baker and N. Pandey" and "D. Mukerjee and S. Kumar (*n*=9 each), "J.M. Merigo and N.M. Modak" (*n*=8), "Vijay Pereira and U. Bamel" (*n*=6).

Role of Regional collaboration

India's collaboration with South Asia countries resulted in 64 papers which together received 624 citations, averaging 9.75 CPP. Among them, India-Pakistan collaborated in 31 papers, followed by India-Bangladesh in 17 papers, India-Nepal in 13 papers, India-Sri Lanka in 6 papers and India-Bhutan in 1 paper. Among 64 India's South Asia collaborative papers: (i) 63 papers involve inter-regional collaboration, which means the participation of India, 1 or more South Asia country and one or more country outside the South Asia region in each paper and (ii) 1 paper involve intra-regional collaboration, which means the participation of India and 1 or more South Asia country alone. The India's South Asia collaboration is led by the participation of other countries outside South Asia, such as Saudi Arabia (*n*=14), USA (*n*=13), Malaysia (*n*=12), China (*n*=9), Italy (*n*=7), Sweden (*n*=6), Croatia, Egypt, Germany, Spain and U.K (*n*=-5 each), etc. Among 64 India's South Asia collaborative papers, 20 received external funded support and together received 351 citations, averaging 17.55 CPP. Among major external sources supporting India's South Asia collaborative research, the largest number of papers (2 each) were published with the funding support of European Commission, European Development Fund, National Natural Science Foundation of China, National Natural Science Foundation of Sri Lanka, Instituto de Salud Carlos II and Ministererio de Economica y Competividad, etc.

The 64 India's South Asia collaborative papers were published in 55 sources (49 journals, 5 conference proceedings and 1 book chapter). The most productive journals were: *Animal Science Papers and Reports, Environmental Science and Pollution Research, Scientometrics* and *World Neurology* (*n*=3 each), *Acta Biomedica, Acta Informatica Medica* and *Energy Reports* (*n*=2 each) and all other journals contributed 1 paper each.

The leading South Asian organizations participating in India's South Asia collaborative papers were: All India Institute of Medical Sciences (AIIMS), New Delhi (*n*=4), Central Institute of Petrochemicals Engineering Technology (CIPET), IVRI,

Bareilly and National University of Science and Technology, Pakistan (*n*=4 papers each), Bhawani Hospital and Research Center, Nepal, Hamdard University, India, Government College University, Lahore, Pakistan, Saveetha Institute of Medical Science and Technology, Chennai, India, Chandigarh University, Mohali, India and Tribhuvan University Teaching Hospital (*n*=3 papers each), PGIMER, Chandigarh, Gandak Hospital, Nepal, CIMAP, Lucknow, Lahore University of Management Science, Pakistan, KE Medical University, Lahore, Pakistan, University of Engineering and Technology, Lahore, Pakistan, University of Columbo, Sri Lanka and Tribhuvan University (*n*=2 papers each). The leading South Asian authors participating in 64 papers were: B. Chaurasia (Nepal) and K. Garg (India) (*n*=6 papers each), K. Dhama (India), K. Datta (India) J. Jaffar (Pakistan) and A.A. Zaidi (Pakistan (*n*=4 papers each), R, Sah (Nepal) and H.P. Devkota (Nepal) (3 papers), etc.

Leading Organizations

Contribution of Top 150 Organizations

India's research output by top 150 organizations in the area of bibliometrics research was broadly categorized under five organization types such as universities, engineering colleges, management institutes, medical institutes and research institutes (Table 6). The top 150 organizations account for a 89.54% share in the national output (3402 papers) and a 78.82% (55217) of total citations to the national output. Amongst top 150 organizations, universities account for the largest contribution (52.73% share) to the national output. In all research output by 92 universities received 34.21% citation share and registered citation performance of 19.50 CPP. The contributions under the universities category have mainly come from library science, computer science and management science departments of the universities. Technology and engineering institutes, account for the second largest contribution (20.96% share) to the national output. In all, the research output by 24 technology and engineering institutes received 26.80% citation share and registered citation performance of 20.73 CPP. Engineering institutes comprising management departments of NITs, IITs and other engineering institutes, account for the third largest contribution (8.23% share) to the national output. The research output by 22 management institutes and schools 15.03% citation share and registered citation performance of 29.63 CPP. Medical institutes account for the fourth largest contribution (4.06% share). The research output by 8 medical institutes received 1.45% citation share and registered citation performance of 5.79 CPP. Research institutes account for the fifth largest contribution (3.56% share). The research output by four research institutes received 1.34% citation share and registered citation performance of 14.29 CPP. The contributions under this category has mainly come from research and library staff of research institutes.

Table 6: Contribution and Citation impact of Different Type of 150 Top Organizations.

Sl. No.	Type of organization	TO	TP	TC	CPP	PPO	%TP	%TC
1	Universities and Colleges.	92	1794	18890	10.53	19.50	52.73	34.21
2	Technology and Engineering Institutes.	24	713	14799	20.76	29.71	20.96	26.80
3	Management Institutes and schools.	22	280	8297	29.63	12.73	8.23	15.03
4	Medical Institutes.	8	138	799	5.79	17.25	4.06	1.45
5	Research Institutes.	4	121	738	6.10	30.25	3.56	1.34
	Total of 150 Organizations.	150	3046	43523	14.29	20.31	89.54	78.82
	India's total publications.		3402	55217	16.23			
	Share of top 150 organizations in India's total publications.		89.54	78.82				

TO=Total organizations; TP=Total papers; TC=Total citations; CPP=Citations per paper; PPO=Publication productivity per organization+.

Contribution of Top 30 Organizations

A total of 1238 organizations (676 from India) were involved the publication of national output of India in bibliometrics research in 2014-23. Of these, 46.2% (312) were Indian organizations and 53.8% (364) of foreign origin. The top 30 organizations contributed 1728 papers, accounting for a 50.8% share to the national output. Each of the 30 organizations contributed from 30 to 157 papers. The research output by top 30 organizations (1728) received 19942 citations since their publication, an average of 11.54 CPP.

The average productivity of top 30 Indian organizations was 57.6 papers. Only eight of 30 organizations contributed above the group average productivity of 30 organizations: Symbiosis International Deemed University (*n*=157), Malaviya National Institute of Technology, Jaipur (*n*=156), Banaras Hindu University (*n*=101), University of Delhi (*n*=92), National Institute of Science Technology and Development Studies, New Delhi (*n*=90), Chandigarh University (*n*=90), Symbiosis Institute of Technology (*n*=87) and Indian Institute of Technology, New Delhi (*n*=65).

The average citation impact, measured by citations per paper and relative citation impact, of the top 30 Indian organizations was 11.54 CPP and 0.71. Only 7 organizations registered their citations impact the group average citation impact of all of 30 organizations: Malaviya National Institute of Technology Jaipur (51.55 and 3.18), South Asian University (27.31 and 1.68), National Institute of Industrial Engineering, Mumbai (26.56 and 1.64), Banaras Hindu University, Varanasi (14.12 and 0.87), O.P. Jindal Global University, Sonepat (12.92 and 0.8), Indian Institute of Technology, New Delhi (11.88 and 0.73) and Indian Institute of Technology, Kharagpur (11.65 and 0.72).

The international collaborative publications share of top 30 organizations to the national output varied from 1.89% to 72.44%, with an average of 24.88% share. A detailed profile of top 10 most productive and 10 most Impactful organizations is given in in Table 7 and a profile of top 30 Indian organizations, contributing 30 or more papers, is presented in Table 8.

Table 7: Profile of Top 10 Most Productive and Top 10 Most Impactful Organizations.

Sl. No.	Name of the organizations	TP	TC	CPP	RCI	ICP	%ICP
Top 10 Most Productive Organizations							
1	Symbiosis International Deemed University	157	1048	6.68	0.41	19	12.10
2	Malaviya National Institute of Technology Jaipur.	156	8042	51.55	3.18	113	72.44
3	Banaras Hindu University.	101	1426	14.12	0.87	16	15.84
4	University of Delhi.	92	757	8.23	0.51	24	26.09
5	National Institute of Science Technology and Development Studies, New Delhi.	90	496	5.51	0.34	4	4.44
6	Chandigarh University.	90	145	1.61	0.10	12	13.33
7	Symbiosis Institute of Technology.	87	420	4.83	0.30	6	6.90
8	Indian Institute of Technology Delhi.	65	772	11.88	0.73	19	29.23
9	Periyar University.	53	70	1.32	0.08	1	1.89
10	Mizoram University.	51	390	7.65	0.47	6	11.76
Top 10 Most Impactful Organizations							
1	Malaviya National Institute of Technology Jaipur.	156	8042	51.55	3.18	113	72.44
2	South Asian University.	48	1311	27.31	1.68	19	39.58
3	National Institute of Industrial Engineering.	41	1089	26.56	1.64	21	51.22
4	Banaras Hindu University.	101	1426	14.12	0.87	16	15.84
5	O.P. Jindal Global University.	36	465	12.92	0.80	18	50.00
6	Indian Institute of Technology Delhi.	65	772	11.88	0.73	19	29.23
7	Indian Institute of Technology Kharagpur.	34	396	11.65	0.72	9	26.47
8	Birla Institute of Technology and Science, Pilani.	31	340	10.97	0.68	11	35.48
9	University of Delhi.	92	757	8.23	0.51	24	26.09
10	Aligarh Muslim University.	45	368	8.18	0.50	16	35.56

Table 8: Profile of Top 30 Most Productive Organizations contributing to India's Bibliometrics Research.

Sl. No..	Name of the organizations	TP	TC	CPP	RCI	ICP	%ICP	TLS	TLS-WN	Collaborating links with top 30
1	Symbiosis International Deemed University.	157	1048	6.68	0.41	19	12.10	321	91(7)	6(2), 7(79), 12(2), 13(2), 14(1), 18(4), 24(1)
2	Malaviya National Institute of Technology Jaipur.	156	8042	51.55	3.18	113	72.44	433	23(8)	2(1), 4(1), 13(3), 14(1), 18(4), 20(7), 24(4), 29(2)
3	Banaras Hindu University.	101	1426	14.12	0.87	16	15.84	140	40(6)	4(3), 5(8), 6(1), 10(3), 11(24), 18(1)

Sl. No..	Name of the organizations	TP	TC	CPP	RCI	ICP	%ICP	TLS	TLS-WN	Collaborating links with top 30
4	University of Delhi.	92	757	8.23	0.51	24	26.09	215	20(10)	2(1), 3(3), 4(2), 5(2), 8(4), 13(3), 17(1), 19(1), 24(2), 28(1)
5	National Institute of Science Technology and Development Studies India.	90	496	5.51	0.34	4	4.44	238	19(5)	3(8), 4(2), 8(1), 11(7), 15(2)
6	Chandigarh University	90	145	1.61	0.10	12	13.33	17	12(7)	2(2), 3(1), 12(1), 14(2), 16(2), 18(2), 22(2)
7	Symbiosis Institute of Technology.	87	420	4.83	0.30	6	6.90	131	83(4)	2(79), 10(1), 12(2), 14((1)
8	Indian Institute of Technology Delhi.	65	772	11.88	0.73	19	29.23	98	13(7)	4(4), 5(1), 13(1), 15(1), 17(2), 20(2), 24(2)
9	Periyar University.	53	70	1.32	0.08	1	1.89	18	0	0
10	Mizoram University.	51	390	7.65	0.47	6	11.76	45	10(5)	3(3), 15(1), 16(2), 19(2), 21(2)
11	South Asian University.	48	1311	27.31	1.68	19	39.58	73	31(2)	3(24), 5(7)
12	Manipal Academy of Higher Education.	47	171	3.64	0.22	8	17.02	117	3(2)	7(2), 20(1)
13	Amity University	47	155	3.30	0.20	15	31.91	101	11(5)	1(2), 2(3), 4(3), 8(1), 18(2)
14	Lovely Professional University.	46	147	3.20	0.20	15	32.61	129	8(6)	2(1), 6(2), 7(1), 18(2), 19(1), 24(1)
15	Jawaharlal Nehru University	45	263	5.84	0.36	4	8.89	72	11(6)	4(5), 5(2), 8(1), 10(1), 24(1), 28(1).
16	Aligarh Muslim University	45	368	8.18	0.50	16	35.56	80	4(2)	6(2), 10(2)
17	All India Institute of Medical Sciences, New Delhi.	43	207	4.81	0.30	17	39.53	104	3(2)	4(1), 8(2)
18	Chitkara University, Punjab.	43	171	3.98	0.25	15	34.88	100	11(5)	2(4), 3(1), 6(2), 13(2), 14(2)
19	University of Kashmir.	42	157	3.74	0.23	9	21.43	44	7(6)	4(1),10(2), 14(1), 24(1), 26(2)
20	National Institute of Industrial Engineering.	41	1089	26.56	1.64	21	51.22	96	13(5)	2(7), 8(2), 12(1), 24(1), 25(2)
21	Panjab University.	38	243	6.39	0.39	4	10.53	53	7(2)	5(5), 10(2)
22	Vellore Institute of Technology.	36	165	4.58	0.28	9	25.00	80	5(3)	6(3), 16(1), 24(1)
23	Alagappa University.	36	134	3.72	0.23	3	8.33	24	1(1)	26(1)
24	O.P. Jindal Global University.	36	465	12.92	0.80	18	50.00	115	16(9)	1(1), 2(4), 4(2), 8(2), 14(1), 15(1), 20(1), 22(1), 27(3)
25	Indian Institute of Technology Kharagpur.	34	396	11.65	0.72	9	26.47	115	2(1)	20(2)
26	Pondicherry University.	34	174	5.12	0.32	12	35.29	41	5(3)	19(2), 23(1), 30(2)
27	Maharshi Dayanand University.	32	141	4.41	0.27	1	3.13	28	6(3)	13(1), 21(2), 24(3)
28	Bharathidasan University.	32	137	4.28	0.26	1	3.13	29	4(3)	3(1), 4(1), 15(2)
29	Birla Institute of Technology and Science, Pilani.	31	340	10.97	0.68	11	35.48	41	5(3)	2(2), 5(1), 24(2)
30	Annamalai University	30	142	4.73	0.29	3	10.00	19	4(3)	16(1), 23(1), 26(2)
		1728	19942	11.54	0.71	430	24.88	3117		

Sl. No..	Name of the organizations	TP	TC	CPP	RCI	ICP	%ICP	TLS	TLS-WN	Collaborating links with top 30
		3402	55217	16.23	1.00		0.00			
		50.79	36.12							

TP=Total papers; TC=Total citations; CPP=Citations per paper; ICP=International Collaborative papers; TLS=Total Link strength; TLS-WN=Total link strength within the network of top 30 authors.

In terms of Total Link Strength (TLS), Malaviya National Institute of Technology Jaipur tops (*n*=433) the list, followed by Symbiosis International Deemed University, Pune (*n*=321), National Institute of Science Technology and Development Studies, New Delhi (*n*=238), University of Delhi (*n*=215), Banaras Hindu University (*n*=140), Symbiosis Institute of Technology (*n*=131), Lovely Professional University (*n*=129), Manipal Academy of Higher Education (117), O.P. Jindal Global University (*n*=115), Indian Institute of Technology, Kharagpur (115), All India Institute of Medical Sciences, New Delhi (104), Amity University (*n*=101), Chitkara University, Punjab (*n*=100), Indian Institute of Technology, New Delhi (*n*= 98), National Institute of Industrial Engineering, Mumbai (*n*=96), etc.

In terms of organization-to-organization linkages, the organizational pair "Symbiosis International Deemed University and Symbiosis Institute of Technology" depicts the largest collaborative linkages (*n*=79). This is followed by "Banaras Hindu University and South Asia University"(*n*=24), "Banaras Hindu University and National Institute of Science Technology and Development Studies"(*n*=8), "Malaviya National Institute of Technology Jaipur and National Institute of Industrial Engineering and National Institute of Science Technology and Development Studies and South Asian University" (*n*=7 each), "University of Delhi and Jawaharlal Nehru University" and "National Institute of Science Technology and Development Studies and Punjab University"(*n*=5 each), "Symbiosis International Deemed University and Chitkara University, Punjab", "Malaviya National Institute of Technology Jaipur and Chitkara University, Punjab" and "University of Delhi and Indian Institute of Technology Delhi", "Malaviya National Institute of Technology Jaipur and OP Jindal Global University" (*n*=4 each) (Table 7).

Out of 1238 organizations identified only 36 that met the minimum publication threshold of at least ten documents. The collaborative networks of these 36 organizations were examined, focusing on the co-authorship links established with other entities. Subsequently, the analysis narrowed its focus to the 32 organizations exhibiting the strongest overall collaboration strength, as measured by the total link strength. These top 32 organizations were further categorized into six distinct clusters. Network analysis revealed that these focal organizations maintained a range of collaborative links, varying from 1 to 11. Additionally, their total link strength demonstrated significant variation, ranging from 1 to 45, as shown in Figure 2.

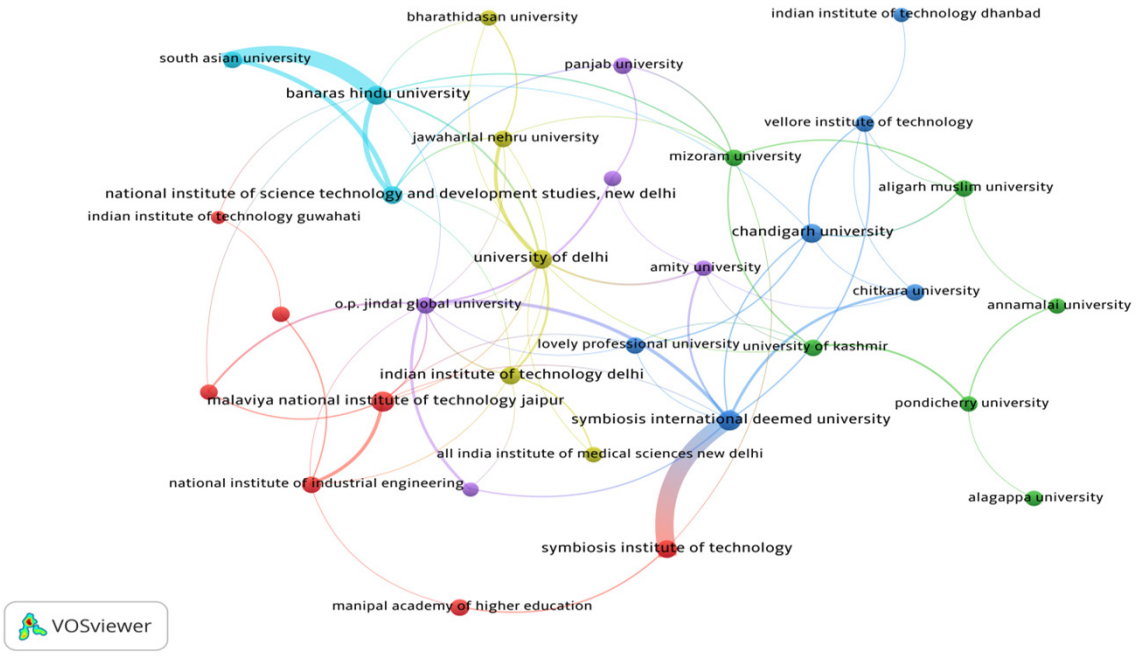

Figure 2: Top 32 Institutions' collaboration network map.

Leading Authors

A total of 5954 authors (1432 authors from India) contributed to 3402 publications in India's bibliometrics research. Of these 39.6% (568) were Indian authors and 60.$% (864) of foreign origin. The top 30 prolific authors contributed 830 papers, accounting for a 24.4% share to the national output. Each of the 30 authors contributed from 11 to 131 papers. The research output by papers by 30 prolific authors (830 papers) received 19262 citations since their publication, an average of 23.2 CPP. The average productivity of top 30 authors was 27.67 CPP. Only six of 30 authors had their productivity above the group average of all 30 authors: S. Kumar (*n*=131), B.M. Gupta (*n*=70), G. Pratap (*n*=56), V.K. Singh, V.K. (*n*=55), N. Pandey, N Malaviya (*n*=47) and M.K. Verma (*n*=34). The average citation impact, measured by citations per paper and relative citation impact, in respect of the top 30 Indian authors was 23.21 CPP and 1.43 respectively. Only four of 30 authors authors registered citation impact above the group average of all 30 authors: N. Pandey (86.32 and 5.32), S. Kumar (59.39 and 3.66), D. Pattnaik (48.7 and 3.0) and P.K. Muhuri (45.88 and 2.83).

The share of international collaborative publications in national output of top 30 authors varied from 0.0% to 96.30%, with an average of 35.06%. The profile of top 10 most prolific and 10 most Impactful authors in Table 9 and that of top 30 Indian authors contributing 30 or more papers is presented in Table 10.

Table 9: Profile of Top 10 Most Prolific and Top 10 Most Impactful Authors.

Sl. No.	Name of the author	Affiliation of the author	TP	TC	CPP	RCI	ICP	%ICP
Top 10 Most Productive Authors								
1	S. Kumar	Malaviya NIT, Jaipur.	131	7780	59.39	3.66	114	87.02
2	B.M. Gupta	NISTADS, New Delhi.	70	335	4.79	0.29	3	4.29
3	G. Pratap	APJ Abdul Kalam University, Kerala.	56	274	4.89	0.30	9	16.07
4	V.K. Singh	BHU, Varanasi.	55	1127	20.49	1.26	14	25.45
5	N. Pandey	Malaviya NIT, Jaipur.	47	4057	86.32	5.32	41	87.23
6	M.K. Verma	Mizoram University.	34	163	4.79	0.30	4	11.76
7	S.M. Dhawan	NPL, New Delhi.	27	153	5.67	0.35	0	0.00
8	R. Gupta	Sri Venkateswar University.	27	123	4.56	0.28	0	0.00
9	D. Pattnaik	Malviya NIT, Jaipur.	27	1315	48.70	3.00	26	96.30
10	R. Sureka	Malviya NIT, Jaipur.	26	493	18.96	1.17	18	69.23
Top 10 Most Impactful Authors								
1	N. Pandey	Malaviya NIT, Jaipur.	47	4057	86.32	5.32	41	87.23
2	S. Kumar	Malaviya NIT, Jaipur.	131	7780	59.39	3.66	114	87.02
3	D. Pattnaik	Malviya NIT, Jaipur.	27	1315	48.70	3.00	26	96.30
4	P.K. Muhuri.	South Asia University.	16	734	45.88	2.83	10	62.50
5	S. Dhir	IIT, New Delhi.	16	362	22.63	1.39	6	37.50
6	V.K. Singh	BHU, Varanasi.	55	1127	20.49	1.26	14	25.45
7	R. Sureka	Malviya NIT, Jaipur.	26	493	18.96	1.17	18	69.23
8	A. Uddin	South Asia University.	16	248	15.50	0.96	4	25.00
9	S.K. Sood	NIT, Kurukshetra.	18	273	15.17	0.93	0	0.00
10	S.K. Banshal	South Asia University	24	262	10.92	0.67	2	8.33

Table 10: Profile of Top 30 Most Prolific Authors contributing to India's Bibliometrics Research.

Sl. No.	Name of the author	Affiliation of the author	TP	TC	CPP	RCI	ICP	%ICP	TLS	TLS-WN	Collaborative linkages
1	Kumar, S	Malaviya NIT, Jaipur	131	7780	59.39	3.66	114	87.02	412	105	5(47), 9(24), 10(26), 14(8),
2	Gupta, B.M.	NISTADS, New Delhi	70	335	4.79	0.29	3	4.29	160	79	7(27), 8(26), 15(9), 13(1), 14(8), 29(8)
3	Pratap, G	APJ Abdul Kalam University, Kerala	56	274	4.89	0.30	9	16.07	56	2	1(2)
4	Singh, V.K.	BHU, Varanasi.	55	1127	20.49	1.26	14	25.45	195	62	12(23), 21(15), 19(8), 23(6), 20(6), 30(4)
5	Pandey, N	Malaviya NIT, Jaipur.	47	4057	86.32	5.32	41	87.23	168	58	1(47), 10(4), 9(2)
6	Verma, M.K.	Mizoram University.	34	163	4.79	0.30	4	11.76	59	1	12(1)
7	Dhawan, S.M.	NPL, New Delhi.	27	153	5.67	0.35	0	0.00	54	39	2(27), 8(10), 13(1), 15(1)
8	Gupta, R	Sri Venkateswar University.	27	123	4.56	0.28	0	0.00	60	36	2(26), 7(10)
9	Pattnaik, D	Malviya NIT, Jaipur.	27	1315	48.70	3.00	26	96.30	80	26	1(24), 5(2),
10	Sureka, R	Malviya NIT, Jaipur.	26	493	18.96	1.17	18	69.23	77	30	1(26), 5(4)
11	Garg, K.C.	NISTADS, New Delhi.	25	215	8.60	0.53	0	0.00	32		
12	Banshal, S.K	South Asia University.	24	262	10.92	0.67	2	8.33	66	44	4(23), 23(6), 20(6), 21(6), 19(2), 6(1)
13	Elango, B	IFET College of Engineering, Tamil Nadu.	21	180	8.57	0.53	9	42.86	23	2	2(1), 7(1)
14	Vaishya, R	Indraprastha Apollo Hospital.	21	161	7.67	0.47	6	28.57	53	25	29(13), 2(8), 15(4)
15	Kappi, M	Kuvempu University.	20	61	3.05	0.19	0	0.00	46	18	2(9), 7(1), 14(4), 29(4)
16	Sood, S.K.	NIT, Kurukshetra.	18	273	15.17	0.93	0	0.00	25		
17	Singh, K	BHU, Varanasi.	17	56	3.29	0.20	7	41.18	57		
18	Dhir, S	IIT, New Delhi.	16	362	22.63	1.39	6	37.50	47		
19	Lathabai, H.H.	University of Kerala, Trivandrum.	16	104	6.50	0.40	1	6.25	41	12	4(8), 12(2), 23(1), 20(1)
20	Muhuri, P.K.	South Asia University.	16	734	45.88	2.83	10	62.50	52	23	4(6), 12(6), 19(1)
21	Uddin, A	South Asia University.	16	248	15.50	0.96	4	25.00	36	22	4(15), 12(6), 30(1)

Sl. No.	Name of the author	Affiliation of the author	TP	TC	CPP	RCI	ICP	%ICP	TLS	TLS-WN	Collaborative linkages
22	Ram, S	Thapar Institute of Engineering and Technology.	15	126	8.40	0.52	1	6.67	9		
23	Basu, A	South Asia University.	14	147	10.50	0.65	3	21.43	35	18	4(6), 12(6), 20(5), 19(1)
24	Garg, K	AIIMS, New Delhi.	14	51	3.64	0.22	10	71.43	55	4	
25	Surulinathi, M	Bharathidasan University.	14	80	5.71	0.35	0	0.00	40		
26	Bhatt, A	Gujarat University.	13	44	3.38	0.21	0	0.00	39		28(4)
27	Mulay, B	Symbosis Deemed International University.	13	89	6.85	0.42	0	0.00	33		
28	Pathak, M	GNCT, Delhi.	13	59	4.54	0.28	0	0.00	19	4	26(4)
29	Vaish, A	Indraprastha Apollo University.	13	134	10.31	0.64	2	15.38	41		
30	Bhattacharya, S	NISTADS, New Delhi.	11	56	5.09	0.31	1	9.09	20	25	4(13), 2(8), 15(4)
			830	19262	23.21	1.43	291	35.06	2090		
			3402	55217	16.23	1.00					
			24.40	34.88							

TP=Total papers; TC=Total citations; CPP=Citations per paper; ICP=International Collaborative papers; TLS=Total Link strength; TLS-WN=Total link strength within the network of top 30 authors.

In terms of Total Link Strength (TLS), S. Kumar tops (*n*=412) the list, followed by V.K. Singh (*n*=1950, N. Pandey (*n=168*), B. M. Gupta (*n*=160), D. Pattnaik (*n*=80), R. Sureka (*n*=77), S.K. Banshal (*n*=66), R. Gupta (*n*=60), M.K. Verma (*n*=59), K. Singh (*n*=57), G. Pratap (*n*=56), K. Garg (*n*=55), S.M. Dhawan (*n=54*), R. Vaishya (*n=53*) and P.K. Muhuri (*n*=52). When total link strength within the network is considered, S. Kumar (105) tops the list, followed by B.M. Gupta, B.M (79), V.K. Singh (62), N. Pandey (58), S.K. Banshal (44), S.M. Dhawan (39), R. Gupta (36), R. Sureka (30), D. Pattnaik (26), R. Vaishya (25), S. Bhattacharya (25), P.K. Muhuri (23), A. Uddin (22), M. Kappi (18) and A. Basu (18).

In terms of author to author linkages, the largest collaborative linkages count (*n*=47) are depicted by author pair "S. Kumar and N. Pandey", followed by "B.M. Gupta and S.M. Dhawan" (*n*=27), "S. Kumar and R. Surekha" and "B.M. Gupta and R. Gupta" (*n*=26 each), "A. Kumar and D. Pattnaik" (*n*=24), "V.K. Singh and S.K. Banshal" (*n*=23), "V.K. Singh and A. Uddin" (*n*=15), "R. Vaishya and A. Vaish" and "V.K. Singh and S. Bhattacharya" (*n*=13), "S.M. Dhawan and R. Gupta" (*n*=10), "B.M. Gupta and M. Kappi" (*n*=9). "V.K. Singh and H.H. Lathbai", "B.M. Gupta and R. Vaishya", "B.M. Gupta and A. Vaish" and R. Vaishya and A. Vaish" (*n*=8 each).

A study examined the co-authorship patterns of 5,954 authors with a minimum document threshold of 20 publications per author was established. Among these authors, 34 meet the criteria for further analysis. Co-authorship link strength, a measure of collaboration intensity between authors, was calculated for each of the 34 qualifying authors. VOSviewer network visualization software (version 1.6.20) was then employed to identify authors with the strongest co-authorship links. These focal authors exhibited the highest number of links (ranging from 1 to 18) and the strongest total link strength (between 2 and 199). VOSviewer analysis (Figure 3) revealed the presence of six distinct author clusters based on their research output and impact, as shown in Figure 2. These clusters comprised a total of 104 links and exhibited a TLS of 487. Cluster 1 (represented in red) contained the largest number of authors (17), followed by Cluster 2 (green) with 7 authors, Cluster 3 (blue) with 6 authors and Cluster 4 (yellow) with 2 authors. The remaining two clusters (Clusters 5 and 6) each contained a single author.

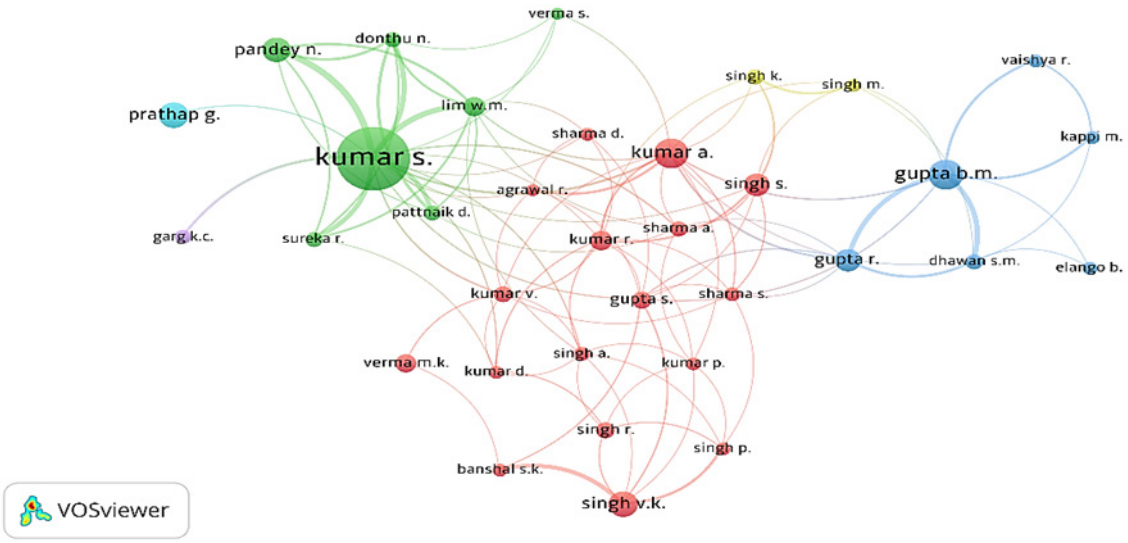

Figure 3: The top 34 author's collaboration network map of India's Bibliometrics Research.

Leading journals

Of the 3402 publications by India in bibliometric research, 3040 appeared in 1134 journals, 226 papers in conference proceedings, 87 in book series and 49 as books. Of the 215 journals, the top 30 reported 1480 papers (54.5%), contributing 9 to 611 papers in each, received 13328 citations, averaging to 9.05 citations per paper. Among the top 30 journals, the top 5 most productive journals were *Library Philosophy and Practice* (*n*=611), *Scientometrics* (*n*=137), *Journal of Scientometric Research* (*n*=105), *Desidoc Journal of Library and Information Technology* (*n*=101), *Annals of Library and Information Studies* (*n*=55).

Among the top 30 journals, the top 5 journals by total citations received were *Journal of Business Research* (*n*=4447), *Scientometrics* (*n*=1820), *Library Philosophy and Practice* (*n*=1271), *Desidoc Journal of Library and Information Technology* (*n*=698) and *Journal of Cleaner Production* (*n*=620).

Among the top 30 journals, the top 5 journals by citation impact per paper were *Journal of Business Research* (153.34 CPP), *Journal of Cleaner Production* (41.33 CPP), *Journal of Clinical Orthopaedics and Trauma* (39.33 CPP), *Technological Forecasting and Social Change* (38.79 CPP) and *IEEE Access* (35.22 CPP).

Among the top 30 journals, the top 5 journals by impact factor were *Technological Forecasting and Social Change* (*n*=14) (IF=13.636), *Journal of Business Research* (*n*=29)(IF=13.44), *Journal of Cleaner Production* (n=15)(IF=11.1), *Management Review Quarterly* (*n*=10)(IF=9.7) and *Journal of Environmental Management* (*n*=35)(IF=7.97). Table 11 presents the profile of top 30 journals contributing 9 or more papers in India's bibliometrics research.

Table 11: Most Productive Journals Which Reported India's Bibliometrics Research.

Sl. No.	Name of the journal	TP	TC	CPP	IF (2022)
1	Library Philosophy and Practice.	611	1271	2.08	0.64
2	Scientometrics	137	1820	13.28	3.71
3	Journal of Scientometric Research.	105	189	1.80	0.81
4	Desidoc Journal of Library and Information Technology.	101	698	6.91	0.97
5	Annals of Library and Information Studies.	55	534	9.71	0.74
6	Current Science	52	448	8.62	1
7	Benchmarking	35	432	12.34	7.97
8	Science and Technology Libraries.	32	216	6.75	2
9	Journal of Business Research.	29	4447	153.34	13.44
10	Environmental Science and Pollution Research.	28	76	2.71	5.8
11	Indian Journal of Information Sources and Services.	27	17	0.63	NA
12	Global Knowledge Memory and Communication.	25	60	2.40	1.926

Sl. No.	Name of the journal	TP	TC	CPP	IF (2022)
13	Plant Cell Biotechnology and Molecular Biology.	22	13	0.59	0.27
14	Vision	22	42	1.91	2.8
15	Sustainability Switzerland.	21	166	7.90	3.9
16	Journal of Cleaner Production.	15	620	41.33	11.1
17	Journal of Informetrics	14	100	7.14	3.83
18	Technological Forecasting and Social Change.	14	543	38.79	13.636
19	International Journal of Information Science and Management.	14	79	5.64	0.7
20	Qualitative Research in Financial Markets.	14	96	6.86	1.5
21	Environment Development and Sustainability.	14	79	5.64	5.6
22	Library Hi Tech.	13	149	11.46	3.71
23	Iberoamerican Journal of Science Measurement and Communication.	12	52	4.33	0.5
24	Indian Journal of Ophthalmology.	12	41	3.42	2.969
25	Management Review Quarterly.	10	169	16.90	9.7
26	Fiib Business Review.	10	65	6.50	2.16
27	IEEE Access	9	317	35.22	4.82
28	Quality and Quantity.	9	91	10.11	3.429
29	Journal of Clinical Orthopaedics and Trauma.	9	354	39.33	1.74
30	Journal of Environmental Management.	9	154	17.11	8.7
	Total of top 30 journals.	1480	13338		
	Total of India.	3402	55217		
	Share of top 30 journals in India's total.	43.50	24.16		

Subject-Wise Distribution

Distribution by Broad Subjects

Scopus database categorizes bibliometrics research contributed by India in 2014-23 under 17 broad disciplines (Table 12). Medicine, Biochemistry, Genetics and Molecular Biology and Immunology and Microbiology are the top most productive disciplines, accounting for 52.44%, 14.63% and 12.80% publications share respectively. Three more disciplines, namely Social Sciences, Computer Science and Business, Management and Accounting account for the second largest share (46.36%, 24.02% and 20.75%) respectively in bibliometrics output by India. Arts and Humanities, Engineering and Medicine (19.25%, 11.05% and 10.41% share) respectively. In terms of citation performance of India in bibliometrics by broad subject categories, Psychology (23.59 CPP) account for the highest citation impact, followed by Business, Management and Accounting (19.66 CPP), Economics, Econometrics and Finance (12.63 CPP), Agricultural and Biological Sciences (5.53 CPP) and Arts and Humanities (2.80 CPP) the least citation impact.

Table 12: Subject-Wise Distribution of India's Bibliometrics Research.

Sl. No.	Name of the subject	TP	TC	CPP	%TP	Sl. No.	Name of the subject	TP	TC	CPP	%TP
1	Social Science	1577	8960	5.68	46.36	10	Energy	120	1760	14.67	3.53
2	Computer Science	817	7161	8.76	24.02	11	Agricultural and Biological Science	109	603	5.53	3.20
3	Business, Management and Accounting	706	13882	19.66	20.75	12	Biochemistry, Genetics and Molecular Biology.	106	796	7.51	3.12
4	Arts and Humanities	655	1831	2.80	19.25	13	Chemical Engineering.	60	583	9.72	1.76

Sl. No.	Name of the subject	TP	TC	CPP	%TP	Sl. No.	Name of the subject	TP	TC	CPP	%TP
5	Engineering	376	4445	11.82	11.05	14	Psychology	59	1392	23.59	1.73
6	Medicine	354	3551	10.03	10.41	15	Physics and Astronomy.	58	366	6.31	1.70
7	Economics, Econometrics and Finance	230	2904	12.63	6.76	16	Materials Science.	57	608	10.67	1.68
8	Decision Science	202	2282	11.30	5.94	17	Pharmacology, Toxicology and Pharmaceutics.	57	286	5.02	1.68
9	Mathematics	130	657	5.05	3.82			3402	55217	16.23	100.00

Keywords Analysis

A total of 1758 keywords which characterize the content of 3402 papers, contributed by India in the area of bibliometrics research, were analyzed by the frequency of their occurrence. High-frequency keywords are considered important research themes, trending research topics and as popular knowledge-concepts. Of the 1758 keywords identified in this study, 150 had frequency of occurrence 5 times and above.

Keywords by Sub-field Subjects

From the 1256 keywords, 70 significant keywords were identified and ranked by the frequency of occurrence from 1 to 1332 related to subject sub-fields studies in 3402 papers in India's bibliometric research. Some of these keywords may be broadly classified under the following subject cluster's themes:

(i) Health Sciences keywords: COVID-19 (*n*=167), Cancer (*n*=37), Biomedical research (*n*=34); Public Health SARC-CoV-2 (*n*=23 each), Health risks (*n*=17); Telemedicine (*n*=14); and Ophthalmology (*n*=10) and Virology (*n*=9);

(ii) Artificial Intelligence and Related Technologies keywords: Artificial Intelligence (*n*=111), Machine Learning (*n*=91), Blockchain (*n*=60), Internet of Things (*n*=54), Deep Learning (*n*=45), Big Data (*n*=35), Data Mining (*n*=32), Virtual Reality (*n*=20), Natural Language Processing (*n*=13) and Image Processing (*n*=10);

(iii) Environment Sustainability and Development related keywords(*n*=115), Sustainability (*n*=113), Waste (*n*=83), Water related (*n*=63), Wastewater Treatment (*n*=36), Climate Change (*n*=36), Ecosystem (*n*=25), Sustainable Development Goals (*n*=24), Waste Management (*n*=21), Heavy Metals (*n*=15), Waste Disposal (*n*=14) and Ecology (*n*=11);

(iv) Industry and Economy: Industry 4.0 (*n*=37), Finance (*n*=31), Industrial Research (*n*=30), Entrepreneurship (*n*=22), Banks (*n*=22); Economics (*n*=24), Circular economy (*n*=22) and Accounting and Behavioral Finance (*N*=10 each);

(v) Management: Supply Chain Management (*n*=44), Tourism (*n*=36), Knowledge Management (*n*=26), Information Management (*n*=23), Marketing (18), Management (16), Hospitality (*n*=15), Decision Support Systems (*n*=11) and Leadership (*n*=9);

(vi) Technology: Technology related (*n*=88); Nanotechnology (*n*=39), Innovation (*n*=36), Quantum Technology (*n*=9);

(vii) Agriculture and Biological Sciences: Agriculture (*n*=30), Plant Disease (n=26), Genetics (22), Gene (*n*=15); Farming (11) and Viruses (*n*=8); and

(viii) Others areas: Higher Education and Learning Systems (*n*=21 each), Library and Information Science (*n*=19), Education (*n*=14), Behavioral Research and E-Learning (*n*=14 each), Learning Algorithms (*n*=13).

Keywords having Geographical Focus

India as a keyword appeared most times (*n*=278), followed by United States (*n*=111), China (*n*=87), United Kingdom (*n*=34), Germany and Australia (*n*=25 each), Developing countries (*n*=17), Canada (*n*=7), Netherlands (9), Saudi Arabia (*n*=7), Bangladesh (6), Belgium (*n*=3), etc.

Keywords Characterizing Features of Bibliometrics Research

Of 1256 keywords, 74 characterize features of bibliometrics research.

Bibliometrics related Keywords: Bibliometrics (*n*=1321), Scientometrics (*n*=1265), Altmetrics (*n*=73) and Webometrics (*n*=42);

Type of analysis: Bibliometric Analysis (*n*=1265), Citation Analysis (*n*=297), Scientometric Analysis (*n*=175), Co-Citation Analysis (*n*=102), Bibliographical Couplings (*n*=95), Network Analysis (*n*=88), Co-Occurrence Analysis (*n*=66), Cluster Analysis (*n*=54), Thematic Analysis(*n*=42), Co-Word Analysis(*n*=23), Social Network Analysis (*n*=22), Sentiment Analysis (*n*=9), Data Envelope Analysis (*n*=4) and Opinion Mining (*n*=2);

Database: Scopus (*n*=379), Web of Science (*n*=255), Factual Database (*n*=32), Database (*n*=24), Bibliographies (*n*=15), Bibliographical Database (*n*=13), Medline (*n*=5) and Dimension =(*n*=1);

Computer Softwares: VOSviewer (*n*=326), Biblioshiny (*n*=71), Mapping (*n*=46), Science Mapping (*n*=46), Visualization (*n*=40), Software (*n*=34), Gephi Software(*n*=25), Data Visualization (*n*=20), CiteSpace (*n*=16);

Other Aspects Studied: Authorship Pattern (*n*=155), Citations (*N*=135), Research Productivity (*n*=88), H-Index (*n*=84), Impact Factor (*n*=72), Degree of Collaboration (*n*=72), Productivity (*n*=54), Doubling Time (*n*=38), Relative Growth Rate (*n*=37), Lotka's Law(*n*=37), Collaboration (*n*=36), Journals (*n*=35), Funding (*n*=33), Bradford's Law (*n*=28), Author Productivity (*n*=27), Citation Impact (*n*=24), Research Performance (*n*=24), Patents (*n*=18), Web Impact Factor (*n*=15), Bibliographical Indicators(*n*=15), Topic Modeling (*n*=12), Benchmarking (*n*=11), Zipf's Law (*n*=7), Y-Index(*n*=1); and

Social media: Social Networks (Online) (n=35), Facebook (n=6), Youtube (n=3) and Web 3.0 (*n*=2).

High-Cited papers

India contributed 43 such special papers in the area of bibliometrics that received 100 or more citations per paper in 2014-23. For the purpose of this study these 43 special papers are assumed as Highly-Cited Papers (HCPs). These 43 papers registered 100 to 2480 citations per paper since their publication during 2014-23, accumulated in all 9652 citations, averaging to 224.46 citations per paper. Their distribution over citations count is skewed. Of the 43 HCPs, 10 received 200 to 2480 each, whereas the remaining 33 papers received citations from 100 to 199 citations per paper. The bibliographic details in respect of the top fifteen of the most cited papers are given in Table 13.

Table 13: List of Top 10 HCPs.

Sl. No.	Name of the author	Title of the paper	Source	TC	ACPY
1	Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., Lim, W.M.	How to conduct a bibliometric analysis: An overview and guidelines.	(2021) Journal of Business Research, 133, pp. 285-296.	2480	620.00
2	Singh, V.K., Singh, P, Karmakar, M., Leta, J., Mayr, P.	The journal coverage of Web of Science, Scopus and Dimensions: A comparative analysis.	(2021) Scientometrics, 126 (6), pp. 5113-5142.	460	115.00
3	Donthu, N., Kumar, S., Pattnaik, D.	Forty-five years of Journal of Business Research: A bibliometric analysis.	(2020) Journal of Business Research, 109, pp. 1-14.	388	77.60
4	Goyal, K., Kumar, S.	Financial literacy: A systematic review and bibliometric analysis.	(2021) International Journal of Consumer Studies, 45 (1), pp. 80-105.	366	91.50
5	Muhuri, P.K., Shukla, A.K., Abraham, A.	Industry 4.0: A bibliometric analysis and detailed overview.	(2019) Engineering Applications of Artificial Intelligence, 78, pp. 218-235.	328	54.67
6	Agarwal, A., Durairajanayagam, D *et al.*	Bibliometrics: Tracking research impact by selecting the appropriate metrics	(2016) Asian Journal of Andrology, 18 (2), pp. 296-309.	287	31.89
7	Mukherjee, D., Lim, W.M., Kumar, S., Donthu, N	Guidelines for advancing theory and practice through bibliometric research.	(2022) Journal of Business Research, 148, pp. 101-115.	242	80.67
8	Kraus, S., Breier, M., Lim, W.M., Dabić, M., Kumar, S., Kanbach, D., Mukherjee, D *et al.*	Literature reviews as independent studies: guidelines for academic practice.	(2022) Review of Managerial Science, 16 (8), pp. 2577-2595.	231	77.00
9	Kent Baker, H., Pandey, N., Kumar, S., Haldar, A	A bibliometric analysis of board diversity: Current status, development and future research directions.	(2020) Journal of Business Research, 108, pp. 232-246.	239	47.80
10	Mishra, D., Gunasekaran, A., Papadopoulos, T., Childe, S.J	Big Data and supply chain management: a review and bibliometric analysis.	(2018) Annals of Operations Research, 270 (1-2), pp. 313-336.	209	26.13

Sl. No.	Name of the author	Title of the paper	Source	TC	ACPY
11	Verma, S., Sharma, R., Deb, S., Maitra, D.	Artificial intelligence in marketing: Systematic review and future research direction.	(2021) International Journal of Information Management Data Insights, 1 (1), art. no. 100002.	194	48.50
12	Hota, P.K., Subramanian, B., Narayanamurthy, G.	Mapping the Intellectual Structure of Social Entrepreneurship Research: A Citation/Co-citation Analysis.	(2020) Journal of Business Ethics, 166 (1), pp. 89-114.	195	39.00
13	Lim, W.M.a b, Kumar, S., Ali, F.	Advancing knowledge through literature reviews: 'what', 'why' and 'how to contribute'.	(2022) Service Industries Journal, 42 (7-8), pp. 481-513.	185	61.67
14	Verma, S., Pant, M., Snasel, V.	A Comprehensive Review on NSGA-II for Multi-Objective Combinatorial Optimization Problems.	(2021) IEEE Access, 9, art. no. 9393947, pp. 57757-57791.	185	61.33
15	Goodell, J.W., Kumar, S., Lim, W.M., Pattnaik, D.	Artificial intelligence and machine learning in finance: Identifying foundations, themes and research clusters from bibliometric analysis.	(2021) Journal of Behavioral and Experimental Finance, 32, art. no. 100577.	184	46.00

ACPY Average citations per year

The 43 HCPs (comprising of 35 articles and 8 reviews) being multiple author papers were examined for their collaboration at their affiliating institution level and at the country level of their institutions. In four papers, the authorship in each was affiliated to a single parent institution (zero institutional collaboration). Of the remaining 39 HCPs, five papers were involved in collaboration at national level and the remaining 34 in collaboration at international level. USA participated as a collaborating country in 19 papers, followed by Malaysia (*n*=13), Australia (*n*=9), South Africa (*n*=8), U.K. (*n*=6), Finland (*n*=5), France (*n*=4), Brazil, Italy and Germany and Norway (*n*=2 each). In overall, a total of 90 authors from across 37 institutions/organizations contributed to 43 HCPs.

The top four organizations of foreign origin (foreign organizations) in 43 HCPs are as follows: i) Swinburne University of Technology Sarawak Campus, Malaysia contributed the most (*n*=12), ii) Swinburne University of Technology, Australia (*n*=8), iii) Georgia State University, USA (*n*=5) and iv) University of Akron, USA (*n*=4).

The top two authors of foreign origin (foreign authors) are as follows: i) W.M. Lim (Swinburne University of Technology Sarawak Campus, Malaysia) contributed the most (*n*=20), ii) N. Donthu (Georgia State University, USA)(*n*=5) and D. Mukherjee (University of Akron, USA)(*n*=3).

The top 11 Indian organizations participating in 43 HCPs are as follows: i) Malaviya National Institute of Technology Jaipur (*n*=14), ii) Indian Institute of Technology, Kanpur (*n*=4), iii) Banaras Hindu University, Varanasi, (*n*=3), iv) South Asia University, New Delhi, (*n*=3), v) Woxsen University, Hyderabad, (*n*=3), vi) National Institute of Industrial Engineering, Mumbai (*n*=3), vii) Banaras Hindu University, Institute of Technology, Varanasi, (*n*=2), viii) International Management Institute, New Delhi, (n=2), ix) Jamia Millia Islamia, New Delhi, (*n*=2), x) SASTRA University, Thanjuvar, (*n*=2) and xi) Symbosis International Deemed University (*n*=2).

The top 10 Indian authors participating in 43 HCPs are as follows S. Kumar (*n*=15) N. Pandey (*n*=5), D. Mishra (*n*=3), U. Bamel, S. Dhir, A. Haleem, M, Javaid, P.K. Muhuri, S. Singh, V.K.Singh and A.K. Shukla (*n*=2 each).

The distribution of 43 HCPs over subject categories, 26 HCPs is as follows: Business, Management and Accounting, followed by Computer Science (*n*=10), Engineering (*n*=9), Decision Science, Social Science and Medicine (*n*=7 each), Economics, Econometrics and Finance (*n*=6), Environmental Science (*n*=5), others (*n*=7).

The distribution of 43 HCPs over 28 reporting is as follows: *Journal of Business Research* contributed the most (n=10), *Annals of Operations Research, International Journal of Consumer Studies, Journal of Cleaner Production, Scientometrics and Technological Forecasting and Social Change* (*n*=2 each) and 1 each across 21 journals.

The article that topped the ranking of 43 HCPs with highest citations is: "How to conduct a bibliometric analysis: An overview and guidelines." N. Donthu, S. Kumar, S. *et al.* (2021) in *Journal of Business Research* (2480 citations). The article that 2nd is: "The journal coverage of Web of Science, Scopus and Dimensions: A comparative analysis" by V.K. Singh. P. Singh *et al.* (2021) in *Scientometrics, (460 citations)*. The article 15th

position is: "Artificial intelligence and machine learning in finance: Identifying foundations, themes and research clusters from bibliometric analysis" authored J.W. Goodell, S. Kumar *et al.* (2021) published in *Journal of Behavioral and Experimental Finance* (184 citations).

Out of 3402 papers, only 15 (0.44%) High-Cited Papers (HCPs) were linked through co-citation in India's bibliometrics Research. These HCPs had a total citation count ranging from 184 to 2480, as shown in Figure 4. These top 15 papers were divided into ten clusters with 12 links (Figure 4).

RESULTS AND CONCLUSION

Bibliometric analysis has become a valuable tool for quantitative and qualitative analysis of research topics. This study focuses on analyzing of India's bibliometrics research publications over a 10-year period 2014-23. By using bibliometric methods, qualitative and quantitative indicators, this study reveals publication trends, impact evaluation, core authors, institutions, journals, trending research topics, subject areas and preferred medium of research communications. This study also reveals

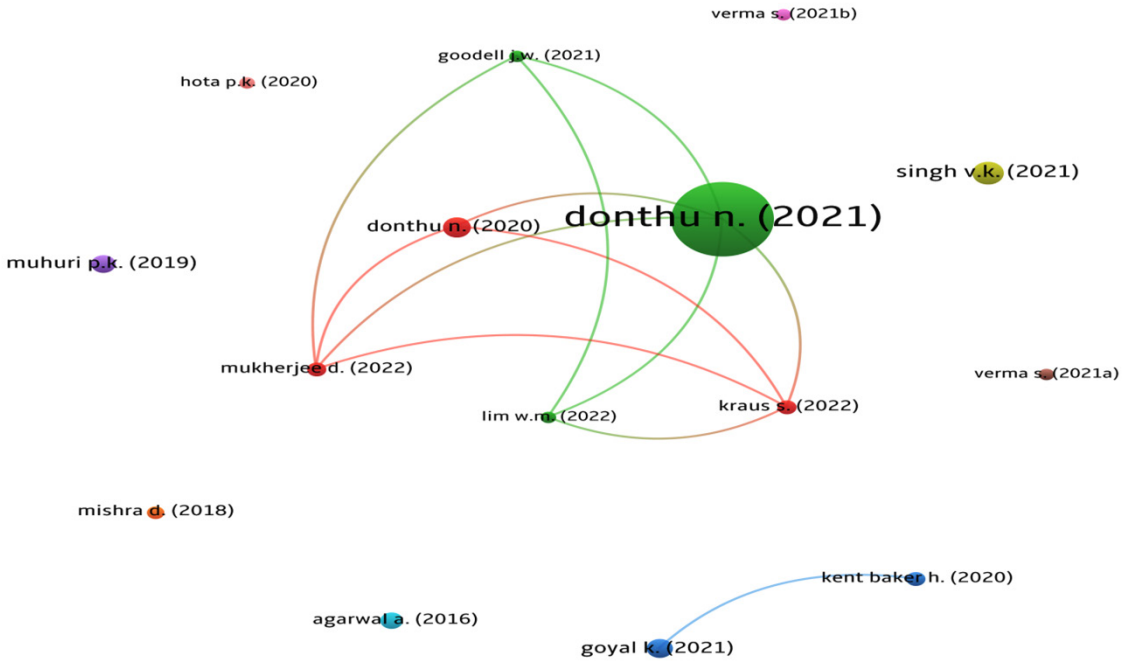

Figure 4: Network visualization of co-citation links among 15 highly-cited publications.

potential collaborating institutions, significant studies and trending topics within bibliometrics domain.

India's bibliometrics research has shown a faster growth rate (36% annual average) compared to the global growth rate (21.39%). However, India's global share is still relatively small (9% over 10 years), ranking third after China and the United States. Funding from national and international agencies plays a crucial role in supporting bibliometrics research in India, with only 14% of the national output being funded.

International collaboration has been instrumental in driving productivity and research quality in bibliometrics. India has collaborated significantly with the USA, Malaysia, UK and Australia. The study also reveals a shift in organizational focus, with bibliometrics research moving away from universities towards engineering and technology organizations, as well as management schools. These emerging centers have shown higher citation impact despite their lower publication share.

The study highlights leading organizations and prolific authors in bibliometrics research. Organizations such as Symbiosis International Deemed University, Malaviya National Institute of Technology and Banaras Hindu University have shown exceptional productivity. Prolific authors like S. Kumar, B.M. Gupta and G. Pratap have played a dominant role in national publication productivity.

Furthermore, the study identifies top-performing organizations and authors based on citation metrics. Malaviya National Institute of Technology Jaipur, South Asian University and National Institute of Industrial Engineering, Mumbai have shown high performance in citations per paper. Authors like N. Pandey, S. Kumar and D. Pattnaik also stand out in terms of citation impact.

The study analyzes Highly-Cited Papers (HCPs) to identify influential studies, relevant topics, collaborative partners, leading organizations, prolific authors and important communication channels. Only a small percentage (1.26%) of India's papers received significant citations (100 to 24, 80 citations).

Additionally, the study examines 1,256 keywords that appeared in India's bibliometrics research. Prominent subjects include COVID-19, Sustainable Development, Artificial Intelligence, Machine Learning, Technology, Waste, Water-related issues and Blockchain. Geographically, bibliometrics research focuses on India, the United States, China, the United Kingdom, Germany and Australia.

CONCLUSION

This study provides an overview of India's landscape in bibliometrics research. It highlights the view that Indian organizations and authors have a strong base to conduct bibliometrics research and have the potential to emerge as global leader. But it is the lack of funds that is coming as a challenge to meet India's global aspirations for greater productivity coupled with and high-quality research. Fostering robust national and international collaborations, leveraging diverse expertise are the emerging challenges in bibliometrics research. India's regional collaboration constitutes a small part of the international collaborative research output by India. This study has identified leading countries, institutions, journals and trending research fields. This study strengthens once again the view that bibliometric analysis is certainly a promising and effective tool to identify the potential collaborative partners, significant studies and research topics.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Cite this article: Gupta BM, Dhawan SM, Mamdapur GMN. Bibliometrics Research in India: A Quantitative and Qualitative Assessment of Publications during 2014-23. Journal of Data Science, Informetrics, and Citation Studies. 2024;3(1):69-89.