PUBLICATION PATTERN OF SCIENTOMETRIC LITERATURE PUBLISHED IN INDIA DURING 2001-2020: A SCIENTOMETRIC ANALYSIS

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Abstract

Introduction: Scientometric is the most extreme measures for the assessment of scientific productivity. Scientometric markers are utilized to measure the exploration efficiency of productivity of researchers.

Purpose: The study aims to presents the scientometric analysis of the literature published in the area of scientometric in India for period of 2001-2020.

Objectives: To recognize the authorship pattern of scientometric writing distributed in India. To investigate development and dissemination of articles, to find the Relative Growth Rate (RGR) and Doubling Time (DT) articles.

Methodology: For the present study, bibliographic data was downloaded from the Web of Science database for the period 2001 to 2020. A total of 205 records were retrieved on being used this search query.

Findings: The study reveals that the maximum number of publications 16.58% is in 2020. The maximum growth rate verified is 2007. In block year 2006-2010, the relative growth found as highest and the lowest is 2016-2020. The highest doubling period is the block year 2016-2020. Out of a total of 205 publications, the highest 85.36%publicationsare articles and maximum articles contributed by joint authors. In the block year 2006-2010, the Degree of Collaboration is found highest. Author Pratap G. has written the maximum number of publications and USA

ranks on most number of publications in collaboration with India. The Journal Scientometric is the top most journal to publish the literature during the period of study.

Originality: The study is an original work and not published anywhere.

Keywords: Scientometric; Bibliometric; Informetrics; Degree of Collaboration; India; Relative growth rate; Doubling time; Web of science.

Introduction

Scientometric is the utmost significant measures for the evaluation of scientific productivity. Scientometric indicators are used to measure the research productivity of the scientific community. Bibliometrics, Scientometrics, and Informetrics are somehow similar but a little bit different from each other based on their assessment.

"Scientometrics" is the English translation of articulation of Nalimov's commendable monograph Naukometriy in 1969, which was a decently dark to western researcher even it was changed over to English. Without permission to the web and limited assignment, it was only here and there referred to. Regardless, the term ended up being when the journal Scientometrics appeared in 1978 (Garfield).In this article, the publication pattern of the field of Scientometrics has been considered based on literature published in India covered in the database of WOS during the period 2001-2020.

Review of Literature

Biradar and Tadasad revealed in their scientometric study of authorship and collaboration pattern in the field of Economics have found that maximum papers were produced by single authors, Collaborative Index was varying from 1.80 to 2.29, Degree of Collaboration was highest (0.58) during 2000-2014(45).

A scientometric study of jaundice literature published by SAARC countries and the study found that out of 1048 papers total of 1027 (98%) publications were published in co-authorship, the block year 2014-2018 has the highest DC (0.99), CI (5.17), CC (0.75) and MCC (0.75). The value of CAI of single authors have diminished from 146.78 to 56.55, the highest activity index for India was 113.33 found in year block 1999-2003. The block 2004-2008 has a total of paper 215, total citation 5133 and citation per paper is 23.9which was the highest among all(Das et al. 18-25).

A study published on groundnut research during 2000-2013 indexed in the CAB abstract of India and examined taking 3,875 literature. It was observed that doubling time was increasing and the relative growth rate was decreasing. Maximum researches were done in collaboration with other organization (Dhoble et al. 304-313).

Geology literature published by Indian Geologists and examined that internationally collaborated articles have got a maximum number of citations but maximum articles were used to the study nationally collaborated papers. Among the worldwide collaborated papers,the USA ranked at the top. "Himalayan Geology" was identified as the top-ranked journal (Jhamb et al. 37-51).

A study on literature published on Iranian chemistryresearch in Science Citation Index (SCI) from 1990 to 2006. Osareh and McCain found that since 1990, the literature on Iranian chemistry research in the SCI, was increasing at a rate of 26% and 7 main clusters were formed during their study period. The highest publication was from Organic Chemistry followed by Analytical Chemistry (88-98).

Objectives

1. To identify the authorship pattern of scientometric literature published in India.

2. To analyze growth and distribution of articles from the period 2001-2020.
3. To locate the Relative Growth Rate (RGR) and Doubling Time (DT) articles.
4. To discover major prolific authors and top collaborated countries.

Methodology

The methodology for the study, bibliographic data was downloaded with help of the Web of Science database (www.webofknowledge.com.)**.** To retrieve the dataset for conducting the current study the following search strategy was used "TS=(SCIENTOMETRICS OR BIBLIOMETRICS) Refined by: COUNTRIES/REGIONS: (INDIA) Timespan: 2001-2020. Indexes: SCI-EXPANDED, SSCI, A&HCI". A total of 205 records were retrieved on being used this search query. The records retrieved are analyzed henceforth.

Data Analysis and Findings

Year-wise Distribution of Publications

Table 1 shows the distribution of publications year wise. It was found that a total of 205 publications were published during the study period. The highest number of publications 34 (16.58%) was in the year 2020, followed by 2018 having 22 (10.72%), in the year 2015 having 21 (10.24%) publications. The publications were gradually increasing from 2001 to 2020 except in some of the years.

Table-1:Year-wise Distribution of Publications

Year	Record Count	Percentage
2001	1	0.48
2002	3	1.43
2003	3	1.46
2004	1	0.48
2005	3	1.43

2006	2	0.97
2007	8	3.9
2008	4	1.95
2009	4	1.95
2010	13	6.34
2011	5	2.43
2012	10	4.87
2013	9	4.39
2014	13	6.34
2015	21	10.24
2016	15	7.3
2017	16	7.8
2018	22	10.72
2019	18	8.78
2020	34	16.58
Total	205	

Annual Growth of Publication

Annual growth of publication denote the yearly growth of the publication of any journal from early period to later period.

The calculation of growth rate taken with the formula:

$$\mathbf{r = \frac{P1 - P0}{P0} \times 100}$$

Where, r = Percentage of publication growth
P0 = No. of publication in the base year
P1 = No. of Publication in the present year

Table-2: Annual Growth of Publication

Block Year	Record Count	Annual Growth	Publication Growth rate (%)

2001	1	0	0
2002	3	2	200.00
2003	3	0	0.00
2004	1	-2	-66.67
2005	3	2	200.00
2006	2	-1	-33.33
2007	8	6	300.00
2008	4	-4	-50.00
2009	4	0	0.00
2010	13	9	225.00
2011	5	-8	-61.54
2012	10	5	100.00
2013	9	-1	-10.00
2014	13	4	44.44
2015	21	8	61.54
2016	15	-6	-28.57
2017	16	1	6.67
2018	22	6	37.50
2019	18	-4	-18.18
2020	34	16	88.89
			Average:49.79

To attain a summary of publication, the number of literature published from 2001-2020 is shown in Table-2 which displays the difference in publication. 205 literatures were published in annual average growth of 49.79. From the study, it is found that the growth was increasing except in some of the years. Years 2001 to 2003, 2014 to 2015, and 2019 to 2020 growth is

encouraging whereas in 2003-2004, 2007 to 2009, and 2012 to 2013not encouraging. The highest growth was recorded in 2007 having a growth of 300% followed by the year 2010 having 225%.

Relative Growth Rate and Double Time

The growth of publication calculated with help of RGR and Dt model, developed by M. Mahapatra in1985. (61-70)

The relative growth and doubling time calculated using the formula:

$$RGR = \frac{W2 - W1}{T2 - T1}$$

Where,
RGR = Growth Rate over a specific period of the interval,
W1 = Log_e (natural log of the initial number of contributions)
W2 = Log_e (natural log of the final number of contributions)
T1 = Unit of initial time
T2 = Unit of the final time

$$DoublingTime(Dt) = \frac{0.693}{R}$$

Where,
R= Growth rate

Table- 3: Relative Growth and Double Time of Publication

Year Block	Record Count	Cumulative no. of Records	w1	w2	Relative Growth Rate (RGR)	Doubling Time (Dt)
2001-2005	11	11	0	2.40	---	---
2006-2010	31	42	2.4	3.74	1.34	0.52
2011-2015	58	100	3.74	4.61	0.87	0.80
2016-2020	105	205	4.61	5.32	0.71	0.97

Table 3 shows the relative growth of the publication in different block years, it was observed that in the block year 2006-2010 the relative growth was highest (1.34) and the lowest was seen in the block year 2016-2020 having a relative growth rate 0.71. The maximum doubling time observed in the block year 2016-2020 and the lowest was observed in the block year 2006-2010.

Document Type

Table-4: Document Type-wise Distribution

Document	Record count	Percentage
Articles	175	85.36
Letters	11	5.36
Reviews	11	5.36
Editorial Materials	7	3.41
Early Access	6	2.92
Proceedings Papers	3	1.46
Corrections	2	0.90

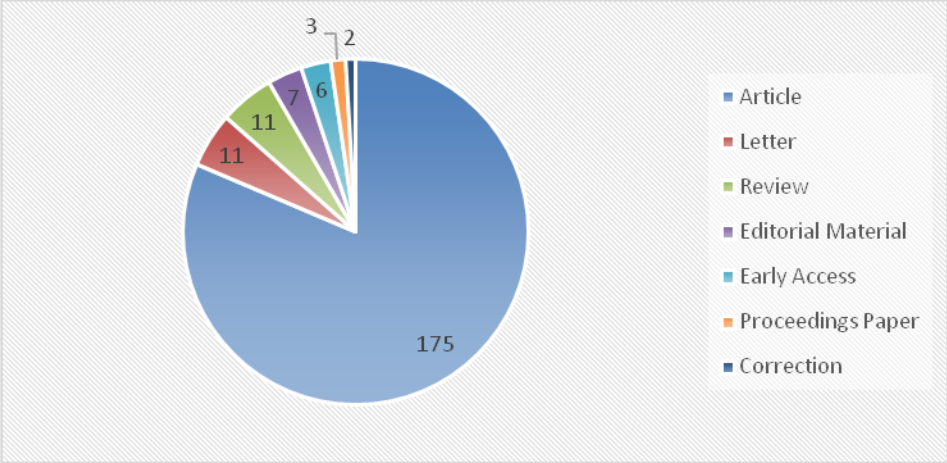

Figure-1: Document Type-wise Distribution

Table 4 and figure 1 depicts document type-wise distribution of the publication, it was found that out 205 publication, the highest publication was articles having 175 (85.36%), followed by letter and review having 11 (5.36%) each, editorial material was 7 (3.41), early access having 6 (2.92%), proceedings paper was 3 (1.46%) and least was correction having 2 (0.90%) publications.

Authorship Pattern

Authorship study is a bibliometric study concentrated on authorship patterns. They portray writer qualities and creation of articles and level of joint effort of a particular gathering of writers.

Table-5: Authorship Pattern wise Distribution

Block Years	Number of Authors	Total

	1	2	3	4	5	6	7	8	9	10	More than 10	Articles
2001 - 2005	4	6	1	0	0	0	0	0	0	0	0	11
2006 - 2010	7	5	10	4	1	0	1	1	0	0	2	31
2011 - 2015	26	14	10	4	3	1	0	0	0	0	0	58
2016 - 2020	27	16	23	22	5	4	2	1	0	0	5	105
Total Articles	**64**	**41**	**44**	**30**	**9**	**5**	**3**	**2**	**0**	**0**	**7**	**205**

Table 5depicts the authorship pattern for four block periods of 5 years each. The number of authors ranges from 1 to 50 and the majority of the articles being contributed by multiple authors. Total of 141 (68.78%) publications published in co-authorship whereas 64(31.21%) single authorship. In multiple-authorship, the highest number of contributions (44) as a result of co-authorship and three authors, followed by two authors (41) and four authors having (30) contributions. The total number of publications was increasing in each block period. But the number of contributions in the current decade developed by more than thrice (163) compared to the first decade (44).

Degree of Collaboration (DC): Subramanyam proposed DC, the measure for calculating the proportion of single and multi-author papersand to interpret as the degree (33-38).

According to Subramanyam:

DC=Nm/(Ns+Nm)

Where,

Nm = Number of multi- authored papers

Ns = Number of single-author paper

DC varies from 0 when all papers have a single author to 1 when all papers have more than one author and can be simply calculated and simply interpreted.

Table-6: Degree of Collaboration

Block Year	**Single Authored Publications (N_s)**	**Multiple Authored**	**(N_s+N_m)**	**Degree of Collaboration**

		Publications (N_m)		**(DC)**
2001-2005	4	7	11	0.43
2006-2010	7	24	31	0.71
2011-2015	26	32	58	0.19
2016-2020	27	78	105	0.65
Total	64	141	205	Average:0.49

The degree of Collaboration (DC) for each block year is shown in table 6. where it was found that the block year 2006-2010 has the highest DC (0.71), followed by the block year 2016-2020 having DC of 0.65. The lowest DC (0.19) observed in the block 2011-2015.

Most Prolific Authors

Table-7: Most Prolific Authors

Author	**No. of Contribution**	**Percentage**
Pratap, G.	49	23.9
Kumar, S.	18	8.78
Singh, V. K.	16	7.8
Garg, K. C.	13	6.31
Uddin, A.	9	4.39
Merigo, J. M.	8	3.90
Modak, N. M.	7	3.41
Bhattacharya, S.	6	2.92
Gupta, B. M.	6	2.92
Lathabai, H. H.	6	2.92
Nishy. P.	6	2.92

Table 7 depicts the most prolific authors, it was found that Pratap, G. has contributed the highest 49 (23.9%) number of publications, followed by Kumar, S. 18 (8.78%) publications, V. K. Singh, 16 (7.8%) publications, Garg, K. C. 13 (6.31%) publications, Uddin, A. 9 (4.39%) publications, Merigo, J. M. 8 (3.9%) publications, Modak, N. M. 7 (3.41%) publications, respectively.

Top Collaborative Countries

Table-8: Top Collaborative Countries

Country	No. of Contribution	Percentage
USA	24	11.7
Chile	9	4.39
England	9	4.39
Germany	8	3.9
France	7	3.41
Peoples Republic China	5	2.43
Australia	4	1.9
Belgium	4	1.9
Saudi Arabia	4	1.9
Sweden	4	1.9

Table 8 shows the top collaborative countries with India. It was found that the USA contributed the highest 24 (11.7%) publications, followed by Chile and England 9 (4.39%), Germany 8 (3.9%), France 7 (3.41%) and many other countries were contributed less than 7 publications, respectively.

Research Areas

Table-9: Research Area-wise Distribution

Research Area	Record count	Percentage
Information Science Library Science	88	42.92
Computer Science	79	38.53
Science Technology other topics	52	25.36
Business Economics	21	10.24
Engineering	11	5.36
Environmental Science Ecology	9	4.39
Public Administration	5	2.43
Operation Research Management Science	4	1.95
Pharmacology Pharmacy	4	1.95
Agriculture	3	1.46
Education Educational Research	3	1.46
Paediatrics	3	1.46

Table 9 shows the research area-wise distribution of the publication, where it found that Information Science Library science contributed the highest number of contributions 88(42.92%), followed by Computer Science 79 (38.53%), Science Technology other topics 52 (25.36%), Business Economics21 (10.24%), Engineering 11 (5.36%), Environmental Science Ecology 9 (4.36%), Public Administration 5 (2.43%) and remaining research areas with less than 5 records.

Top Journals Contribution

Table-10: Top Journals Contribution

Journal	Record Count	Percentage
Scientometrics	64	31.22
Current Science	48	23.41
Malaysian Journal of Library and Information Science	11	5.36
Technological Forecasting and Social Change	5	2.43
Electronic Library	4	1.95
Indian Journal of Pharmaceutical Education Research	3	1.46
Journal of Intelligent Fuzzy System	3	1.46
Animal Science Papers and Reports	2	0.97
IETE Technical Review	2	0.97
Journal of Cleaner Production	2	0.97
Journal of Informetrics	2	0.97

Table 10 shows the contribution of the top journal, which reveals that the journal Scientometric has contributed the highest 6 (31.22%) number of publications, followed by Current Science 48 (23.41%) records, Malaysian Journal of Library and Information Science 11, Technological Forecasting and Social Change 5, Electronic Library 4, Indian Journal of

Pharmaceutical Education Research and Journal of Intelligent Fuzzy System having 3 records each, Animal Science Papers and Reports, IETE Technical Review, Journal of Cleaner Production and Journal of Informetrics with 2 records each.

Conclusion

From the study analysis of scientometric literature published during 2001-2020, it was found that the highest number of publications 34 (16.58%) was in the year 2020. The growth was increasing except in some of the years.The highest growth was recorded in 2007.In the block year 2006-2010 the relative growth was found highest and the lowest in the block year 2016-2020. The highest doubling time was observed in the block year 2016-2020 and the lowest was observed in the block year 2006-2010. Out of a total of 205 publications, the highest publication was articles having 85.36%.Most of the articles have been contributed by multiple authors. In the block year 2006-2010, the Degree of collaboration was found highest. Author Pratap, G. has contributed the highest number of articles during the study period.The analysis presumes that distributions of articles in the field of scientometrics are expanding day by day, authors are attempting to build the collaboration with others and using various sources for their articles which likewise increase others reference file.

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