Scientometric Analysis of Cancer Research in India

Veena S. Yeshawant
Research scholar,
Department of Library and Information Science,
Rani Channamma University, Belagavi,
Karnataka, India.
veena.yeshawant@gmail.com

Kiran P. Savanur
Assistant Professor,
Department of Library & Information Science,
Rani Channamma University, Belagavi,
Karnataka, India.
kps@rcub.ac.in

Abstract

Cancer research in India has risen in size and influence during the last 20 years. From low-tech, large-scale health outcomes to some of the most sophisticated fields of fundamental cancer science, Indian clinicians, scientists, and federal and state policymakers have championed cancer research. A scientometric study using descriptive analyses to determine annual growth patterns in publications across all cancer research literature from India. A visualisation software tool (VOS viewer) was used to explore the geographical distribution of the research activity. We retrieved 17,904 cancer-related articles published by India-affiliated authors from 2012 to 2021. An increase in the number and range of topics explored in cancer-related



publications over time was identified. The summary of the current corpus of cancer-related research for India can be used to direct the development of the national cancer control plan alongside informing the national cancer research strategy. Our novel and feasible scientometric approach can be used to direct future national and regional mapping of cancer research.

Keywords: *Cancer Research, Cancer Epidemiology, Scientometric Analysis, Policy, India.*

1. Introduction:

Despite advances in cancer prevention and treatment, cancer morbidity and mortality are increasing rapidly around the world. Breast, lung, and colorectal cancers had the highest global incidences in 2020, with lung cancer being the leading cause of cancer death. Cancer burden increases due to factors such as population growth, ageing, and lifestyle (e.g. diet and physical activity), as well as social and economic development, particularly in low- and middle-income countries.

Cancer cases in India increased at an average annual rate of 1.1-2 per cent from 2010-2019, according to a new report. Deaths from cancer in the country also went up at an average rate of 0.1-1 per cent in the same period, the paper showed. The growth rates are among the global highest, according to the analysis by the Institute for Health Metrics and Evaluation (IHME), University of Washington School of Medicine published in *JAMA* journal on December 30, 2021. As many as 1,392,179 people in India had cancer in 2020, projections from another study showed. The five leading sites of the disease were the breast, lung, mouth, cervix, uteri and tongue, researchers found.

Among men, the projected incidence was 94.1 per 100,000 individuals and for women, it was 103.6 per 100,000 individuals in 2020, according to the Cancer Statistics Report, 2020. Globally, the picture is not very different, going by the IHME study *Global Burden of Disease Study 2019 analysis*. New cancer cases jumped to over 23 million in 2019 from 18.7 million in 2010. Cancer deaths reached 10 million in 2019 from 8.29 million in 2010. These figures represent an increase of 20.9 per cent and 26.3 per cent respectively.

2. Objectives of the study: Our objectives were to

1. Determine the extent of cancer research publications in India from 2012 to 2021.
2. Identify the number of publications across research organisations in India.
3. Top Productive Authors in the Research Area.
4. Most cited sources in the area of Research.
5. Most Relevant Document types are used to publish in the research area.
6. Keyword Co-occurrence Analysis.

3. Methods and Data Collection:

The publication data for performing this study were searched and downloaded from the Web of Science Database, is a database of bibliographic citations of multidisciplinary areas that covers the various journals of medical, scientific, and social sciences including humanities. The Search Strategy was made and conducted on 30 March 2022 by providing the topical keyword "Cancer" with enabling period of "10 Years" (2012 – 2021). The period of '10 years' was enabled to cover a maximum number of publications. A total of 17,356 publications fulfilled the desired search query.



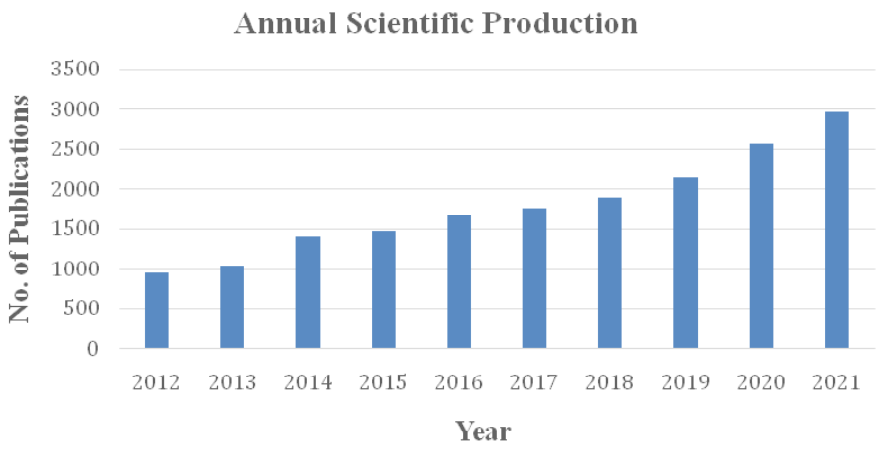
Mapping of a discipline or a specified subject area includes many manifolds analysis and structural representations of the scientific data. In this study, we used Visualization Of Similarity (VOS) Viewer software to visualize the scientific landscape especially complex scientometric relations such as Co-authorship analysis and Co-word occurrence analysis in Cancer research. MS-Excel is used as an analysis tool to analyse different scientific structures based on different Scientometric indicators.

4. Data Analysis and Results:

4.1 Annual Scientific Production

Annual scientific production trends in the terms of publications is represented in figure 1. During 2012-2021, a total of 17,904 publications were published on cancer research in India. The average number of publications published per year was 1790. It can be visualized from the figure that the growth of literature in the field of cancer in India was exponential.

Figure 1. Annual Scientific production in Cancer publications



4.2 Top 20 Most Productive Sources Exhibited with Cancer Publications

All the recorded 17904 publications were from 2085 journals. Out of the total of 2085 journals, 782 (37.5%) journals published one paper only. The most productive journal we analysed with a maximum of 603 publications was *Annals of Oncology, followed by the Journal of Clinical Oncology* with 509 publications. Table 1 along with Figure 2 shows below the most productive 20 Journals published papers in Cancer.

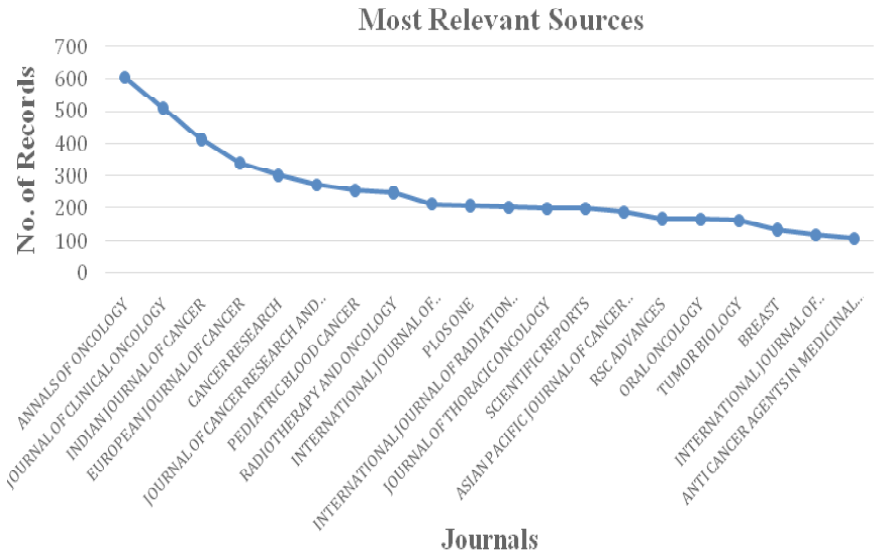
Table 1. Top 20 Most Relevant Sources

Sl. No.	Journals	No. of Records	%
1	ANNALS OF ONCOLOGY	603	3.396
2	JOURNAL OF CLINICAL ONCOLOGY	509	2.854
3	INDIAN JOURNAL OF CANCER	413	2.301
4	EUROPEAN JOURNAL OF CANCER	340	1.916
5	CANCER RESEARCH	302	1.698
6	JOURNAL OF CANCER RESEARCH AND THERAPEUTICS	272	1.53
7	PEDIATRIC BLOOD CANCER	255	1.435
8	RADIOTHERAPY AND ONCOLOGY	249	1.396
9	INTERNATIONAL JOURNAL OF GYNECOLOGICAL CANCER	213	1.201
10	PLOS ONE	209	1.179
11	INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS	203	1.167



12	JOURNAL OF THORACIC ONCOLOGY	199	1.145
13	SCIENTIFIC REPORTS	199	1.123
14	ASIAN PACIFIC JOURNAL OF CANCER PREVENTION	189	1.056
15	RSC ADVANCES	168	0.938
16	ORAL ONCOLOGY	167	0.933
17	TUMOR BIOLOGY	163	0.91
18	BREAST	135	0.754
19	INTERNATIONAL JOURNAL OF BIOLOGICAL MACROMOLECULES	119	0.676
20	ANTI CANCER AGENTS IN MEDICINAL CHEMISTRY	109	0.62

Figure 2. Top 20 Most Relevant Sources



4.3 Author's productivity in terms of h-index, g-index, Total Citations (TC) and Total Publications (TP)

In the year 2005, Jorge Eduardo Hirsch, an Argentinian American physics professor, invented the h-index. The index is based on the distribution of citations in a single author's publications. The h-index is an author-level matrix, and an author has an h-index of 'h' if they have h papers that have been cited at least h times. The h-index was regarded as a reliable and authentic tool for mapping an individual author's scientific contribution and achievement.

Table 2 is the analysis of the author's productivity in terms of the Total number of publications (TP), h-index and Average Citation per Paper (ACP) in Cancer research. The study revealed that apart from the top 4 or 5 authors in the terms of h-index, most of the authors had similar citation and publication characteristics. Following is table 2 with the top 20 authors and their productivity with matrices.

Table 2. Top 20 authors and their productivity

Sl. No.	Authors	TP	TC	ACP	h-index
1	Kumar S	427	6767	15.85	37
2	Gupta S	404	4458	11.03	26
3	Kumar R	354	4023	11.36	32
4	Kumar A	349	3940	11.29	30
5	Sharma A	288	3069	10.66	30
6	Prabhash K	249	2479	9.96	23
7	Singh A	232	3240	13.97	26
8	Singh S	228	2859	12.54	33
9	Sharma S	208	2047	9.84	25
10	Joshi A	195	1227	6.29	19
11	Kumar V	194	3018	15.56	26
12	Singh N	194	2982	15.37	26
13	Noronha V	181	1149	6.35	19

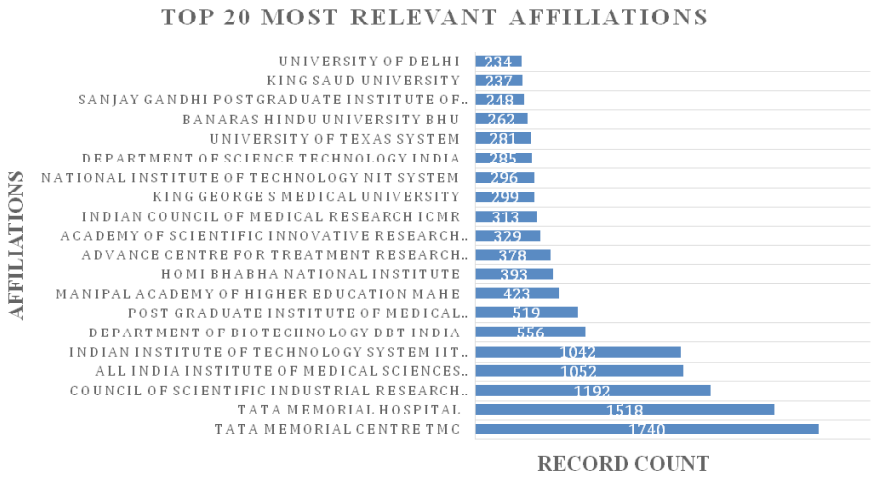


14	Das,S.	167	2025	12.13	25
15	Mahantshetty U	164	2705	16.49	26
16	Chatterjee S	155	1211	7.81	20
17	Gupta A	152	1894	12.46	24
18	Kumar P	141	2546	18.06	25
19	Ghosh, S.	136	1985	14.06	24
20	Patil S	134	1008	7.52	15
21	Singh R	132	1496	11.33	20
22	Banerjee, S.	132	2002	15.17	27

4.4 Mostrelevant affiliation related to Cancer publications

Figure 3 displays the top 20 most relevant affiliations from which cancer research publications have been carried out. During the 10 Years the period (2012-2021), Tata Memorial Centre has topped the list with a maximum of 1740 publications followed by Tata Memorial Hospital (1518), Council of Scientific Industrial Research (1192), All India Institute of Medical Science (1052) and Indian Institute of Technology System (1042) and so on.

Figure 3. Top 20 most relevant affiliations



4.5 Most relevant Document Types related to Cancer publications

In Below Table 3, the number of publications published in a different type of document is listed. The purpose of this table is to show the number of publications published under each category of document types like journal articles, conference articles, etc.

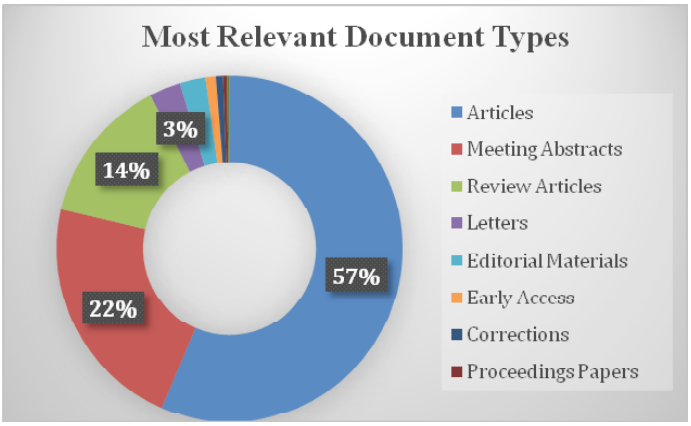
From Table 3 it is clear that out of the total 17904 publications, 10256(57.28%) are journal articles whereas 4035 (22.53%) are Meeting Abstracts followed by 2511(14.02%) Review Articles and 533(2.97%) Letters were published in Cancer Research from 2012-2021.

Table 3. Most Relevant Document Types

Document Types	Record Count	%
Articles	10256	57.283
Meeting Abstracts	4035	22.537
Review Articles	2511	14.025
Letters	533	2.977
Editorial Materials	436	2.435
Early Access	175	0.977
Corrections	120	0.67
Proceedings Papers	65	0.363
Book Chapters	40	0.223
Retracted Publications	5	0.028
Book Reviews	4	0.022
Retractions	3	0.017
Biographical-Items	2	0.011
News Items	2	0.011
Hardware Reviews	1	0.006
Reprints	1	0.006



Figure 4. Most Relevant Document Types



4.6 Languages-wise distribution of Cancer publications

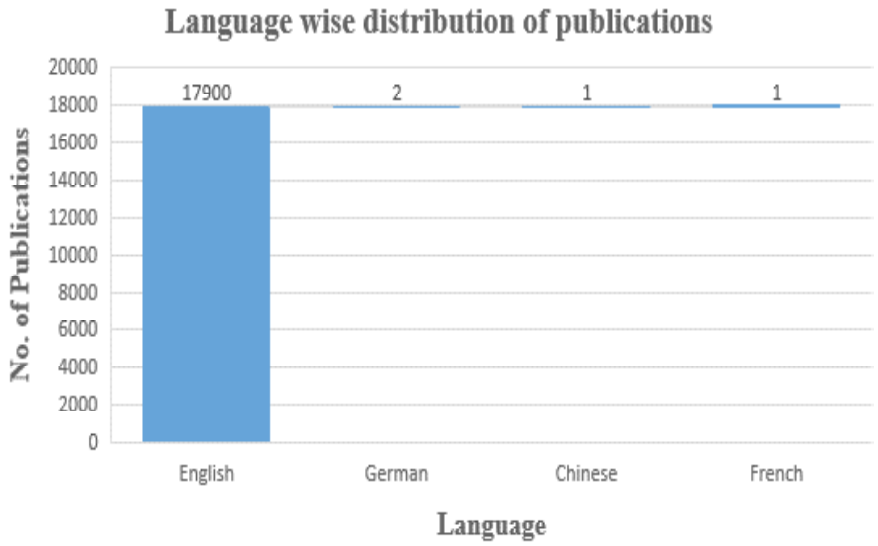
Table- 4 shows the articles that appeared in different languages. From this table, we come to know in which language Cancer articles are published more, as there are many different languages namely English, German, Chinese, etc. The purpose of this table is to know the predominant language of the paper's subject field.

From Table 4 it's clear that out of 17904 articles, 17900(99.97%) articles are in the English language. Only 2 articles in German and 1 article in Chinese language and French both the languages. The English language is the most predominant language in the field of Cancer in India.

Table 4. Languages wise distribution of Cancer publications

Languages	Record Count	%
English	17900	99.97
German	2	0.011
Chinese	1	0.005
French	1	0.005

Figure 5. Languages wise distribution of Cancer publications



5. Structural Analysis and Visualization in Cancer research publications:

5.1 Keyword Co-occurrence Analysis

Keyword co-occurrence examines a discipline's research hotspot. It also investigates research trends in a specific domain. Table 5 is the list of the top 20 most occurred keywords used in Cancer research. The keyword "Breast Cancer" is used more than any other keyword. It shows more research studies are being done on breast cancer.

The overlay analysis displays the co-occurrence of keywords over a specified period. According to the graph, the keywords used in Cancer research such as breast cancer, Apoptosis, Cytotoxicity, Chemotherapy, Metastasis, and so on have only evolved since the beginning of 2012 until now. According to the findings, the implementation of technology has increased research in areas such as medicine, cancer and treatment and diagnosis.



JLD : Vol. 8 ,No. 2, Aug - 2022
ISSN : 2395 - 518 X

Table 5.

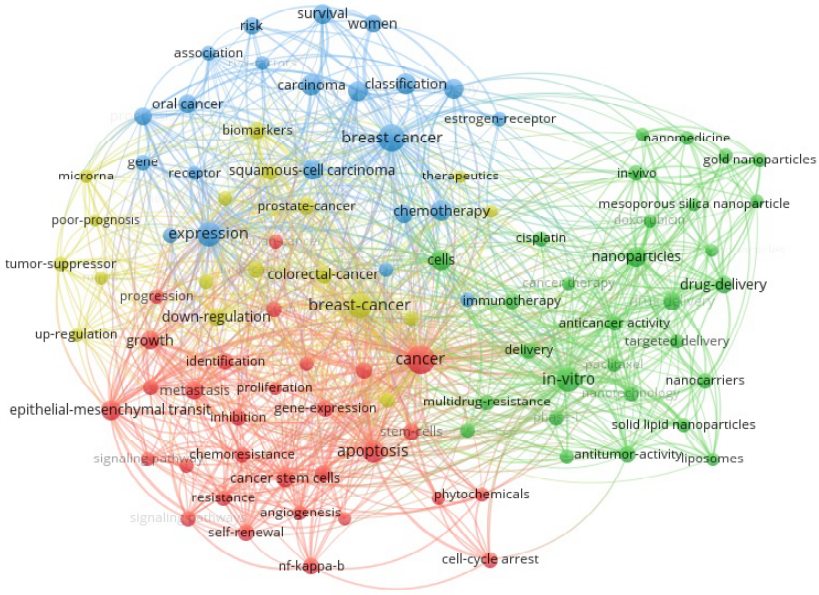
Top 20 keywords used in Cancer research publications

Sl. No.	Key Words	Occurrence
1	Breast cancer	1313
2	Cancer	1226
3	Apoptosis	912
4	Cervical cancer	362
5	Lung cancer	360
6	Cytotoxicity	341
7	Prostate cancer	299
8	Chemotherapy	269
9	Oral cancer	266
10	Colorectal cancer	252
11	Metastasis	245
12	Anticancer	232
13	Nanoparticles	228
14	Drug delivery	203
15	Molecular Docking	196
16	Colon cancer	188
17	India	178
18	Cancer stem cells	154
19	Curcumin	154
20	Head and neck cancer	137

मनोमयः अयं हि पुरुषः

JLD : Vol. 8 ,No. 2, Aug - 2022
ISSN : 2395 - 518 X

Figure 6. Keywords Mapping on Cancer Research Using VOS Viewer



6. Conclusion:

An extensive Scientometric study on cancer research was conducted using Clarivate Analytics Web of Science database data spanning all years. Several studies on scientific publication production, author and affiliation performance, citation characteristics of publications in Cancer research, network analysis and visualisations of keyword co-occurrences have been conducted.

References:

Shnawa BH, Al-majmaie SM. Oncology research productivity of Iraqi authors: A bibliometric analysis during 1955-2019. Med Leg Update. 2021; 21(1):174-182.

Begum M, Lewison G, Jassem J, et al. mapping cancer research across central and Eastern Europe, the Russian Federation and Central Asia: Implications for future national cancer control planning. Eur J Cancer. 2018; 104:127-136.

Cabral BP, da Graça Derengowski Fonseca M, Mota FB. The recent landscape of cancer research worldwide: A bibliometric and network analysis. Oncotarget. 2018; 9(55):30474-30484.

Horton R. Offline: Indonesia-unravelling the mystery of a nation. Lancet. 2016; 387(10021):830.

Grimshaw JM, Eccles MP, Lavis JN, Hill SJ, Squires JE. Knowledge translation of research findings. Implement Sci. 2012; 7(1):1.

Kandun IN, Samaan G, Santoso H, et al. Strengthening Indonesia's field epidemiology training programme to address international health regulations requirements. Bull World Health Organ. 2010; 88 (3) :211-215.

Mustika R, Nishigori H, Ronokusumo S, Scherpbier A. The odyssey of medical education in Indonesia. The Asia Pacific Scholar. 2019; 4 (1) : 4-8.

Hedt-Gauthier BL, Jeufack HM, Neufeld NH, et al. Stuck in the middle: A systematic review of authorship in collaborative health research in Africa, 2014-2016. BMJ Global Health. 2019; 4(5):e001853-2016.

Bramer WM, Rethlefsen ML, Kleijnen J, Franco OH. Optimal database combinations for literature searches in systematic reviews: A prospective exploratory study. Syst Rev. 2017;6 (1): 1-12.

Irawan DE, Abraham J, Zein RA, Ridlo IA, Aribowo EK. Open access in Indonesia. Dev Change. 2021; 52:651-660.



JLD : Vol. 8 ,No. 2, Aug - 2022
ISSN : 2395 - 518 X