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Nature Reviews Cancer: A Bibliometric Study

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Abstract

Cancer is the most imperative growing health issue in the world. Various significant research works have been conducted on cancer and its allied diseases. However, there have been very few analysis related to cancer scientific publications over the past two decades. This paper tries to provide a bibliometric approach to analysing Nature Reviews Cancer, a Springer Nature journal that is published monthly and indexed in the Scopus database. A total of 3,126 documents were retrieved from the Scopus database during the period 2001 to 2018. Further, the bibliographic information were analysed using RStudio. The highest (37.42%) percentage of documents were in the form of reviews. A comprehensive bibliometric analysis has been used to analyse the annual growth trend, the document types, the most productive author, the top contributing country, the top contributing institution, and the most cited article published during 2001 to 2018.

Keywords: Nature Reviews Cancer, Bibliometric Study

Introduction

Cancer is a leading indecisive disease, which can affect any part of the body, causing death. Globally, around one in six deaths occurs due to cancer. Most of the low- and middle-income countries suffer the most, with about 70% of deaths occurred there. Cancer is a genetic disease. The increased research on cancer and its allied diseases has led to various publications of elementary research, evaluation of curative effects, clinical trials, and so on. These publications are a crucial information resource and are very supportive in recognising the recent research on cancer treatment. Though, there has been little research available for this study.

Due to the rapid development of the Internet and other technology, there has been an increase in the number of publications on medical research. As a result, various data repositories, publisher databases, and institution repositories have been developed. Further, there are many new tools and techniques that have been developed to analyse the research carried out in a specific field. Bibliometric tools like Publish or Perish, RStudio, HistCite, BibExcel, Pajek, and so on are mostly used by the researcher in the current environment. These tools enable the collection of metadata and the analysis of the proper literature resources to judge the development status of the particular discipline, and potentially estimate its development. Subsequently, more researchers publish a variety of papers in specific domains, which is useful for others. In this study, bibliometric analysis has been applied to the *Nature Reviews Cancer* journal to find out the different parameters of bibliometric analysis, i.e. annual scientific production, the most productive author, the most productive country and institutions, the most cited paper, and so on.

Nature Reviews Cancer

Nature Reviews Cancer is a peer-review journal published monthly by Nature Research, a leading publisher from the United Kingdom. The prime objective of the journal is to serve the research community by encouraging them to publish significant scholarly papers related to cancer/oncology. The journal covers primary research, reviews, critical comments, news, and analysis related to cancer research. The journal strives to publish papers with comprehensible enhanced figures, and is authoritative, and accessible. Further, the journal aims to provide facilities to its authors, referees, and readers. The journal is a product of Springer Nature, available in open access and indexed in the Scopus database. The two-year impact of the journal is 51.484, Eigenfactor is 0.074, and article influence score is 19.538. Because of its broad concept, the journal has a wide reach to the relevant researcher.

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Objectives

The prime objectives of the paper are as follows:

- To identify the type of documents published.
- To identify the growth of annual scientific publications.
- To recognise the authorship pattern.
- To recognise the geographical distribution.
- To recognise the most cited publication.
- To recognise the author dominance factor.

Materials and Methods

The bibliometric method has been deployed to analyse the data exported from the journal *Nature Reviews Cancer*. Scopus database, a comprehensive database, is used to retrieve the bibliographic information from the year 2001-2018. The database is a sister product of Elsevier, which is associated to the fields of humanity, science, technology, medicine, and so on. The database is associated with more than 3,000 academic, government, and corporate institutions. It is the largest peer-reviewed citation database on scientific journals, books, and conference proceedings. A total of 3,219 documents have been published in the *Nature Reviews Cancer* journal.

Data Analysis

The data are analysed with RStudio, a bibliometrix package used in the Scopus database to calculate the growth of annual scientific publications, types of documents, country rank production, country collaborations, and so on. StatPlanet tools are used for creating world maps to visualise country-wise distribution. Further analysis, in terms of document type, annual scientific publication, authorship patterns, geographical distribution, and author dominance factors are calculated. Table 1 clearly shows that a total of 3,129 documents have been published in the *Nature Reviews Cancer* journal. There are a total of 5,958 authors; the highest number (2,940) are multi-authored, 1,883 are corresponding authors, and 337 are noted as papers with single authors. The ratio of documents per author is 0.955, author per document is 1.05, co-author per document is 1.9, and the collaboration index is 2.36. Similarly, a total of 5,32,400 citations, with an average of 170.5 citations per document has been observed.

Table 1: Information about Data

Documents	3129
Sources (Journals, Books, etc.)	2
Period	2001–2019
Total citations	532400
Average citations per document	170.5
Authors	3277
Author appearances	5958
Authors of single-authored documents	337
Authors of multi-authored documents	2940
Single-authored documents	1883
Documents per author	0.955
Authors per document	1.05
Co-authors per document	1.9
Collaboration index	2.36

Distribution of Document Type

Table 2 illustrates the distribution of document types that have been published in the *Nature Reviews Cancer* journal. Reviews were the most significant contributors to the journal - 1,198 (38.28%), followed by articles (822 or 26.27%), and notes (758 or 24.22%). The remaining types of documents, like conference papers, articles in the press, editorials, errata, letters, and so on, are less significant, making up less than 20% of the contribution.

Table 2: Document Type

Sr. No.	*Document Types*	*Total Articles*	*Percentage*
1	Articles	822	26.27
2	Articles in press	5	0.15
3	Conference papers	8	0.25
4	Editorials	128	4.09
5	Errata	89	2.84
6	Letters	69	2.20
7	Notes	758	24.22
8	Reviews	1198	38.28
9	Short surveys	52	1.66
Total		3129	100

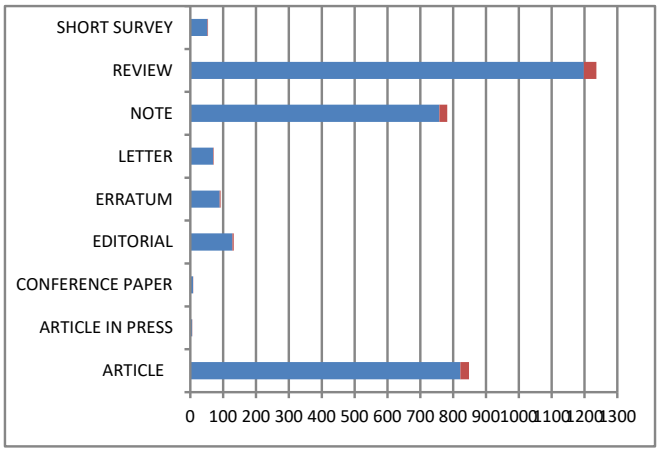

Fig. 1: Document Type

Annual Scientific Production

The attentiveness of the current research is revealed in its publication output. Table 3 clearly shows the number of publications in the journal during the period 2001 to September, 2019. It may be seen from Fig. 2 that there is a sudden increase in publications in 2002, followed by a steady growth till 2009. There is a sudden drop up to 2012. Further, it can be seen in 2013 that there is a sudden decline, followed by a slight increase after 2016, which continues till 2019.

Table 3: Annual Scientific Production

Sr. No.	*Year*	*Articles*	*Percentage*
1	2001	36	1.15%
2	2002	189	6.04%
3	2003	169	5.40%
4	2004	196	6.26%
5	2005	205	6.55%
6	2006	206	6.58%
7	2007	208	6.65%
8	2008	217	6.94%
9	2009	197	6.30%
10	2010	200	6.39%
11	2011	196	6.26%
12	2012	186	5.94%
13	2013	164	5.24%
14	2014	161	5.15%
15	2015	130	4.15%
16	2016	111	3.55%
17	2017	121	3.87%
18	2018	121	3.87%
19	2019	116	3.71%
Total		3129	100%
Annual Percentage Growth Rate 6.716325			

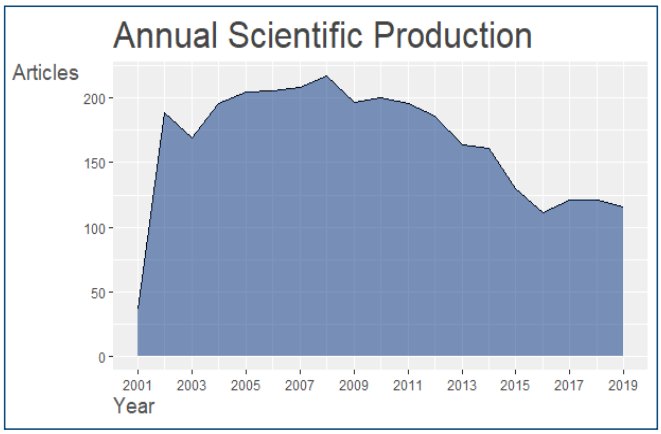

Fig. 2: Annual Scientific Production

Table 3 clearly reflects that the highest number of documents (217 or 6.94%) were contributed in 2008, followed by 208 (6.65%) in 2007, 206 (6.58%) in 2006, 205 (6.55%) in 2005, and 200 (6.39%) in 2010. The other years have contributions less than 200. The annual growth percentage rate is 6.716325.

Most Productive Author

Authors are the sole contributors to any publication. Table 4 reveals the top ten most productive contributions made on *Nature Reviews Cancer* journal. McCarthy N. appeared as the topmost contributor, with 376 papers, followed by Seton Rogers S. and Novak K. with 260 and 145 documents contributed, respectively.

Table 4: Top 10 Most Productive Authors

Sr. No.	*Authors*	*Articles*
1	McCarthy N.	376
2	Seton Rogers S.	260
3	Novak K.	145
4	Hutchinson E.	143
5	Alderton G. K.	120
6	Greenwood E.	86

7	Harjes U.	71
8	Dart A.	59
9	Burgess D. J.	52
10	Alderton G.	50
Total		1362

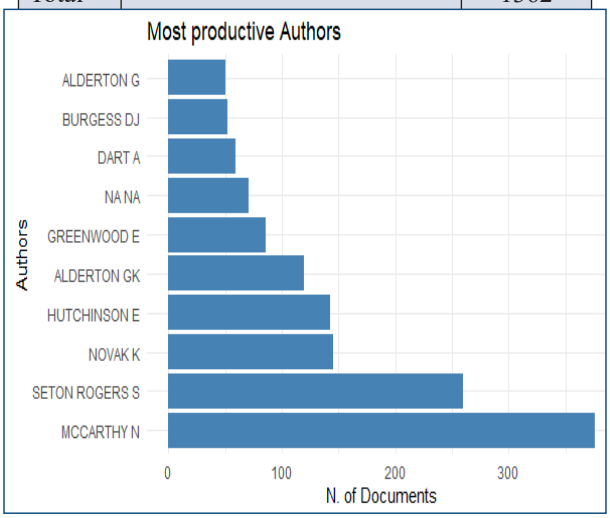

Fig. 3: Most Productive Authors

Most Productive Country

Generally, each author of a publication is affiliated to a specific country. Contributions made by the author could be considered as the country's research productivity. Table 5 shows that the USA, with 862 publications, is the most productive country in terms of the number of publications, followed by the UK with 268, Canada (76), Germany (73), Australia (63), the Netherlands (54), Spain (48), Italy (45), France (43), and Switzerland (29).

Table 5: Top 10 Productive Countries

Sr. No.	*Country*	*Publications*
1	USA	862
2	UK	268
3	Canada	76
4	Germany	73
5	Australia	63
6	Netherlands	54
7	Spain	48
8	Italy	45
9	France	43
10	Switzerland	29

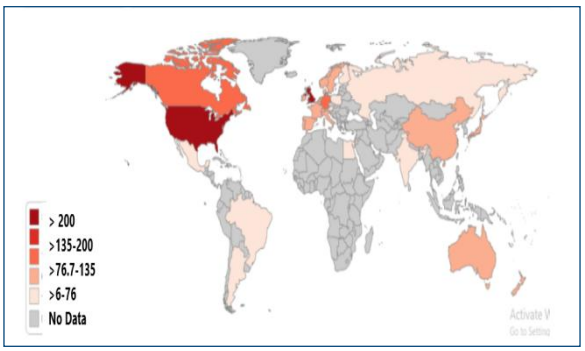

Fig. 4: Most Productive Country

Table 6 depicts that the USA leads with 626 manuscripts with a frequency of 0.2556, SCP = 555, MCP = 71, and MCP Ratio = 0.113, followed by the United Kingdom with 189 articles with a frequency of 0.1587, SCP = 150, MCP = 39, and MCP Ratio = 0.206. The other countries have very few contributions.

Table 6: Top 10 Corresponding Author's Countries

Sr. No.	*Country*	*Articles*	*Frequency*	*SCP*	*MCP*	*MCP Ratio*
1	USA	626	0.5256	555	71	0.113
2	United Kingdom	189	0.1587	150	39	0.206
3	Germany	59	0.0495	36	23	0.390
4	Canada	53	0.0445	34	19	0.358
5	Australia	44	0.0369	34	10	0.227
6	Netherlands	35	0.0294	30	5	0.143
7	Spain	28	0.0235	19	9	0.321
8	France	24	0.0202	13	11	0.458
9	Italy	23	0.0193	17	6	0.261
10	Israel	21	0.0176	14	7	0.333

NB: SCP: Single Country Publications
MCP: Multiple Country Publications

Citation

Generally, a citation recognises the evidence in published or unpublished work in the form of bibliography reference. It establishes the credibility of the author, the country, as well as the journal. In this paper, an analysis of the total citations per country and manuscripts per citation has

been carried out. Table 7 reflects the citations received country-wise, in terms of total citations and average article citations per year. It is revealed that the USA received the highest citations with T C = 2,94,529 and AAC = 470.5.

Table 7: Total Citations per Country

Sr. No	*Country*	*TC*	*AAC*
1	USA	294529	470.5
2	United z	61698	326.4
3	Canada	28084	529.9
4	Germany	25262	428.2
5	Australia	16614	377.6
6	Spain	13308	475.3
7	France	11919	496.6
8	Netherlands	10985	313.9
9	Italy	8950	426.2
10	Israel	8546	371.6

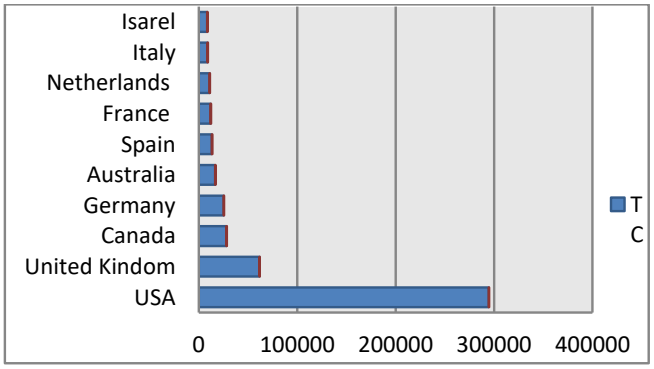

Fig. 6: Total Citations per Country

Manuscript per Citation

Table 8 clearly shows that 'MicroRNA signatures in human cancers', authored by Calin G.A. and Croce C.M., received the highest citations, with TC = 5425 and TCP = 417, followed by 'Oncomirs – MicroRNAs with a role in cancer' authored by Esquela-Kerscher A. and Slack F. J., with TC = 5235 and TCP = 403. The rest of the manuscripts received fewer than 5,000 citations.

Table 8: Top 10 Manuscripts per Citations

Sr. No.	*Manuscripts*	*Author*	*TC*	*TC per Year*
1	MicroRNA signatures in human cancers	Calin G. A., Croce C. M.	5425	417
2	Oncomirs – MicroRNAs with a role in cancer	Esquela-Kerscher A., Slack F. J.	5235	403
3	The blockade of immune checkpoints in cancer immunotherapy	Pardoll D. M.	4641	663
4	Epithelial-mesenchymal transitions in tumour progression	Their J. P.	4631	272
5	The phosphatidylinositol 3-kinase-AKT pathway in human cancer	Vivanco I., Sawyers C. L.	4478	263
6	New functions for the matrix metalloproteinases in cancer progression	Egeblad M., Werb Z.	4442	261
7	Targeting HIF-1 for cancer therapy	Semenza G. L.	4304	269
8	Multidrug resistance in cancer: Role of ATP-dependent transporters	Gottesman M. M., Fojo T., Bates S. E.	3698	218
9	Hypoxia – A key regulatory factor in tumour growth	Harris A. L.	3480	205
10	Photodynamic therapy for cancer	Dolmans D. E. J. G. J., Fukumura D., Jain R. K.	3298	206

Author Dominance Factor

The author dominance function calculates the author's dominance ranking (Kumar, 2008). It is a ratio indicating the fraction of multi-authored articles in which a scholar appears as the first author. It uses K-means clustering to identify clusters of documents which deal with common concepts. Table 9 shows that Hutchinson E., Alderton G. K., and Brooksbank C. appeared as the most dominating authors, with a dominance factor of 1.0000000.

Table 9: Author Dominance

Sr. No.	Author	Dominance Factor	Total Articles	Single-Authored	Multi-Authored	First Authored	Ranked by Article	Rank by Df
1	Hutchinson E.	1.0000000	143	80	63	63	14	1
2	Alderton G. K.	1.0000000	120	119	1	1	13	1
3	Brooksbank C.	1.0000000	28	22	6	6	12	1
4	Gatenby R. A.	0.5000000	8	0	8	4	10	4
5	Gorski D. H.	0.5000000	8	0	8	4	10	4
6	Chen Z.	0.4000000	5	0	5	2	1	6
7	Dang C. V.	0.4000000	5	0	5	2	1	6
8	McCarthy N.	0.3442623	376	315	61	21	15	8
9	Gazdar A. F.	0.3333333	6	0	6	2	5	9
10	Gillies R. J.	0.3333333	6	0	6	2	5	9
11	Watt F. M.	0.3333333	6	0	6	2	5	9
12	Cao Y.	0.2000000	6	1	5	1	5	12
13	Kerbel R. S.	0.2000000	5	0	5	1	1	12
14	Smyth M. J.	0.1666667	6	0	6	1	5	14
15	Jain R. K.	0.1428571	8	1	7	1	10	15

Funding/Sponsor

A total of 167 funding agencies have sponsored 3,126 documents published in the *Nature Science Research* journal during the period 2001 to August, 2019. Of this, only the top ten funding agencies have been listed in Table 10. It reveals that the major sponsors are the National Institutes of Health, with 226 (7.22%) number of sponsors, followed by the Foundation for the National Institutes of Health, with 175 (5.59%), and the National Cancer Institute, with 129 (4.12%).

Table 10: Top 10 Funding Agency

Sr. No.	Funding Agency	Total Sponsor	Percentage
1	National Institutes of Health	226	7.22
2	Foundation for the National Institutes of Health	175	5.59
3	National Cancer Institute	129	4.12
4	Cancer Research UK	53	1.69
5	National Health and Medical Research Council	40	1.27
6	European Commission	37	1.18
7	American Cancer Society	34	1.08
8	Canadian Institutes of Health Research	30	0.95
9	Deutsche Forschungsgemeinschaft	30	0.95
10	Associazione Italiana per la Ricerca sul Cancro	27	0.86
11	Wellcome Trust	27	0.86
12	European Research Council	25	0.79
13	KWF Kankerbestrijding	25	0.79
14	U.S. Department of Defense	25	0.79

N = 3126; Total funding agency = 167; Average per funding agency = 18.71

Discussion

The bibliometric study of the journal *Nature Review Cancer* shows that multi-authored articles appeared more in this journal compared to single-author papers. This clearly indicates that more authors are associated with this journal and are more prominent on review articles. The annual scientific production of the journal clearly shows a steady increase in cancer publications, though there are slight inconsistencies. McCarthy N. was the highest contributor to the journal, but the contributions are multi-authored. The USA had the most publication in both total and corresponding author publications. Citation provides credibility to the author, country, as well as to the journal. MicroRNA signatures in human cancers, authored by Calin G.A. and Croce C.M. had the highest number of citations and they belong to the USA. In this aspect, the USA has proved that it is the most productive country, in terms of quality, compared to the other papers in this study.

The USA and the UK are fast developing countries in terms of research productivity, as seen in this study. Eradicating cancer requires increasing productivity of quality research in the field. In this context, most of the research institutes in developed countries come forward to sponsor the author who desires to work on cancer research. Further, this study only defines the number of publications that were a source of specific funding agencies and not a financial agency. The National Institutes of Health and the Foundation for the National Institutes of Health are the topmost funding sources as observed in this study.

Conclusion

The study examines the characteristics and developments in the *Nature Review Cancer* journal using bibliometric study. The result shows that review publications are emerging as the most published articles in this journal. The scientific production of the publication is quiet positive. The increasing number of publications, citations, and its high impact factor confirm that the editorial policy of the journal is very strong and future-oriented. According to the study, publications in connection to cancer have been growing in most of the western countries, i.e., the USA, the UK, Germany, and so on, over the past decade. Further, the bibliometric study of a journal may signify the worth of that journal, which allows a researcher to acquire fast and reliable abstracts of their concerned research area.

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