

# **Research Patterns and Citations in the Cancer Research Output of Madurai Kamaraj University**

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## **ABSTRACT**

*The study examines the research pattern and citation in the field of Cancer research done by the researchers of M.K University. The study intends to find out the type of document, the growth in literature, the most prolific authors, the most productive departments and the most relevant sources along with the citations, the most frequent keywords and different collaborative measures. The researcher collects 428 publications from the Web of Science database published during 2010-2020 and analyzes and visualizes the data using Bibliometrix R Packages, bibexcel and VOS viewer. The mean value of DC, CC & MCC are 0.99, 0.77 and 0.79 respectively and it is highly significant and shows high collaboration in the authorship. The authorship pattern is inversely proportional to the number of citations. RSC Advances, Environmental Toxicology and InorganicaChimicaActa are the most preferred journals and research works on breast cancer and antibacterial activity are comparatively more ongoing cancer researches during the study period. The study suggests that the researchers not only depends on the collaborative research works but also should focus on improving the quality of research works based on variables such as quality of paper, the novelty of ideas, methodology, accessibility and visibility of the research field.*

**KEYWORDS:** Research Pattern, Citation, Cancer Research, M.K University, Research Output, Scientometric study, Degree of Collaboration, Collaborative Co-efficient, Modified Collaborative Coefficient.

## **INTRODUCTION**

Cancer is the second leading cause of mortality worldwide. Overall, the prevalence of cancer has increased. India has the largest pool of patients with cancer. For a country like India, preventive oncology and early detection are much more important than drug discovery. Scientific research competence today is important for many professions

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and activities: it is necessary not only to creatively apply the obtained knowledge but also to create new knowledge, to carry out the applied researches. Quality assurance of higher education-whether based on the international evaluation, national evaluation, or international higher education rankings-has defined university professors' research performance as a key indicator because their research and publications related to their teaching contents as well as to university reputation, funding, and industry linkage. Academic publishing is the process of placing the results of one's research into the literature. The characteristics of academic research is it contains novel ideas and novel information. The defining element of Higher Education Institutions today is research, which has become the gold standard when it comes to the evaluation of higher education institutions.

Madurai Kamaraj University, is on its relentless journey for the past 53 years surmounting hurdles of indigenous and exotic nature on its way and has passed through the tests of accreditation towards reaching the status of excellence. University is aware that the process of achieving excellence is continuous and therefore, all efforts are in progress to keep up the momentum.

The Madurai Kamaraj University offers 41 post graduate, 35 M.Phil. and 17 Diploma / P.G. Diploma / Certificate courses in the various departments. Presently, 66 U.G. and 45 P.G. courses are offered in the affiliated Colleges. At present 2428 students and research scholars are on the roll. Currently more than 163 individual research projects are being carried out with an outlay exceeding 34 Crores. The University has a modernized central Library with 3 lakhs books, 15,000 e-journals, 3,000 e-books, 55,000 reference and text books. The one Gbps internet connection, INFONET centre with 50 nodes and smart class rooms have enriched the ICT enabled teaching and learning.

Madurai Kamaraj University strongly believes in de-centralised and participatory governance. As a visionary step, academic and administrative autonomy has been granted to select Schools. The University has established linkages with community around through its various outreach activities. The National and International level connectivity and visibility of this University is a pointer that the University is moving from the status of University with Potential for Excellence to the status of University of Excellence.

### **REVIEW OF RELATED LITERATURE**

Ramkumar (2020) studied the scientometric analysis of Sanskrit Universities in India in terms of the quantum, trend, and overview of the direction of doctoral research, the variance in research productivity between Single- Campus and Multi-Campus University; and the impact of multi-topics guidance on the research productivity of guides. In a study by Sathi (2019) the research output of faculty members of Indian Institute of Management, Calicut has explained. The findings show that there is a high degree of collaboration among the faculty members and Dr. Kulbhushan Balooni is the most prolific author. A joint author study by Ganesan and Mangai (2019) analyses the Web of science publications of Alagappa University during the period 1989-2016. H-index of Alagappa University is 57. CSIR and South Korea are the most prolific institutions and countries respectively and Sanjeev Raja is the most prolific author. Publication output of Kerala Agriculture University is studied by Ajitha and Vasudevan (2019). Yadav and Others (2020) conducted a scientometric study of Mizoram University based on Indian Citation Index. The multi authorship pattern is dominating in the total of 265 articles of Mizoram University with an average collaboration index of 2.78.

A scientometric study of publications of Urumu Dhanalakshmi College is conducted by Jeyachitra and others (2017) found that female faculties contribute very less number of research publications than the male faculties and the most prolific author is Dr P. Sakthivel. In a study by Prabahar and others (2017) analyzed the scholarly communications

of faculties and researchers of Indian Institute of Astrophysics (IIAP), Bangalore to find out the year-wise distribution of publications, the authorship pattern, most productive author, year-wise citations to the articles published, most prolific authors, most preferred journals and so on. The study found that the three author collaboration was dominating and the degree of collaboration was 0.88. Bhakta and Bhui (2018) commenced a study on the research productivity in University of Petroleum and Energy Studies using scientometrics methods. The importance of the study relies on the ranking of journals according to their citations received by them. The most cited journal is Renewable and Sustainable Energy Reviews with 382 citations, but it ranks fourth according to publication.

The previous studies reviewed here are studying the entire output of a particular institution. None of the studies concentrates on the research output of institutions in a particular subject field. So the present study is an attempt to analyze the research pattern of M K University especially in the field of cancer research.

### **NEED FOR THE STUDY**

M K University is one of the 16 universities of the nation has been conferred with a special grant under RUSA and the majority of the grant is for Cancer research. An analysis of the research output of M K University on cancer research will be useful for the authority to get an overview of research progress and impact on cancer research conducting in various departments of the university and to make necessary planning towards research development and fund allotment for research.

### **OBJECTIVES**

1. To identify the type of document used for communicating cancer research by the researchers of M. K University
2. To find out the growth in literature along with the citation of cancer research output
3. To identify the most prolific authors with citation received by them and the most productive departments in cancer research
4. To understand the relationship between authorship pattern and citations received
5. To explore the authorship pattern and measures of collaboration
6. To understand the most frequently used keywords in cancer research
7. To list out the most relevant sources with the citation and impact factor

### **METHODOLOGY**

The research publications on cancer research of M. K University during 2010-2020 were considered for the study. The data for the study area was extracted from the Web of Science database published by Clarivate Analytics. The retrieved data on cancer research was refined by the period of 2010-2020 and organization enhanced by M. K. University. A total of 428 records were downloaded on 9<sup>th</sup> January 2021 and were analyzed based on the objectives framed. The researcher used Bibliometrix R packages, bibexcel and VOS Viewer to scan various measures and to visualize the final dataset.

## RESULTS AND DISCUSSIONS

### Details of data during 2010-2020

**Table 1:** Details of Data during 2001-2020

Details	Value
Time span	2010:2020
Documents	428
Authors	1221
Single-authored documents	3
Average citations per documents	15.19
Average citations per year per doc	2.434
References	17317

The data under study contains 428 records which were published during 2010-2020 in the Web of Science database. A total of 1221 authors contributed 428 research publications and among these only 3 are single-author contributions. The average citation per document is 15.19 and average citations per year per document is 2.434. The researchers utilize a total of 17317 references for all the research publications.

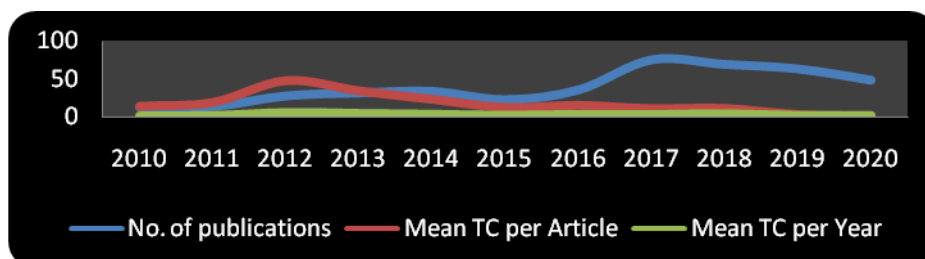
### Year-wise growth pattern

The number of citations are considered as one of the measures of the quality of scientific work. The year-wise growth pattern with total citations of cancer research output by the researchers of M K University is given in Table 2 and Figure 1.

**Table 2:** Year-wise growth pattern

Year	No. of records	% of 422	Mean TC per Article	Mean TC per Year
2010	12	2.71	14.833	1.348
2011	13	2.71	19.846	1.985
2012	27	2.71	48.481	5.387
2013	31	2.71	35.032	4.379
2014	33	2.71	23.970	3.424
2015	22	2.71	13.227	2.205
2016	35	2.71	16.029	3.206
2017	75	2.71	11.667	2.917
2018	69	2.71	11.986	3.995
2019	61	2.71	3.869	1.934
2020	49	2.71	1.955	1.955
		<b>442</b>		

The growth of publications has escalated from 2010 to 2014. A sudden decline occurs in 2015 with only 22 records. It then dramatically climbed to 75 records in 2017 and it is the peak year of publications. Afterwards, a gradual decline occurs from 2017 to 2020. The mean total citation per article shows increment up to 2012 and after 2012 decline over the years. The mean citation per year remains relatively stagnant with three hikes in the years 2012, 2013 and 2018. This shows that citations received by the research output of cancer studies reduced when compared to the previous year.

**Figure 1:** Year-wise growth pattern

### Document Type Distribution

How the researchers of M K University communicate their cancer research output is shown in Table 3. A greater number of research outputs are produced as articles (86.92%) followed by Review (5.84%) and Meeting Abstracts (4.91%). Other types of documents like Proceeding Paper, Letter, Correction and Editorial Material share only less than 1% of the total records. 427 publications are in English language and only one publication is in the Welsh language.

**Table 3:** Document Type

Document Types	No. of Publications	% of 428
Article	372	86.92
Review	25	5.84
Meeting Abstract	21	4.91
Proceedings Paper	4	0.93
Letter	3	0.70
Correction	2	0.47
Editorial Material	1	0.23

### Degree of Collaboration

To find out the degree of collaboration, the formula suggested by Subramanyam<sup>13</sup> has been applied in the study.

The degree of collaboration can be calculated using the formula;

$$DC = N_m / (N_m + N_s)$$

Where, DC= Degree of Collaboration

$N_m$  = Number of Multiple Authored Paper

$N_s$  = Number of Single Authored Paper

**Table 4:** Degree of Collaboration

Year	Single Authored Paper	Multiple Authored Paper	Total	DC
2010	0	12	12	1.00
2011	1	12	13	0.92
2012	1	26	27	0.96
2013	0	31	31	1.00
2014	0	33	33	1.00
2015	0	22	22	1.00
2016	0	35	35	1.00
2017	1	74	75	0.99

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2018	0	69	69	1.00
2019	0	61	61	1.00
2020	0	50	50	1.00
Total	<b>3</b>	<b>425</b>	<b>428</b>	<b>0.99</b>

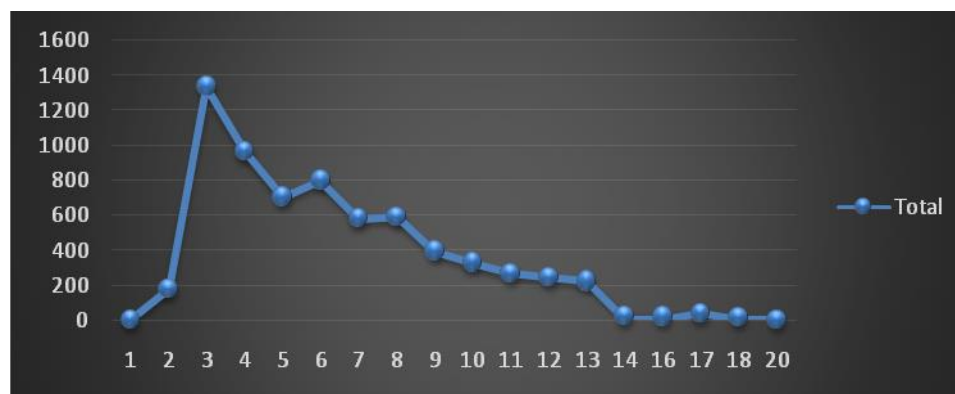
The degree of collaboration per year is shown in Table 4. For the three years 2011, 2012, 2017 the degree of collaboration recorded as 0.92, 0.96, and 0.99 respectively and for all other years, it was 1. It shows that there is a very high degree of collaboration between the researchers at M K University in cancer research works. The co-authorship graph (Figure 3) visualize the collaborative connections between the researchers.

### **Authorship Pattern with Total Citation**

Table 5 and Figure 4 represent how the total number of citation varied between collaborative works. The maximum number of citation 1335 (19.89%) received by the total of 59 three authored papers followed by 965 (14.38%) citations received by the 66 four authored publications and 800 (11.92%) citations received by 48 six authored publications. The number of citation rise from first-authored paper (0.01%) to three authored paper (19.89%) and afterwards, show descending trend with a slight hike in the six authored and eight authored papers. Most of the studies show that citation increased with the increasing number of collaboration such as in the number of authors, institutions and country. But here it is found that citation decreased with increased collaboration.

**Table - 5:** Authorship Pattern with Total Citation

<b>Authorship Pattern</b>	<b>No. of Publications</b>	<b>% of 428</b>	<b>Total Citation</b>	<b>% of 6711</b>
1 Author	3	0.70	1	0.01
2 Authors	33	7.71	179	2.67
3 Authors	59	13.79	1335	19.89
4 Authors	66	15.42	965	14.38
5 Authors	65	15.19	704	10.49
6 Authors	48	11.21	800	11.92
7 Authors	32	7.48	581	8.66
8 Authors	34	7.94	591	8.81
9 Authors	25	5.84	394	5.87
10 Authors	30	7.01	327	4.87
11 Authors	14	3.27	267	3.98
12 Authors	4	0.93	245	3.65
13 Authors	8	1.87	224	3.34
14 Authors	2	0.47	22	0.33
16 Authors	2	0.47	21	0.31
17 Authors	1	0.23	39	0.58
18 Authors	1	0.23	16	0.24
20 Authors	1	0.23	0	0.00
Total	<b>428</b>	100.00	<b>6711</b>	100.00

**Figure 2:** Authorship Pattern with Total Citation

### Highly Productive Department

Department of Chemistry is the most productive department with 110 publications followed by Department of Zoology with 101 publications and Department of Biotechnology with 82 publications. The different departments with total citation received are listed out in Table 9. Like the productivity, Department of Chemistry and Department of Biotechnology are the top departments which secure more than 2000 citations followed by Department of Zoology with 1603 citations.

**Table 6:** Highly Productive Departments on Cancer Research

Department	No. of Publications	2010-12	2013-15	2016-18	2019-20	Total Citations
Dept. of Chemistry	110	1149	603	401	45	2198
Dept. of Biotechnology	82	566	773	595	75	2009
Dept. of Zoology	101	429	537	557	80	1603
Dept. of Botany	26	18	90	173	16	297
Dept. of Nano science & Technology	17	0	57	197	6	260
Dept. of Physics	30	9	52	146	33	240
Dept. of Microbial Biotechnology	13	0	8	93	36	137
Dept. of Animal Science	16	9	46	50	0	105
Dept. of Bioinformatics	17	0	63	21	6	90
Dept. of Environmental Sciences	6	58	0	25	3	86

### Most Frequent Keywords

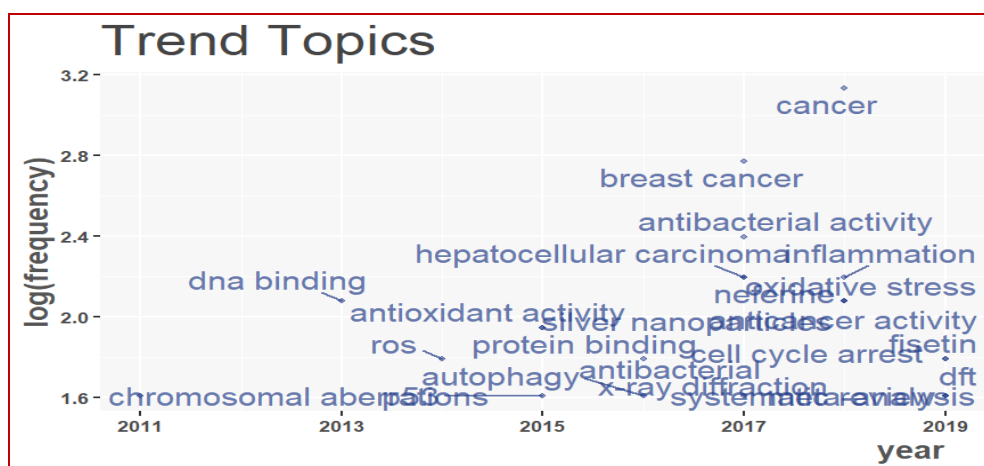
Analyzing author keywords or keywords plus show the real trend of a research field. Here the most frequently used 20 author keywords are listed in Table 7 and visualize in Figure 5. 'Cancer' is the most frequently assigned keyword (n=23) followed by 'Breast-cancer' (n=16) and 'Antibacterial activity' (n=36). Hence it can be drawn that research works on breast cancer and antibacterial activity are comparatively more ongoing cancer researches during the study period.

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**Table 7:** Most Frequent Keywords

Keywords	Frequency
Cancer	23
Breast Cancer	16
Antibacterial Activity	11
Hepatocellular Carcinoma	9
Inflammation	9
Neferine	9
Anticancer Activity	8
DNA Binding	8
Oxidative Stress	8
Silver Nanoparticles	8
Antioxidant Activity	7
Protein Binding	7
Antibacterial	6
Cell Cycle Arrest	6
Fisetin	6
ROS	6
Autophagy	5
Chromosomal Aberrations	5
DFT	5
Meta-Analysis	5

**Figure 3:** Most frequent keywords



### Most Relevant Sources

The most preferred sources by the researchers in M K University to publish the cancer research output is given in Table 8 with h-index, g-index, total citation and the impact factor received by the sources. The researchers of M K University publish their research article in journals with high impact factor. RSC Advances (13 articles, 3.119 IF), Environmental Toxicology (12 articles, 3.118 IF) and InorganicaChimicaActa (12 articles, 2.304 IF) are the most preferred journals among the total 207 journals.



**Table 8:** Most Relevant Sources

Sl. No.	Sources	Articles	H-Index	G-Index	TC	IF
1	RSC Advances	13	10	13	190	3.119
2	Environmental Toxicology	12	5	8	76	3.118
3	InorganicaChimicaActa	12	8	12	198	2.304
4	New Journal Of Chemistry	11	7	10	118	3.288
5	Journal of Photochemistry And Photobiology B-Biology	10	7	10	184	4.383
6	Annals of Oncology	9	1	1	1	18.274
7	European Journal of Medicinal Chemistry	9	8	9	310	5.572
8	Journal of Cluster Science	9	5	9	91	1.731
9	Asian Pacific Journal of Cancer Prevention	8	5	8	106	1.583
10	Dalton Transactions	8	7	8	675	4.174

## CONCLUSION

Research projects funding based on the growth of the research performance of the particular institution. Conducting scientometrics research based on the publication of institutions will be beneficial to the administration as well as the funding agencies. The present study examines 428 publications of M K University in the field of cancer research only. Among these publication outputs, only 3 publications are single-authored contributions thus there found a high degree of collaboration of 0.993. The productivity of researchers on cancer research shows a gradual decrease after 2017. The mean citation per year remains relatively stagnant with three hikes in the years 2012, 2013 and 2018. Similar to other studies articles are the major document type of publication and only one publication is in Welsh the rest are in the English language. The mean value of DC, CC & MCC are 0.99, 0.77 and 0.79 respectively and it is highly significant and shows high collaboration in the authorship. RSC Advances, Environmental Toxicology and InorganicaChimicaActa are the most preferred journals among the total 207 journals. Research works on breast cancer and antibacterial activity are comparatively more ongoing cancer researches during the study period.

The quest will be very worth for the institution to understand in which direction the research is going on. We can see that productivity is increasing over a year but its quality based on the citation is declining. The citation received by a paper depends on many factors such as quality of paper, the novelty of ideas, methodology and accessibility of paper etc. Hence it is suggested that the researchers not only depends on the collaborative research works but also should focus on improving the quality of research works based on these variables. And also the researcher should be concentrate to publish their research works in journals which indexed by major databases and make it open access.

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