



Tata Memorial Hospital: 1989 -2019-A Slanted Bibliometrics Case Study

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Abstract

Tata Memorial Hospital (TMH), Mumbai, India, is one of the leading tertiary referral centres for cancer treatment in South-East Asia and has celebrated its Platinum Jubilee (Anniversary) in 2017. The visionary management of the institute has ensured that a proper library is maintained ever since its inception. Accordingly, the library has evolved into a centre of excellence with time. Some of the milestones of the institute are presented here briefly. To this end, the significance of the library is highlighted. The hospital library serves the following need of their clientele (a) helps in clinical decision-making (b) helps in keeping abreast with state of art literature and (c) helps in contributing a scholarly piece of work. As use of library facilities is more visible through contribution by the authors, a selective and descriptive bibliometric study of TMH publications over a period from 1989 to 2019 based on WoS data has been undertaken. Societal aspects and behaviour of authors are being investigated in terms of their contribution pattern, namely to Indian and Foreign journals of origin; to different publishers, to open access journals and in the different types of publications. The collaboration with USA, UK and SAARC countries is discussed. How senior faculty have encouraged their juniors to contribute articles is illustrated. Positive correlation between number of references and number of citations received is also observed.

Keywords: Tata Memorial Hospital, Bibliometric, Scientometrics study, Platinum Jubilee, Library Milestones, Publisher wise contribution, Open Access Journals, Subject- Categorisation, WoS, PubMed, Oncologist, Case study



0. Introduction

In 2017, Tata Memorial Hospital, Mumbai, India (TMH), one of the leading tertiary referral centres for cancer diagnosis, treatment, and care in South-East Asia^[1] has celebrated its platinum jubilee (anniversary). Since its inception, the visionary management of the hospital has ensured that a proper library is maintained (Manohar et al., 1993)^[2]. It would therefore be useful to highlight the significance of the library and scholarly communication by the organization. Accordingly, a bibliometric study based on the Web of Science (WoS) is presented in this article covering the period between its golden jubilee (1991-92) and platinum jubilee (2017) with two years period prefix and suffix to the events. Both the events have witnessed an international conference discussing the various facets of the discipline by national and international clinicians and researchers. This has helped to enhance the library facility as well as contribution by the faculty. The bibliometric work is preceded by a brief history of the Centre along with some of the milestones of the library department.

Tata Memorial Centre (TMC) comprises of two arms, namely, Tata Memorial Hospital (TMH) and the Advance Cancer Treatment Research Center (ACTREC) - formerly known as Cancer Research Institute (CRI). Now, under the aegis of the Department of Atomic Energy (DAE) the Centre has expanded its activities and four centres are now functioning viz. at Guwahati, Sangrur, Varanasi, and Vizag. National Cancer Grid is another initiative. However, the present study is confined to the TMH.

TMH as an institution alone has higher publication contribution in PubMed database compared to those of some of the countries from the South-East Asia and SAARC (Appendix-1).

0.1 Objectives of the study

- i. To narrate the growth and evolution of the institute and library over a period from inception
- ii. To use the bibliometric technique to analyse the institutional publication pattern and some of the associated reasons during the period (1989-2019)
- iii. To depict social aspects and behaviour of authors over the period



1. About Tata Memorial Hospital and the Library

TMH, one of the many innumerable contribution from the house of Tata's to the nation became functional in 1941. Since 1962 it is funded and controlled by the Department of Atomic Energy, Govt. of India. The motto of the TMC is 'Service, Education, Research'. The institute is listed in the prestigious directory of the global cancer treatment body viz. Union for International Cancer Control cancer treatment (UICC) 1992 ed.

In 1941 there were 1609 patients registered which rose to 35,000 in the Golden Jubilee year of 1991-92 (Pai & Borges, 1995)^[1]. The number of new cases registered in 2017 was more than 64,000. The in-patient bed strength has risen from 80 in 1941 to 375 in 1993. Now the day care unit is also functioning. In 1983, TMH became the first institute in India to carry out successful bone marrow transplantation (Advani & Nair, 1998)^[3]. All three major modality viz. surgery, chemotherapy and radiotherapy for cancer treatment are available under one roof.

Over the past three decades various new educational and training programs are offered by the institute. This resulted into increase in the number of library users. To cater the information, need of the user's library has enhanced in terms of infrastructure and services. TMH library subscribed about 185 journals and has more than 8,000 books, 1,000 theses, and 21,000 back volumes. During 1980-88, the TMH ranked fourth in the publications list of Indian institutes with an average of 69 citations per year (Pai & Borges, 1995)^[1].

Starting with the computerization of bibliographies of staff publications on the Main-Frame ND system in 1987, TMH has been one of the first medical libraries in the country to computerize its services (Manohar et al., 1993)^[2]. The standalone CD-ROM (Onco-disc database) was switch over to LAN environment in anticipating the users demand for upcoming UICC - International Conference during 1993. Another major advantage of Onco-Disk for the library had been to enhance its local database of local staff publications with wider coverage of oncology literature available from India.

In early nineties the modular approach was adopted to exploit computing technology by way of using CDS/ISIS package for dissertations, topical databases, membership database. While Serial Control module using DBMS technology (Manohar, et al., 1993)^[4]. The success of such



initiatives helped the library to enhance information services, reposition and introduce internet facilities during 1995-96. During this era, the library has given its input for the institute home page in order to make web page presence. This paved the way for library home page and introduction of Web-OPAC type facilities over the next few years. In the new millennium, the library used proprietary integrated library software for the automation. Now, the library is using open-source technologies. All such endeavors helped to leverage the benefits of computing technologies and reposition in the new environment(Sharma, et al., 1997) ^[5].

The continuous education to information literacy programs for the benefit of the users in order to optimize the utilization of the resources available has been always a key to success. All library professionals have been enthusiastic to help the end-users in their information need and even today this is a regular feature (Sharma, et el., 1995)^[6]. In the print era, in order to support the authors' library use, a list of “instructions to authors” was kept ready to use for various index journals. Now, the services have been expanded to educating novice users for different styles of writing, citation management tools, scope of a journal, plagiarism related issues, impact factors and others. Library uses its notice board for displaying staff publications and a monthly email is sent to the concerned authors.

TMH authorities encouraged the Library to become a member of DAE (Department of Atomic Energy) consortia in 1997-98. However, the services became operational only in the next millennium. Thereafter, library systematically and steadily has moved toward more e-contents. To this end, certain databases like TNM, MD Consult, BNF, CINHALL-NRC Plus, and Clinical Key were introduced for the benefit of the users by providing in house information access to all major databases in the field. The Inter Library Loan facility is one of the regular services offered to users. The online resources are accessible 24X7 within campus and remotely. Thus, it can be said that the library is fulfilling its motto of serving the need of its patrons and fulfilling their thirst for knowledge in the digital milieu too.

2. Literature Review

To understand and portray the quantitative and qualitative growth of any institution, a bibliometric analysis using multidisciplinary databases like WoS and Scopus is the most preferred method. To this end, the literature growth is understood in terms of the document



types, most prolific authors, most preferred journals for the contribution, the journals most cited, the citations received, or citation impact of the publications. The author's contribution behaviour is studied in terms of collaboration with other countries, contribution to journals of national or foreign origin. Now, the publisher wise contribution is another method of understanding the behaviour of authors (Bakkalbasi, et al., 2006; Husain & Mushtaq, 2010; Kumar, 2018; Mulimani & Hadagali, 2018; Sharma, 2018; Tupe & Khaparde, 2016)^[7-12].

The present study illustrates how senior mentor faculties have encouraged their mentees to contribute articles. Thus, the sociology of scientific knowledge and behaviour science is touched upon (Leydesdorff & Milojevic, 2015)^[13].

Multidisciplinary bibliographic databases like WoS have two main advantages over field-specific databases like PubMed (Medline). First, the number of journals covered is very high. Second, broader coverage of different documents such as News, Meeting Abstract, Conference Papers, and Book Chapters is there, whereas PubMed does not index such materials. However, the constraint of WoS is that document (Publication) type assigned or categorized is not always clear. To illustrate “Case or Case Report” assigned in WoS has a different connotation in (Bio)medicine and Law domain indicated as “case studies” (Leeuwen, Wijk & Wouters, 2016)^[14]. Similarly, a clear distinction between “Proceedings Papers” and “Conferences” is not always possible in WoS (Gorraiz, Gumpenberger & Glade, 2016)^[15]. In addition, for ‘Review’ type document PubMed criteria, many times is different from WoS. The multicenter study, clinical trials at various phases are not separately treated in multidisciplinary databases, whereas in Medline these are important publication types.

Though, in conventional metric analysis many times, documents like case reports, meeting abstracts, news, and few others are not covered thoroughly. In medical science, the case reports are considered patient-oriented and are valuable resources of unusual and many times new ideas or information that may lead to new research, evidence generation, and advances in clinical practice. Thus, it is an ethical duty of the senior doctors and academicians to encourage their juniors to make any paper worth publishing, by improving their writing abilities and providing critical peer review experience (Jackevicius, 2018; Ortega-Loubon, Culquichicón & Correa, 2017)^[16-17].



Accordingly, in the present study, the selective types of documents are compared in two ways namely WoS categories and PubMed assign categories.

Subject categories or subject areas are database-specific, which in turn are based on the journal's research fields (Bartol et al., 2014; Abrizah et al., 2013; Tijssen, 2010)^[18-20]. In the present study WoS subject areas like 'Radiology-Nuclear: Imaging, Nuclear Medicine' are mapped to 'Radiation' or 'Radiotherapy' according to Medical Subject Headings (MeSH) a controlled vocabulary of Medline. In addition, certain journals are categorised under the broader subject area "Medicine" but the article published deals with some aspect of chemotherapy or drug therapy.

During the pre-internet era, the surface-mail was predominant and the logistic supply of the journals in time was an issue for developing countries like India. This in turn was one of the constraints for the authors to cite the latest references. Many times, such old references were partially responsible for lesser contribution into index and/or international journals (Thrower, 2012; Silva et al., 2018)^[21-22].

The OA (Open Access) movement gained momentum in 1998 with the introduction of www and founding of the Scholarly Publishing and Academic Resources Coalition (SPARC). There are different models of OA journals emerging with some shade of difference in-licenses, features, or other terms and conditions for use, copyright, and fees. The two routes very common towards OA are "green" road (self-archiving articles published in non-OA journals) and the "gold" road (publishing in OA journals). Thus, for the present study these two routes along with 'Bronze' are considered. Bronze category is considered as available on publishers' website free to read but are not formally licensed for use (Albert, 2006; Sukhov et al. 2016; Brock, 2018)^[23-25]. The search strategy used by Tripathi et al^[26] is used for the present study for the WoS database. PubMed many times assign more than one category to the same document. Therefore, during the course of identifying the type of documents the type mentioned first is considered for analysis (Sharma, 2018)^[27].

The WoS database is preferred for some of the following reasons (a) better coverage than Scopus for the publications prior to 1995 (b) it is found more precise for funding information than Scopus, and PubMed, and (c) the present study aims to understand the contribution since 1989 (Chadegani, 2013; Kokol, 2018)^[28-29].



3. Material and Methods

During January 2020 the data for the study was retrieved from all core categories of the WoS. ('WoS-Medline interface' is not used). The name of institute name viz. Tata Memorial Hospital is used searched for the period of 1989 to 2019 and results were downloaded. The data cleaning includes removal of corrupt characters, normalizing authors name, city name (Bombay to Mumbai). In the next step certain document types such as Biographical-Item, Correction, Erratum, News, Note, Note Item, were excluded. Thus, a total of 4,109 citations remained. From these citations, the unique PMID numbers were identified and searched in the PubMed database. From the PubMed records certain citations like 'Comment', 'Obituary' were excluded. Thus, there were a total of 3,132 unique PubMed records identified.

Both the data sets were analysed using Bibexcel, MS-Excel 2016 and VOSviewer software version- 1.6.15 is used to depict co-authorship collaboration. The PubMed data analysis has helped in identifying certain document types that are more relevant to medical practitioners. This includes 'Case reports', 'Multicentre studies', and 'Comparative studies'.

Journals of national and foreign origin were determined based on the name of publication city and address from the WoS database.

The data two years prior to the Golden Jubilee event has been collected as the faculty as well as students and fellows were enthusiastic to share their work with their fraternity across the globe. At the same time, almost two years' window is given to accumulating citations to articles published during 2017.

The Institute was formed during British colonial rules and some of the eminent clinicians from USA were also invited to advise on building and developing the Centre. Over a period, TMH has kept live relations with some of the leading institutes like Memorial Sloan Kettering, MD Anderson, and King's College- London^[2]. It was, therefore, decided to identify the journals selected for publications from India and these two countries of origin. In addition, collaboration with 'USA' and 'UK or England' is also determined.



Further, India is an active member of SAARC countries, and many patients from these countries are treated at the Centre. Thus, it was decided to identify the collaboration with these countries. During the same period India has the highest contribution in the oncology discipline among the South-East Asian countries in the PubMed database (Appendix -1).

In case of top ten collaboration with countries data is analysed using VOSviewer software keeping a threshold value of maximum 40 authors per documents during each period and minimum two citation received (Appendix-3). Thus, the value differs from some of those given in Table (8), where no such filters are applied.

Limitation of the study

It is urged that while understanding the results some of the following constraints to keep in mind. In order to depict the diffusion of knowledge in the present exploratory study WoS (one of the oldest multidisciplinary bibliographic database) is used. However, to give an insight view of the medical literature (mainly oncology) PubMed a field specific database is also used in conjunction and mentioned at appropriate places. This results into some different values (Table - 2 & 3). In case of countries collaboration (Appendix-3) is analysed using VOSviewer at given threshold values, hence it differs from the Table (8). Similarly, co-authorship depicted is based on the total link strength (TLS) differ from the Table (7).

4. Findings and Discussion

Table 1 First summary

Period	Total No. articles considered	Avg. Authors	Avg. References	Avg. Cited by	Total No. Funding support	Open Access Type			Total No. of Journal by Country of origin		
						Bronze*	Gold	Green	India	UK	USA
1989-	491	5.31	18.31	13.9	24	15	2	14	169	16	78



1998				7						2	
1999-2008	831	5.77	16.02	18.4	7	44	79	33	21	112	19
2009-2019	2787	8.14	19.51	12.0	3	789	210	536	193	645	62
											128
											7

***Bronze OA** is considered as available on publishers' website free to read but are not formally licensed for use.

From Table (1) it is observed that there is a constant growth in the number of articles contributed over the three periods. A consistent increase is observed in the average number of authors, the number of references used, and citations received; except during the period of 2009-2019 the average citations received are less than the previous two periods viz. (1989-1998) and (1999-2008). This is due to the fact that the articles contributed in the last few years comparatively have a short timeframe of hardly three years to accumulate the citations.

It is revealed that comparatively during the period of (2009-2019) higher number of articles were contributed. Simultaneously the average number of authors has increased. Both these aspects may be correlated with the increase in the number of clinical trials and multicentre studies (Table-3). Besides, different kinds of funds available have increased significantly.

There is an interesting aspect of citation analysis viz. the number of references used in an article having a positive correlation with the number of citations it receives; broadly this holds in this case study as a moderate positive correlation (0.11) (Akhavan, 2016)^[30].

The findings of the Table (1) also reveal that there is a significant increase in terms of articles contribution in OA journals since 1999 onward. Further, it can be easily observed that the TMH authors have contributed to Gold OA more than the other two routes. To analyse further, each period has been compared with the previous period only. In the case of the Gold OA, there is a consistent growth of 6.06% and 6.15% during the period of (1999-2008) and (2009-2019) respectively. On similar lines, there is a significant growth of 66.6% and 10.8% in the case of Green OA. Whereas, in the Bronze category of OA journals during the period of (1999-2008) there is an 18.9% increase in the contribution from the earlier period (1989-1998), whereas during the period of (2009-2019) a significant rise to 37.6% is observed. This



phenomenon may be attributed to (a) a growing trend and awareness of researchers to contribute to OA to increase the visibility of their work and (b) to a certain extent due to the availability of funding agency.

Findings of Table (1) reveal that during the period (1989-1998) TMH authors have contributed more in journals published from India and England. But over a period, contributions in journals published from USA have shown considerable increase (Elpidoforos, 2006) [31]. There are various reasons for such changes. To name (a) collaborative work with the developed countries like USA and UK (Table -8), (b) now the outlook of many editorial boards has changed to overcome publication bias, as the clinical data from the developing countries are also found useful to an extent (Catalá-López et al. 2020; Sumathipala, 2004)^[32-33], and (c) it is considered that the funding and accreditation policies have increased publication awareness over a period (Pao, 1991; Elango, 2017; Madhan, 2018)^[34-36].

The other reasons that may be attributed to this phenomenon are the significant web presence, and open access movement which has paved the way for scholarly communication. Simultaneously change in the Indian publisher's policies and merger with some of the other reputed publishers. Many of the society or institution publications were taken over by commercial publishers. Thus, for the potential authors, it was possible to have access to recent articles quickly than the print dominated era. In addition, the library supporting facilities have enhanced inclusive of trial access to some of the journals over a period.

Figure 1 Journals selection by country of origin

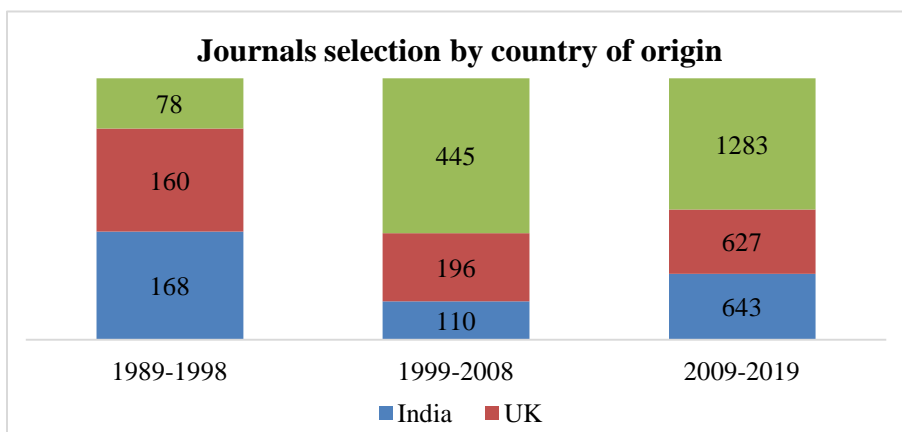




Table 2 WoS based document categories

Period	Total citations	Article	Review	Letter	Meeting Abstract + Conference	Book Chapter + Editorial Materials
1989-1998	491	397 (80.85%)	7 (1.42%)	43 (8.75%)	5 (1.01%)	7 (1.42%)
1999-2008	831	515 (61.97%)	34 (4.09%)	126 (15.16%)	79 (9.59%)	58 (6.97%)
2009-2019	2787	1672 (59.99%)	230 (8.25%)	258 (9.25%)	395 (14.17%)	185 (6.63%)

Percentage is calculated for various document categories based on total citations contributed during the period.

According to WoS document categories (Table-2) during all three periods of the investigation a consistent growth is observed in number for all four types of documents viz. Article, Review, Letter, Meeting Abstract & Conference Papers, and Book Chapters & Editorial. In terms of the percentage the 'Review' type of articles has continuously increased. However, as the literature suggests document categorisation vary according to the database used. Thus, to have a deeper analysis both WoS and PubMed document categories are to be seen together.

Table 3 PubMed based document categories

Period	Total citations	Trial (All Phase wise)	Case Reports	Multicenter	Review	Comparative Study
1989-1998	449	31 (6.90%)	114 (25.38%)	1 (0.22%)	33 (7.34%)	35 (7.79%)
1999-2008	649	27	183	2	45	26



		(4.16%)	(28.19%)	(0.30%)	(6.93%)	(4.00%)
2009-2019	2034	47 (2.03%)	218 (10.71%)	32 (1.57%)	152 (7.47%)	64 (3.14%)

Percentage is calculated for various document categories based on total citations contributed during the period.

Findings (Table - 3) are in accordance with this of Jain, et al., 2015, that the majority of the articles from India contributed are case reports (Jain, 2015)^[37]. This is followed by "Review" and "Comparative Study" during all three periods. However, different types of phase wise clinical trials are combined for simplicity in the tabulation. It is found that there is a consistent contribution to this category of documents. The minor variation observed during the period of (1999-2008) can be attributed to (a) many time PubMed assigned more than one category to the same document while for this study the category which appears first in the database is used for analysis (b) sometimes articles submitted in a particular year but may have been published in next subsequent year while ahead of print is available and considered for citation analysis. However, the multicenter studies have seen momentum during the period of (2009-2019).

Subject Categorization (areas)

Table 4 Subject area-wise contribution

WoS (Broad Subject categorisation)	1989-1998	1999-2008	2009-2019
Anesthesiology & Critical Care	06	10	43
Biochemistry & Molecular Biology	07	16	87
Pathology & Cytology	14	17	182
Radiology-Imaging & Nuclear Medicine	29	123	432
Oncology -Medicine, Genetics	167	213	849
Surgery- otolaryngology and other organs	114	179	345

Essentially, there are three modalities for cancer treatment viz. Surgery, Chemotherapy, and Radiation or Radiotherapy. While, the other most important allied disciplines for the diagnosis



and management specific to this study are (i) Anesthesiology & Critical Care, (ii) Biochemistry & Molecular Biology, (iii) Pathology & Cytology and (iv) Imaging. Thus, these six-broad subject-wise categories are considered to understand the contribution pattern (Table 4).

In the present study, many articles dealing with ‘chemotherapy’ or ‘drug therapy’ are categorised under broader categories like ‘Oncology – Medicine’. In addition, certain articles dealing with the ‘cancer cell’ are categorised under ‘Genetics’ subject area. Furthermore, for simplicity of the discussion herein the ‘Surgery’ category also includes organ wise surgical aspects.

It is easy to observe from the Table (4) that overall, there is a constant and reasonable increase in the publication output of the institute during the last decade. However, for disciplines like anesthesiology, the contribution has taken a jump during the period (2009-2019) compared to the preceding period. This can be attributed to the awareness in contributing to the Index journals, an increase in the clinical, and multicenter studies undertaken. Furthermore, new academic programs are also introduced.

Table 5 Top 10 journals in terms of articles contributed

SO (1989-1998)	Rank	Count (1989-1998)	SO (1999-2008)	Rank	Count (1999-2008)	SO (2009_2019)	Rank	Count (2009_2019)
Journal of Surgical Oncology	1	58	International Journal of Radiation Oncology Biology Physics	1	34	Indian Journal of Cancer	1	211
Leukemia Research	2	23	Journal of Surgical Oncology	2	31	Journal of Cancer Research and Therapeutics	2	145



Cancer Letters	3	22	Journal of Clinical Oncology	3	23	Journal of Clinical Oncology	3	112
Seminars In Surgical Oncology	4	15	Radiotherapy and Oncology	3	23	International Journal of Radiation Oncology Biology Physics	4	107
Journal of Cancer Research And Clinical Oncology	5	12	Leukemia & Lymphoma	4	22	Indian Journal of Pathology and Microbiology	5	104
British Journal of Cancer	6	11	Oral Oncology	5	22	Radiotherapy and Oncology	6	83
Leukemia & Lymphoma	7	11	Clinical Nuclear Medicine	6	16	Oral Oncology	7	55
Cancer	8	10	International Journal of Cancer	7	15	Clinical Nuclear Medicine	8	43
Carcinogenesis	8	10	Annals of Oncology	8	13	Clinical Oncology	9	42
Head and Neck- Journal for The Sciences and Specialties of	8	10	Annals of Thoracic Surgery	8	13	Nuclear Medicine Communications	10	41



The Head And Neck								
Pediatric Hematology and Oncology	8	10	Cancer	9	12			
Cell Biology International	9	9	Acta Cytologica	10	11			
Cancer Genetics and Cytogenetics	10	8	European Journal of Cardio-Thoracic Surgery	10	11			
International Journal of Cancer	10	8	Lancet	10	11			
International Journal of Radiation Oncology Biology Physics	10	8						
Lancet	10	8						

During the period (1989-1998) and (1999-2008), ‘Journal of Surgical Oncology’, ‘Lancet’, and ‘Leukemia & Lymphoma’ are ranked among the top ten journals in terms of contribution. While during the period (1999-2008) and (2009-2019), the ‘Journal of Clinical Oncology’ has been listed among the top ten ranks in terms of contribution. However, the ‘International



Journal of Radiation Oncology Biology Physics’ has remained among under top ten journals across all three periods.

During the period (1989-1998) and (1999-2008) more than one journal-title is ranked equal in terms of contribution compared to the period (2009-2019). During the period (1989-1998) and (1999-2008) narrowly specialized journals have ranked equally. To illustrate ‘Leukemia & Lymphoma’; ‘Pediatric Hematology-Oncology’ during (1989-1998) and ‘Annals of Oncology’ and ‘Annals of Thoracic Surgery’ during the period of (1999-2008) have ranked among top ten journals. However, during the period of (2009-2019) the trend has changed and there is a significant increase in journals such as ‘Journal of Clinical Oncology’ and ‘Journal of Cancer Research Therapeutics’. Though ‘The Lancet’ journal is ranked in the top ten during (1989-1998) and (1999-2008) it is not among the top ten ranks during the period of (2009-2019). This can be attributed to an interesting change as observed since 2000. The publisher of the prestigious journal ‘The Lancet’ has started a new specific title to cancer discipline namely ‘The Lancet Oncology’. There is a reasonable contribution of articles (36) in this journal (2000 to 2019). Thus, it can be said that the growth is not only in terms of quantity but also, in prestigious journals among the medical fraternity. The majority of these journals are either subscribed or access is provided by the library.

Table 6 Top 10 journals in terms of total WoS core collection count (TC)

SO (1989-1998)	TC	SO (1999-2008)	TC	SO (2009-2019)	TC
British Journal of Cancer	359	Journal of Clinical Oncology	3302	International Journal of Cancer	2115
Proceedings of The National Academy of Sciences of The United States of America	308	Lancet	1643	Lancet	1636



Nutrition and Cancer- An International Journal	231	International Journal of Cancer	457	International Journal of Surgery	1507
American Journal of Surgery	209	Cancer	359	Lancet Oncology	1414
Journal of Clinical Investigation	174	Head and Neck- Journal For The Sciences And Specialties of The Head and Neck	302	Nature	1093
Toxicology Letters	120	New England Journal of Medicine	285	New England Journal of Medicine	942
Japanese Journal of Cancer Research	106	Radiotherapy and Oncology	277	Surgery	657
Journal of Surgical Oncology	101	Respirology	222	PLOS One	492
Anesthesiology	96	American Journal of Surgery	182	Journal of Clinical Oncology	323
European Journal of Surgical Oncology	95	Journal of Thoracic Oncology	143	Cytherapy	235

Table (6) provides information about top journal titles that received the highest citations. Overall, it is evident that journals dealing with the clinical aspects are ranked in the top with the exception of Proceedings of the National Academy of Sciences of the United States of America having a broader subject category of Science during 1989-1998. This may be due to the fact that during this period TMH has held two international conferences during (1991) and (1993). These events provided a platform for the scientists working in basic research from the sister wing CRI to undertake more collaborative work with the clinicians.



Table 7 Top 10 prolific authors (Rank-wise)

Author (1989-1998)	Count (1989-1998)	Rank	Authors (1999-2008)	Count (1999-2008)	Rank	Author (2009 to 2019)	Count (2009 to 2019)	Rank
Advani, SH	72	1	Dinshaw, A.	59	1	Prabhash, K	133	1
Nair, CN	28	2	D'Cruz, A. K.	48	2	Joshi, A	129	2
Dinshaw, KA	25	3	Mistry, RC	43	3	Purandare, NC	125	3
Gopal, R	20	4	Pramesh, CS	37	4	Rangarajan, V	106	4
Desai, PB	18	5	Naresh, KN	35	5	Noronha, V	101	5
Pai, SK	16	6	Parikh, P. M.	28	6	Chaturvedi, P	84	6
Kurkure, PA	15	7	Advani, SH	27	7	D'Cruz, A	79	7
Saikia, TK	15	7	Sarin, R	27	7	Rekhi, B	79	7
Soman, CS	14	8	Chaturvedi, P	26	8	Agrawal, A	75	8
Kulkarni, JN	13	9	Jambhekar, Nirmala	23	9	Gupta, S	72	9
Rao, RS	13	9	Gupta, S	22	10	Kane, S	71	10
Parikh, PM	11	10						

The most productive authors are 'Advani, SH', 'Dinshaw, KA' and 'Prabhash, K' during (1989-98), (1999-2008), and (2009-2019) respectively. Even though, in Table (7) all authors who have published articles are not listed. However, it is found that the senior faculty have encouraged their younger colleagues to publish their work. To illustrate 'Mistry, RC' has published six papers during 1992-94 along with 'Desai, PB' (Director till 1995), but later on, contributed 51 articles



during 1996-2015. Similarly, ‘Gupta, S’ who begins his career during ‘Advani, SH’ tenure (up to 2008) has, later on, stood among the top ten authors in the next period (2009-2019).

Besides the Table (7) using Vosviewer software co-authorship analysis is carried out for the three period viz. 1989-1998, 1999-2008 and 2009-2019 and given in the Appendix-2. Different clusters under each period highlight how different mentor (nodes) have helped their mentees and in turn they have continued the cycle. The total link strength (TLS) threshold value is based on maximum 50 authors per document with each author having minimum 10 documents over the period. The thickness of the link suggests the strength of co-authorship. Here it is imperative to say that during early 2000 institute has introduced the Disease Management Group (DMG) policy. According to this policy based on the type or site of cancer (organ or system wise) experts from all the three modalities and other allied or supporting disciplines are taking a clinical decision. Over a period, some clinicians may belong to one or more such group or changed the DMG. Thus, co-authorship pattern may change which in turn reflect mentor from one discipline may have helped mentees from some other discipline also (Appendix-2).

Table 8 TMH collaboration with UK, USA and SAARC countries

Period (Total Citations)	UK (England)	USA	Afghanistan	Bangladesh	Bhutan	Maldives	Nepal	Pakistan	Sri Lanka
1989-1998 (491)	12 (2.44%)	37 (7.53%)	00	00	00	00	00	00	00
1999-2008 (831)	77 (9.26%)	101 (12.15%)	00	01 (0.12%)	02 (0.24%)	00	04 (0.48%)	05 (0.60%)	06 (0.72%)
2009-2019 (2787)	611 (22.96%)	802 (28.77%)	01 (0.03%)	13 (4.66%)	03 (0.10%)	00	06 (0.21%)	19 (0.68%)	07 (0.25%)



From Table (8) it is easy to observe that TMH collaboration with the UK and the USA has increased over three decades. It is also observed that collaboration with the USA is higher compared to the UK. Though numerically less, 1999 onwards collaborative work with SAARC countries have enhanced.

Here collaboration from all countries from the South-East Asia are not considered as it may not be feasible for the patients from far-off countries to travel and get the treatment at the centre and practically there is hardly any direct patient data available. However, TMH is considered as a leading institute in the region because of various factors such different modalities for treatment under the same roof and other infrastructure facilities and service.

Table 9 Publishers wise Distribution of periodicals

Publisher (1989_1998)	Count	Publisher (1999_2008)	Count	Publisher (2009-2019)	Count
Wiley	119	Elsevier	143	Elsevier	440
Elsevier	63	Wiley	123	MedKnow Publications	250
Springer	26	Lippincott Williams & Wilkins (LWW)	59	Wiley	225
Lippincott Williams & Wilkins (LWW)	20	Springer	55	Springer	215
Academic Press	19	Oxford University Press	23	Lippincott Williams & Wilkins (LWW)	124
Association +Institute +Society	22	Association +Institute +Society	55	Association +Institute +Society	190

During all the three periods of investigation, it is revealed that Wiley, Elsevier, LWW have remained among the top five publishers. Contribution among Elsevier titles has increased almost three times during the period of 2009-2019 from those of 1989-1998. There are two reasons for such phenomenal growth. First, the Elsevier aggressive policy towards acquiring certain



important journal titles from other publishers like WB Saunders and others. The second partial reason is that during the past two decades TMH has been a member of DAE-Science Direct consortia, which in turn has had helped in creating awareness about certain titles of interest to the authors. Another distinguishing feature is the increasing contribution to various professional associations, societies, and Institute based journals.

5. Conclusion

The library live collection and services offered have helped the authors to contribute articles. It can be said that the authors have had access to most of the journals selected for contributing their work. Library holdings available on library web page reflect this aspect. In addition, consistent growth has been observed in the number of articles published and number of references cited, which evidently echoes the use of the library facilities.

The publication pattern reveals that TMH authors have predominantly contributed to journals dealing with clinical information as their first choice. Multiple authorship has increased over a period. Further, articles are consistently contributed to leading Indian and Foreign journals of origin. From 1999 onwards, contribution among OA journals has increased in a steady way.

In terms of different document (publication) types, there is a constant and balanced growth. Similar growth is witnessed irrespective of the publisher is academic/institution or commercial. Collaboration with the developed countries has increased with special reference to USA. Between 2009-2019, collaboration with some of the SAARC countries is observed, although small in number. The journals cited (count) has steadily increased. Thus, it can be said that the contribution of TMH to cancer clinical information is increasing both quantitatively and qualitatively. Importantly the senior faculty have performed their ethical and academic duty to encourage the next generation to continue the trend.

6. Significance of the article

The present slanted case study suggests that the TMH library has set an example for the significance of a medical library from the developing world. Meaningful and live collection along with need-based introduction of ICT is a prerequisite for repositioning the library in a changing environment. Users get benefited from some of the tailor-made information services



for contributing their scholarly work. To this end, continuous education to information literacy initiative programs is advocated.

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This article is dedicated to all doctors and allied discipline staff who served the patients. In words of late Dr. RS Rao “Thanks to all the patients who have put their faith in the

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Appendix -1

Contribution of the South-East Asian Region and SAARC countries in PubMed Database in the oncology discipline (1989-2019)

S.No.	Country	Total No. of PubMed citations
1	Afghanistan	33
2	Bangladesh	531
3	Bhutan	11
4	Brunei	51
5	Cambodia	22
6	India	34784
7	Indonesia	635
8	Laos	4
9	Malaysia	3853
10	Maldives	0
11	Myanmar (Earlier Burma)	27
12	Nepal	502
13	Philippines	377
14	Singapore	8778
15	South Korea	13432
16	Sri Lanka	359
17	Thailand	4867
18	Timor-Leste	2
19	Vietnam	400

From the above table it is evident that India has the highest contribution. Further, TMH as an institute alone has more citations than many of the countries listed.



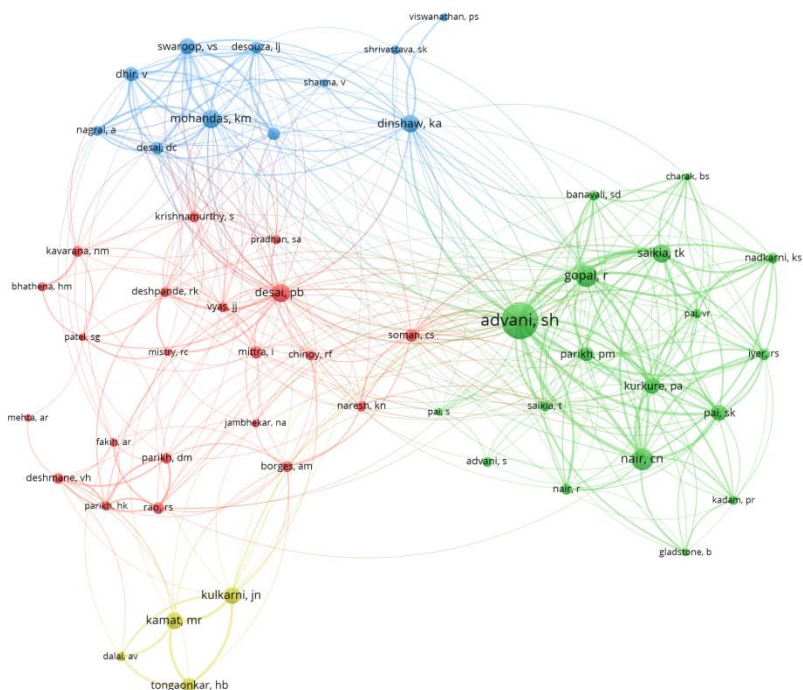
Appendix -2

Co-authorship network using VOSviewer

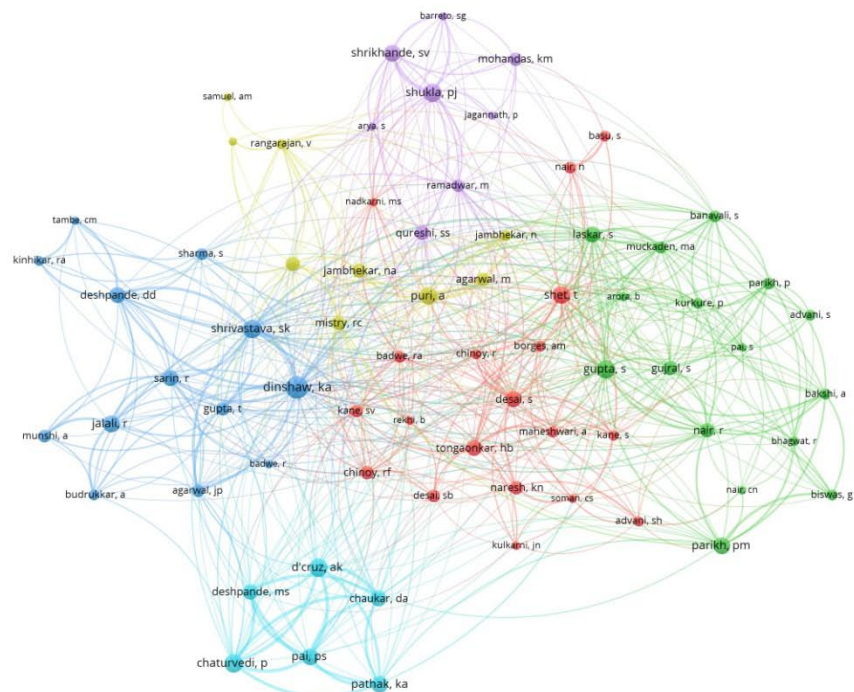
a) PDF and PNG files for three period viz. 1989-1998, 1999-2008 and 2009-2019 are attached which may be added as Appendix -2(a), (b) and (c)

OR

b) Alternatively, the top thirty authors identified in co-authorship according to TLS using VOSviewer is given.

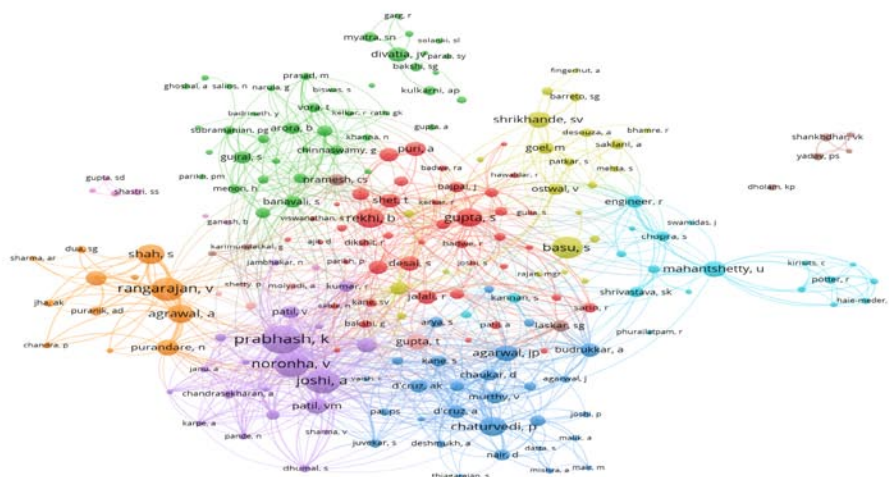


TMH Co-authorship network 1989_1998 1



VOSviewer

TMH Co-authorship network 1999-2008 1



VOSviewer

TMH Co-authorship network 2009-2019 1



Note:

- i. Node size are based on weight of the term/word.
- ii. The total link strength of a node is the sum of link strengths of this node over all the other nodes.

OR

Top 30 authors identified in co-authorship to TLS using VOSviewer with maximum 50 authors per document and minimum 10 documents by each author.

Co-authorship for 1989-1998

Author	Documents	Total Link Strength (TLS)
Advani, S H	129	397
Gopal, R	54	252
Kurkure, P A	32	163
Mohandas, K M	41	157
Dinshaw, K A	37	127
Dhir, V	27	116
Desai, D C	22	113
Desai, P B	40	110
Iyer, R S	20	103
Jagannath, P	22	93
Desouza, L J	19	78
Kulkarni, J N	34	74
Banavali, S D	15	73
Kamat, M R	35	73
Charak, B S	10	59
Deshpande, R K	16	47
Kadam, P R	14	46
Dalal, A V	14	39



Krishnamurthy, S	18	39
Deshmane, V H	17	37
Gladstone, B	10	37
Kavarana, N M	17	32
Borges, A M	17	26
Mistry, R C	10	26
Bhathena, H M	14	20
Chinoy, R F	15	19
Fakih, A R	11	19
Mitra, I	22	16
Jambhekar, N A	11	13
Mehta, A R	10	3

Co-authorship for 1999-2008

Author	Documents	Total Link Strength (TLS)
Dinshaw, K A	46	104
Chaturvedi, Pankaj	24	69
D'cruz, Anil K	26	66
Laskar, Siddhartha	21	62
Chaukar, Devendra A	20	60
Parikh, P M	25	58
Pai, Prathamesh S	18	56
Deshpande, Mandar S	16	53
Gupta, Sudeep	21	49
Nair, R	15	46
Puri, Ajay	23	46
Pathak, K A	17	45
Shet, Tanuja	30	43
Chaturvedi, P	12	40
Ramadwar, Mukta	17	40



Shrivastava, Shyam K	10	40
Deshpande, M S	10	39
Chaukar, D A	10	38
Shrivastava, S K	16	38
Pai, P S	11	37
Shukla, Parul J	22	37
D'cruz, A K	10	36
Jalali, Rakesh	25	36
Muckaden, Mary Ann	12	36
Sarin, Rajiv	20	36
Bakshi, A	12	34
Biswas, G	15	34
Shrikhande, Shailesh V	21	34
Agarwal, J P	10	32
Gupta, Tejpal	15	32
Jambhekar, Nirmala	13	32

Co-authorship for 2009-2019		
Author	Documents	Total Link Strength (TLS)
Prabhash, Kumar	124	610
Joshi, Amit	99	578
Rangarajan, Venkatesh	128	573
Noronha, Vanita	101	547
Shah, Sneha	101	422
Agrawal, Archi	95	398
Purandare, Nilendu	71	383
Chaturvedi, Pankaj	83	338
Gupta, Sudeep	71	305
Gupta, Tejpal	58	284



Prabhash, K	76	282
Ramaswamy, Anant	46	280
Budrukkar, Ashwini	44	261
Mahantshetty, Umesh	75	260
Shet, Tanuja	58	257
Joshi, A	57	251
Noronha, V	58	249
Murthy, Vedang	40	241
Engineer, Reena	48	234
Rekhi, Bharat	100	232
Mahajan, Abhishek	49	223
Patil, Vijay M	35	218
Bhattacharjee, Atanu	26	216
Purandare, Nilendu C	58	207
Patil, Vijay	29	196
Jalali, Rakesh	53	192
D'cruz, Anil	39	191
Chandrasekharan, Arun	21	186
Banavali, Shripad	34	185
Menon, Santosh	49	168



Appendix 3

Top 10 collaborative countries with TMH (1989-2019) using VOSviewer

Collaborative Country (1989-1998)	Count [#]	Collaborative Country (1999-2008)	Count [#]	Collaborative Country (2009-2019)	Count [#]
United States	33	United States	71	United States	439
United Kingdom	11	United Kingdom	21	United Kingdom	203
France	9	France	17	France	159
Sweden	4	Germany	13	Canada	131
Germany	3	Italy	12	Italy	124
Canada	2	Australia	8	Netherlands	119
Italy	2	Canada	8	Australia	117
Spain	2	Japan	8	Germany	116
Sudan	2	Turkey	8	Brazil	91
Australia	1	Netherlands	7	Spain	84
Singapore	1	Singapore	7		

[#]The data is obtained using VOSviewer software keeping a threshold value of maximum 40 authors per documents during each period and at least two citations received. Thus, the value differs from some of those given in Table (8), where no such filters are applied.

In terms of authors collaboration, the USA, UK and France have remained on top three position during all three period of investigation. This suggests that the clinicians could enhance their knowledge, acquire newer skills and share their ideas in a fruitful manner.