CHAPTER 2

REVIEW OF LITERATURE

This chapter is dedicated to scrutinize the review of works relating to various aspects of Bibliometrics and Scientometrics studies in medical science. It could be observed that there are various research studies highlighting the importance of Bibliometric analysis and their applications to library management and organization. This type of analysis enables the researcher to discover the research gap in the previous studies. Review of related studies further avoids the duplication work that has already been done in that area. It also helps the researcher to study the different aspects of the problem. It enables the researcher to identify the unexplored areas, in order to create a new basis for research.

BIBLIOMETRIC STUDIES

Sengupta and Lalita Kumari (1991) analyzed the growth of AIDS literature during 1976 and 1986. They identified the international channel of communication medium of communication, contributing countries, authorship trend, etc.

Gomez I, et al., (1995) studied production in Spanish biomedical main stream science in the years 1986-1989. A series of Bibliometric and Scientometric indicators were applied to determine the geographical distribution, the institutions involved and the most active centers per specialty using their scientific output, their impact and their basic-clinical type of research a great heterogeneity was observed between the autonomous communities, with Madrid and Cataluña being in an outstanding position. This bifocal centralization is stronger when the mainstream research output of hospitals is considered in contrast to the more homogenous distribution of hospital care. The average level of the Spanish research output is basic, clinical papers are mostly published in national journals which are scarcely covered by the database output per specialty and causes of mortality and morbidity. The
indicators for each particular centre are compared with those of the whole of Spain for each specialty in order to find centre of excellence. The Spanish researches are published in journals of a similar impact to those used by other European union countries, although the number of citations received is much smaller, as has already been observed for other disciplines in Spain and peripheral countries.

Kundra (1996)³ investigated the collaborative research trends in Indian Medical Science 1900-1945 and drew general and broad conclusion. The growth pattern suggested that a large proportion of co-authored papers in a discipline of a journal, to some extent, were based on the type of research and the discipline involved. As a result, it is not impossible to have a relatively lower proportion of collaborative papers in particular sample, even when collaborative research overall has become the normal proactive.

Biradar B.S and Vijayalaxmi T, (1997)⁴ discussed the pattern of information used by researchers in the field of Neurology. They identified the average number of references per dissertation as 93, the use of different source of information and stated the obsolescence of literature. Source wise distribution revealed that 80.20 per cent of citations belonged to the periodical articles followed by books, 17.36 per cent. The published sources had contributions with more than two authors as 79.35 per cent.

Chapula, et al. (1998)⁵ he analyzed the preliminary result of a Bibliometric analysis of AIDS literature produced in and or about Latin America and the Caribbean for the period 1980-1996. Findings show that leading countries in AIDSLINE were Haiti, Brazil, Monaco and Presto Rico. The distribution by year of publication showed a decrease in Haiti, from 54 in number in 1983, to 4 in 1995. The countries either increased or maintained an average production throughout the year.
Macias - Chapula, Cesar (2000)\(^6\) analyzed AIDS research contribution from Haiti with the help of AIDS KINE database for the period 1980-1998, to identify the growth pattern in AIDS literature, as well as the types of documents published, authorship pattern, institutional affiliation of authors, and subject contents.

Arunachalam and Gunasekaran (2002)\(^7\) identified mapped tuberculosis and diabetes research in India and China, identifying institutions and cities active in research, journals used for publishing the findings, usage of high impact journals, and impact of their research, as seen from citations received and extent of international collaboration.

Macias - Chapula and Muangos - Wolasco (2002)\(^8\) analyzed AIDS document produced in sub-Saharan Africa. The result indicated a high pattern of collaboration through multiple authorship. Most of the documents were published in English (84.50 per cent) and French (14.73 per cent). Over 57 per cent corresponded to journal articles. The subject content of the documents was mainly focused on epidemiological complications, and prevention and control issues on HIV infections and acquired immune deficiency syndrome.

Suresh (2002)\(^9\) analyzed the collaboration trends in AIDS literature. His study reveals that out of the total 43,468 bibliographic records, 50.06 per cent were contributed by United States individually, while 49.04 per cent from other 74 countries. England was the second major individual contributed 20.94 per cent, and United States and England taken together contributed an exact 70 per cent to the world AIDS literature.

Huber J.T and Gullion (2003)\(^10\) sought to examine literature specific to complementary and alternative medicine where HIV/AIDS is concerned to determine publication patterns and the degree of overlap among bibliographic citation databases that index literature concerning the use of CAM practices in treating HIV/AIDS and facilitate access to this body of literature.
Nalini J.K, (2003)\(^{11}\) reveals in the study a total of 31 articles on problems studies in India related to occupational diseases and published in journals (both Indian and foreign) during the year 2000. She collected and analyzed five hundred thirty three citations of studies mostly contributed both by academic institutions and research institutions. The number of publications on the health of chemical and textile workers topped the list.

Pelzer, Nancy, L. Wiese and William, H (2003)\(^{12}\) analyzed and characterized the bibliographic citations appearing in twelve-core veterinary journals. Citation analysis yielded 55,823 citations, of which 3,564 (6.38 per cent) were considered to be grey literature. Four veterinary specialties, internal medicine, pathology, theriogenology, and microbiology, accounted for 70 per cent of the total number of articles. Three small-animal clinical practice journals cited about 2.5-3 per cent grey literature, less than half that of journals with basic research orientations, where results ranged from almost 6 per cent to approximately 10 per cent grey literature. Nearly 90 per cent of the grey literature appeared as conferences, government publications, and corporate organization literature.

Bordons M, Bravo L and Barrigon (2004)\(^{13}\) explored the usefulness of Bibliometric analyses to detect trends in the research profile of a therapeutic drug and Aspirin was the drug selected. A total of 22,144 documents dealing with Aspirin and published in journal covered by MEDLINE during the period from 1965-2001 have been studied.

Steven Glover, W and Sarah Bowen, L (2004)\(^{14}\) scrutinized bibliometric profile of Tropical Medicine and International Health using the subjects of the articles published and the geographical distribution of the authors during the period 1996-2003. The authors of Europe contributed 564 papers and African authored papers have been cited most with 3512 citations and Malaria was the most common subject area covered by 329 papers published in the study period.
He zhang and Teng (2005)\textsuperscript{15} carried out a Bibliometric research on biochemistry and molecular biology. The result showed that based on yearly analysis, the rates of increase for Chinese papers were 5.96 per cent, 19.53 per cent and 8.83 per cent with an average rate of increase by 12.61 per cent each year. It was also found that there were increasing trends for china’s papers in biochemistry and molecular biology both in the total in the percentage of the world papers. They also pointed out that 38.37 per cent of the total number of papers comes from 72 national universities whereas 13.43 per cent is from the rest 1443 universities. The national universities and institutes of the Chinese Academy of Science are the important cities for research output of biochemistry and molecular biology.

Swapan Kumar Patra and Partha Bhattacharya (2005)\textsuperscript{16} published a paper entitled “Bibliometric study of cancer research in India”. The authors have done a Bibliometric analysis of oncology research in India. The data have been downloaded from PubMed. The study analyses literature growth trends besides the various other Bibliometric indicators.

Welsh T.S. (2005)\textsuperscript{17} made a Bibliometric study of the publishing and citing patterns of telemedicine literature indexed by the Telemedicine Information Exchange (TIE), an online database maintained by the telemedicine research center (TRC) with major support from the national library of medicine.

Lopez- Munoz, et al. (2006)\textsuperscript{18} stated that over the last 25 years, there has been a marked increase in the number of publications generated in relation to bipolar disorder at a worldwide basis. The mathematical adjustment to an exponential curve obtains a correlation coefficient $r=0.9479$, indicating 9.81 per cent of variance. In contrast, the linear adjustment of the measured values provides an $r=0.8493$ indicating 26.33 per cent. Therefore, it is concluded that the repertoire analyzed is more in keeping with an exponential fitting than a linear one, and that postulates of price’s large are fulfilled.
Nwagwa W.E, (2006) provides empirical evidence on the biomedical literature of Nigeria drawn from 295 journals in medicine through which papers on Nigeria were published during the period 1967-2002. He categorized the journals according to their subject heading and examined the potential impact factors of a sample of the journals based on Thomson’s ISI journal citation reports multidisciplinary journals and papers dominated the source types and were also more highly co-authored than the other subject headings. They also have the highest potential impact factor. The publications of this pattern of journal choice on biomedical research in Nigeria are highlighted.

Chand P and Patra S.K, (2007) studied that growth over time of Indian research output on AIDS based on Bibliometric data from PubMed and Web of Science. Lotka’s law and Bradford’s law of scattering have been used to identify core journals.


Swapan Kuman Patra and Prakash Chand (2007) explained the growth over a time period AIDS research output in India based on bibliographic data from PubMed and Web of Science authorship distribution was examined using Lotka’s law Bradford’s law of scattering to identify core journals. The study identified active institutions and statewide distribution AIDS research in India.

Ugolini D. et al. (2007) compared the scientific production in the field of cancer molecular epidemiology among countries and evaluated the publication trend between 1995 and 2004. A Bibliometric study was carried out searching the PubMed database with a combined search strategy based on the keywords listed in the medical subject headings and a free text search. The study emerged Cancer molecular epidemiology is an expanding area
attracting an increasing interest. The identification of an operative definition is a necessary
d condition to give to this discipline a unique scientific identity.

**Lundberg and Jonas (2008)** assessed whether publications of importance towards
the improvement of the health system and its technologies are frequently cited
intrascientifically. They made bibliometric assessment of 596 publications in fifty alerts from
the Swedish council on technology assessment in health care from 2001 to 2004, using
Thomson scientific citation indexes and normalized citation scores.

**Ramos, Padilla, Masia and Gutierrez (2008)** analyzed 35735 articles on
tuberculosis in 2,874 journals as indexed in PubMed from 1997 to 2006.

**Albrecht, C. (2009)** established the quantity and quality of research publications
outputs by grant recipients of the Cancer Association of South Africa (CANSA) over a 10
year period (1994–2003). It can be concluded that, on average, a contribution of about
R50000 from CANSA (value from 1994 to 2003) contributed to the appearance of one peer-
reviewed cancer research publication with an average impact factor of 3.8 in the period under
study. The most popular subjects of research were cancer biology and treatment. In order to
bring about more balance in the future, more attention needs to be focused on the prevention,
early detection, epidemiology and social aspects of cancer.

**Campbell, D. et al. (2009)** investigated the 2008 study and compared the scientific
production of NCIC researchers to that of Canada, of the world, and of a sample of
researchers funded by the US National Cancer Institute (NCI). The current report adds a new
dimension to the previous study by investigating the effect of the different funding programs
of the NCIC on the scientific performance of the researchers it supported.

**Krishnamoorthy G, Ramakrishna J and Devi S (2009)** conducted a study on
Bibliometric analysis of the diabetes literature indexed by the MEDLINE database for the
period 1995-2004, which shows that maximum number of records (13244) was made during 2003 followed by 12690 in 2002 and 11061 in 2001. Relative Growth Rate (RGR) was found to be decreasing year. Ranking of the journals based on the quantum of research out on diabetes during 1995-2004 shows that USA is the largest contributor of literature on diabetes research. The research productivity of diabetes conforms to Bradford’s law of scattering.

Asma Khatun and Zabed Ahmed, S.M (2011) carried out to identify the literature growth, authorship pattern, and collaboration and journal distribution on diarrhoeal disease research in Bangladesh based on data obtained from PubMed, Web of Science and Scopus databases. The result shows increasing R&D activities on diarrhoeal research in Bangladesh Lotka’s law and Bradford distribution which do not apply to diarrhoeal disease research in Bangladesh. The h-index count indicates that Bangladesh tops the diarrhoeal research impact list in south Asia region.

Harande, Y.I (2011) examined the increasing diabetes-related literature in Nigeria using a bibliometric approach. The national library medicine PubMed was used as the database for this exercise. A bibliometrics technique and Bradford-Zipf distribution were utilized. A list of periodical articles on diabetes in Nigeria published during 1966-2009 was compiled for the study. A total of 512 articles were published in 57 journals. The 4 yearly distribution of literature indicated clearly that there was a rapid growth of the literature from the year 1986 onwards. The findings indicate that the literature of diabetes in Nigeria is in harmony with the Bradford-Zipf distribution.

Gupta, B.M (2012) analyzed the heredity blood disorder research output carried out during 2002-11 on different parameters including the global publications share and citation quality of top 10 leading countries, India’s growth, citation impact, share of international collaborative papers, contribution of major collaborative partner countries, contribution of various subject fields and by type of heredity blood disorder, pattern of research
communication in most productive journals, productivity and citation profile of top Indian institutions and authors and characteristics of high cited papers. The Scopus Citation Database has been used to retrieve the data for 10 years (2002-11). He concludes that there is a need to create comprehensive care services, including diagnosis and management of the heredity blood disorders in the Indian context. The study insists that there is a need to undertake more R&D, develop trained manpower at different levels and create sufficient infrastructure to handle the problems associated with heredity blood disorders.

Payam Peymani, et al. (2012)\(^{32}\) carried out a Bibliometric study to investigate the trends in stem cell research in Iran from 1995-2010. Data were obtained from the Institute for Scientific Information (ISI), Web of Science databases and Scopus. There have observed an increasing trend in stem cell publications based on research done in Iran, although the rate of citations of these papers was low.

Ganna P.S. et al., (2013)\(^{33}\) estimated the availability of literature on PubMed-Medline by Indian orthodontists from 1990-2011 by using bibliometric analysis. The study indicates that out of total of 242 articles, 189 got published in international journals and 53 in Indian journals. 50(20.6 per cent) were published in journals of clinical orthodontics followed by 37(15.2 per cent) in American journal of orthodontics and dentofacial orthopedics. 102(42.1 per cent) were original research done by authors. 91(37.6 per cent) articles were from institutes in Karnataka, followed by Tamil Nadu (12.8 per cent), Delhi (11.1 per cent) and Maharashtra (9.5 per cent). There seems to be boom in the publication trend since 2006.

Margaret Sampson, Tanya Horsley and Asif Doja (2013)\(^{34}\) determined the characteristics of medical education studies published in General and Internal Medicine (GIM) and medical education journals and analyze the accuracy of their indexing. 4,418 records retrieved, 3,853 (87.2 per cent) were from medical education journals and 565 (12.3 per cent) were from GIM journals. Qualitative studies and program evaluations were more
prevalent within medical education journals, whereas GIM journals published a higher proportion of clinical trials and systematic reviews ($\chi^2 = 74.28$, df = 3, $P < .001$). Medical education journals had a concentration of studies targeting medical students, whereas GIM journals had a concentration targeting residents; themes were similar. The authors confirmed that 170 (56.7 per cent) of the 300 sampled articles were correctly classified in MEDLINE as evaluative studies. Findings concerning the study types published in medical education versus GIM journals are important for medical education researchers who seek to publish outside the field’s specialty journals.

Sarah Mousavi, Ava Mansouri and Alireza Ahmadvand (2013) assessed the scientific output on rational use of drugs in Iran using a bibliometric analysis of publications. The study indicates that a total of 668 articles were retrieved from all search engines; after excluding the irrelevant, 466 articles were included in the review. Number of publications increased dramatically after 2001 (more than 10 times). Evaluation of prescribing pattern (15 per cent), self-medication (11.3 per cent) and adverse drug reaction (9.1 per cent) were among the most studied topics. From the total of 165 journals, 60 of them had Impact factors and 125 articles were published in these journals. Antimicrobial resistance and adverse drug reaction were the most cited topic. Publication of articles on rational use of drugs research in Iran has undergone an important increase during last decade.

Yidan Sun, Hui-Zhen Fu and Yuh-Shan Ho, (2013) evaluated the global scientific production of genome sequencing research to assess the characteristics of the research performances and the research tendencies. Data were obtained from Science Citation Index Expanded database during 1991-2010. Conventional methods including document types, journals, categories, countries and institutions were used to analyze publication output to reveal the global performance. The development of genome sequencing research during the last 20 years was described by synthetically analyzing the distribution of words in article
title, author keywords, and Keywords Plus in different periods. The results show that disease and protein related researches were the leading research focuses, and comparative genomics and evolution related research had strong potential in the near future.

**Bhutani G, Karlra S, Verma P and Kaushal J (2014)** made a Bibliometric analysis of the Journal of Medical Nutrition and Nutraceuticals publications of the year 2012 - 2013 of JMNN. The total number of articles published, type of articles, their authorship, and the coverage of various sub-specialties were studied. The publications were also classified under Indian or foreign origin and from academic or non-academic institutions, depending upon the institution of the first author. The study revealed that a total of four main issues were published in JMNN in the year 2012-2013, including a total of 46 publications. The review articles were published maximally. All the sub-specialties were well covered, the largest being diabetes and endocrinology. Both academic and non-academic institutions have contributed almost equally toward this journal. The journal has been able to attract the attention of the foreign authors as well. Articles from all parts of the country have been published in JMNN, but the maximum contribution has been from Haryana.

**Minas H, Wright A. Zhao M and Kakuma, R (2014)** analyzed the international journal of mental health systems. All articles published in IJMHS since publication commenced were included (n=158). Selected bibliometric measures indicating Journal productivity, author affiliation, impact, geographic reach, and international collaboration were utilized. The study revealed IJMHS published 158 articles in seven volumes over six years. Articles with three to five authors constitute the dominant authorship pattern, and authors’ affiliations are varied. IJMHS has received an impact factor of 1.06 from Thomson Reuters, and the SCImago Journal Ranking shows IJMHS to be well positioned in the four categories in which it is listed, including comparisons with well-established BMC journals.
that have similar scientific interests. Geographic authorship patterns show contributions from a large number of countries, including many low and middle income countries.

**Yayci E, Guler O.T, Atacag T, and Cetin A, (2014)** investigated bibliometric analysis of publications on polycystic ovary syndrome and turkey’s scientific contribution Web of Science based search on the field of “Polycystic Ovary Syndrome” through the database of Science Citation Index Expanded from 1980 to the date of the study (June 29, 2012), the study also revealed 8891 English scientific documents. Among these, 2836 (31.9 per cent) were from United States of America, followed by England (9.75 per cent), Italy (8.45 per cent), Turkey (5.34 per cent). Turkey has a prominent place with respect to its contribution to the scientific repertory on the field. This contribution has been steadily increasing during the last decade.

**Zyoud S.H Al-Jabi S.W and Sweileh W.M (2014)** conducted a study on worldwide research productivity in the field of electronic cigarette: a bibliometric analysis Data were searched for documents with specific words regarding EC as “keywords” in the title. Scientific output was evaluated based on the methodology developed and used in other bibliometric studies by investigation: (a) total and trends of contributions in EC research during all previous years up to the date of data analysis (June 13, 2014); (b) authorship patterns and research productivity; (c) countries contribution; and (d) citations received by the publications. The result shows that three hundred and fifty-six documents were retrieved comprising 31.5 per cent original journal articles, 16 per cent letters to the editor, 7.9 per cent review articles, and 44.6 per cent documents that were classified as other types of publications, such as notes or editorials or opinions. The retrieved documents were published in 162 peer-reviewed journals.
SCIENTOMETRIC RELATED REVIEWS

Ugolini D.S Parod S and Santi L (1997) assessed the publication quality of the national institute for cancer research (Genoa), Italy and found that the scientists of the institute had published in high quality journals as reflected by the impact factor of the journals.

Elangovan (2002) analyzed 72390 articles in 3669 journals from 94 countries and in 38 languages on tuberculosis from 1966 to 2006. He studied research output by language, medical subject headings, publication type, author address, country of publication, and all other factors to identify the trends in the publications.

Garg K.C, Dutt B and Suresh Kumar (2006) analyzed 2275 papers on malaria research published in journals and indexed by Commonwealth Agricultural Bureaux International (CABI). CD-ROM incorporating Tropical Diseases Bulletin (TDB), and PubMed Medline (web edition) in 1990 and 2000 indicates that the Science Citation Index (SCI) covered only about 68% of the output indexed by CABI and PubMed. Malaria research output is highly scattered in terms of sub-fields of the journals as well as the publishing country of the journals. The publication activity in Brazil increased significantly during 2000 as compared to 1990. Most of the prolific institutions are located in the developed countries particularly in the UK and the USA. ‘Parasite biology’ constitutes the highest output (37 per cent) followed by ‘epidemiology’ (19 per cent) and ‘drug resistance’ and ‘antimalarials’ (16 per cent). USA and Australia emphasized different aspects of ‘parasite biology’. China and Brazil emphasized different facets of ‘epidemiology’. Nigeria and Thailand paid more attention to ‘complicated malaria and its adverse effects’ and ‘drug resistance and antimalarials.’

Ravi and Kumar (2007) mapped and analyzed the 1310 Indian tuberculosis papers indexed in PubMed, SCI and Biochemistry and Biophysics Citations Index databases from 1996 to 2006. They identified institutions and cities active in the research, journals used to communicate their findings, use of high impact journals, and studies on the impact of research efforts and extent of international collaboration.

Sadik Batcha M and Baskaran C, (2007) analyzed the publication activity of G8 countries on cardiology of USA, UK, Italy, Germany, France, Canada, and Russia. Most of the prolific institutions are located in G8 countries and produced 13028 records in the period from 1969 to 2006. This research is based on MEDLARS database which has been published by the national library of medicine. The publication of journal scattering among G8 countries, first placed of journal of American College of Cardiology produced highest out (18.9 per cent) followed by circulation (13.6 per cent).

Krishnamoorthy G and Amudhavalli A (2008) assessed the R&D activity and its output in health sciences in India for about three decades, 1970 to 2000. The study found that the subjects like general medicine, pharmacology, and biochemistry were identified to be the top ranked 3 sub-disciplines. Objects have been examined by using the Activity Index (AI). A1 for cross comparison has been computed as suggested by frame, as it characterizes the relative research effort a country devotes to a specific subject field.
Lewin H.S (2008)\textsuperscript{48} studied diabetes mellitus publication pattern from 1984-2005. PubMed searches were conducted to determine the number of publications for each year from 1984 to 2005. This study examined patterns of publication of diabetes literature indexed in MEDLINE. It is noticed that the diabetes publications represent a larger portion in 2005 than they did in 1984.

Grag and Kumar (2009)\textsuperscript{49} investigated the pattern of citation of the articles published in 46 Indian science journals indexed by SCIE in the year 2006 and cited during 2006 to 2009. The proportion of cited papers and the rate of citation varied for domestic, foreign and collaborative papers, as well as among disciplines and publishers. The present study reveals that collaborative papers had the highest rate of citation per paper. The Indian Journal of Medical Research Published by Indian Council of Medical Research, New Delhi, had the highest citation impact. Highest number of papers were cited in the discipline of medicine.

Groneberg - Kloft, B. et al. (2009)\textsuperscript{50} found 12960 cough-related publications from 132 countries for the period studied. The most productive country was the United States of America (USA), followed by the United Kingdom (UK), France, Japan, Canada, and Germany. These 12960 published items were cited 165868 times. The average number of citations per item increased from 1976 to 1992, with peaks in 1977, 1979, 1981, 1984, 1989 and 1992. Each of these years was followed by a decrease in citation numbers. Bilateral and multilateral cooperation analysis using the radar chart technique showed a progressive increase in international co-authorship starting at the beginning of the 1990s, with a leading role by the USA and the UK.

Bala Adarsh and Gupta B.M (2010)\textsuperscript{51} conducted a study on the profile of biochemistry, genetics and molecular biology research in India during 1998-2007. The study reveals country performance based on its research output, its publication share and rank in
global context, and annual publication growth rate. It also analyzes the share of international collaborative papers in India’s research output, the characteristics of research output of major Indian institution, authors, and highly cited papers. The patterns of research communication by Indian scientists in most productive journals in this discipline have also been evaluated.

**Dilruba Mahbuba, Ronald Rousseau and Divya Srivastava (2010)** conducted a scientometric comparison between two health and population research organizations, namely the International Centre for Diarrhoeal Disease Research in Bangladesh (ICDDR,B) and the National Institute of Cholera and Enteric Diseases (NICED) in India, during the period 1979-2008. The data were collected from the Web of Science (WoS) as well as from official records of these two organizations. The analysis presents the evolution of publication activities. Special attention is given to research impact through time series of the institutional h- and R-indices, as well as to the trend in yearly citations received. Types of publications, international collaboration with other countries, top scientists and most cited articles co-authored by scientists from these institutions are highlighted. It is observed that female scientists play a minor role in these two institutes.

**Grag K.C Kumar S. Dutt S and Oindrilla Chakraborty (2010)** analyzed that 2899 papers published by Indian scientists during 1991-2008 and indexed by Science Citation Index-expanded (SCI-E) indicate that the growth of publication output was slow in the initial stages, which started increasing after 2000. The highest output was in the sub-field of molecular genetics. The organisms which received the maximum priority were humans, plants and animals. A significant proportion of papers were published in journals that originated from the advanced countries of the west and journals with impact factor >1, and about 47 per cent papers were cited more than 5 times. Academic institutions contributed highest number of paper but had less impact as compared to other performing sectors. The papers published by Indian council of agriculture research had the lowest impact. Among the
institution, Madras University had the highest impact, while Indian Veterinary Research Institute had the lowest impact.

**Pouris, Anastassios (2010)** examined the Scientometric assessment. All countries tend to have the same focus in their disciplinary priorities and underemphasize disciplines such as engineering, material science and molecular biology. It expressed concern that the current research infrastructure is inadequate to assist in reaching the objectives developed in the regional, indicating strategic development plan of the community.

**Senthamilselvi A, Srinivasa Raghavan and Amutha G. (2010-11)** highlight scientometric Analysis of Medical Literature output of Hypertension 1996-2006. The average Relative Growth Rate has positive value showing the increasing trend in literature in Hypertension. An analysis of the authorship pattern shows that when the number of authors is more than seven, the number of publications decreases. Literature on Hypertension is available in many forms of which journal articles form a major share of the total output. Literature on Hypertension have been published from 46 countries of the world of which United States of America ranks first forming a maximum percent of the total output.

**Sooryamoorthy, R. (2010)** extracted and analyzed medical publications for three decades and at regular intervals (1975–2005) from the SCI database. This paper pioneers an attempt to find out whether the reported pace of growth in the production of a scientific paper in medicine is an effect of partnerships that scholars have with their counterparts within the organization, within the country, or with those in other countries. This paper also presents the unique patterns of scientific research in medicine, taking into account factors such as the count and fractional count of papers, citations, trends of growth, sectoral participation, partners, and publication outlets, and seeks to provide new insights into the directions medical science is taking in South Africa today.
Abbasi F and Biglu M.H (2011) analyzed the quality and quantity of scientific productions originated by Iranian medical science. All data were extracted from the database of Web of Science. The findings of this study showed that the number of scientific productions emanated by Iranian medical sciences university increased through this study period. The number of scientific productions increased from 259 documents in 1999 to 15852 documents in 2008, an increase of greater than 60 times. Articles were the most frequent document type indexed in the Web of Science.

Raja, S and Balasubramani, R (2011) undertook a study entitled Scientometric Study of the Research Publication on Malaria 2003-2007: A Global Perspective. This study reveals that during 2003-2007 a total of 15685 papers were published by the scientists in the field of malarial research. The average number of publications produced per year was 20 per cent. The highest number of publications 3731 were produced in 2006. The most productive author is White N J with 136 papers dealing with malarial research and 0.9 per cent of all papers published in this research field. The highest number of publication is accounted to 11758 (74.96 per cent) Vs LCS 44000 as Articles and lowest is as Bibliography - 1 Vs LCS 0. The highest number of publication is in USA and the lowest number of publication is in West Indis (Assoc.St.).

Raja S, Ramkumar P and Viji P, (2011) analyzed the research field of Gender in thyroid cancer in terms of publication output as per science citation index (1991- Mar 2010). During 1991- Mar 2010. A total of 380 papers were published by the scientists in the field of Gender in thyroid cancer. The average number of papers published per year was 10.78 per cent. The highest number of papers 41 was published in 2006 and 2007. There were 50 countries involved in the research in this field. USA is the top producing country with 140 publications (36.84%), followed by Italy with 44 publications (11.57 per cent), Japan with 32 publications (8.42 per cent), Germany with 31 publications (8.15 per cent), and Sweden with
19 publications (5.00 per cent). The most productive author is Clark OH with 11 papers dealing with thyroid cancer and 2.89 per cent of all papers published in this research field. The most preferred journals by Thyroid topped the list with 30 (7.89 per cent) followed by Journal of Clinical Endocrinology & Metabolism with 27 (7.10 per cent) publications, Cancer with 22 (5.78 per cent) publications, World Journal of Surgery with 18 (4.73 per cent) publications, and Surgery with 13 publications (3.42 per cent).

Raja S (2012)\textsuperscript{60} discovered the pattern of publication, authorship, citations and secondary journal coverage in the hope such regularities can give an insight into the dynamics of the area under consideration. During 1999-2012 a total of 486 papers were published by the scientists in the field of space neuroscience research. The average number of publications produced per year was 34.7 per cent. The highest number of publication’s 70 were produced in 2010. The most productive author is Rabinovich MI and Spence C with each 6 papers dealing with space neuroscience research and 1.2 per cent of all papers published in this research field. The highest number of publication is in USA 199 (39.9 per cent) and the lowest number of publication is the UAE 1(0.2 per cent).

Vatankhah F (2012)\textsuperscript{61} used Scopus citation database to evaluate the scientific research productivity of Zahedan University of Medical Sciences (ZAUMS) over the period of 1976-2011. He retrieved the number of publications and citations of researchers, academic groups, and university and calculated their h-index scores. The affiliation varieties were used by researchers to address the university and different spellings of author’s names were determined. The results showed that scientific productivity of ZAUMS improved so that its h-index increased from 1 in 2000 to 19 over the period of the study. Total number of 504 publications were indexed in Scopus in the forms of original article, review article, conference paper, letter, editorial, and note. Most of the publications were in the form of
research article (91.2 per cent). There was a significant correlation between the number of publications, citation rates and h-index scores.

Gupta, B.M and Adarsh Bala, (2013)\textsuperscript{62} analyzed the research output of India in Alzheimer’s disease research during 2002-11. The study revealed that India ranks at 16\textsuperscript{th} position (with 900 papers) among top 20 top countries with a global publication share of 1.33 per cent (rising from 0.39 per cent in 2002 to 2.36 per cent during 2011) and an annual average publication growth rate of 31.92 per cent during 2002-11. Its citation impact per paper was 5.81 during 2002-11 (decreasing from 8.85 during 2002-06 to 4.79 during 2007-11). Its international collaborative publications share was 24.00 per cent during 2002-11 (decreasing from 30.09 per cent during 2002-06 to 21.96 per cent during 2007-11).

Gupta B.M and Adarsh Bala (2013)\textsuperscript{63} analyzed the Indian publications output in bone marrow research during 2003-12 on several parameters including contribution and citation impact of most productive countries, India’s overall contribution, its growth pattern, citation impact, the share of international collaboration, identification of significant participating countries in India’s international collaboration, contribution and impact of different types of bone marrow diseases, analyses of bone marrow research by sub-fields and by different population age groups, productivity and impact of leading Indian institutions and authors. The result shows that Indian publications output in bone marrow research consisted of 2613 papers during 2003-12, which increased from 174 papers in 2003 to 397 papers in 2012, witnessing an annual average growth rate of 10.04 per cent. The average citation impact per paper registered by Indian publications in bone marrow research was 2.84 during 2003-12, which decreased from 3.53 during 2003-07 to 2.47 during 2008-12. The international collaborative share of India in overall bone marrow research was 11.56 per cent during 2003-12, which increased from 10.43 per cent during 2003-07 to 12.18 per cent during 2008-12.
Gupta B.M and Bala Adarsh (2013) examined the research output of India in epilepsy research during 2002-11 on several parameters including the growth, rank and global publications share, citation impact, share of international collaborative papers, contribution of major collaborative partner countries, contribution of various subject-fields, contribution and impact of most productive institutions and authors, media of communication and characteristics of high cited papers. Among the top 20 most productive countries in epilepsy research, India ranks at 11th position (with 1550 papers) with a global publication share of 2.88% and an annual average publication growth rate of 15.31 per cent during 2002-11. Its global publication share increased over the years, rising from 2.06 per cent in 2002 to 4.65% during 2011. Its citation impact per paper was 2.77 during 2002-11, which decreased from 3.48 during 2002-06 to 2.41 during 2007-11. Its international collaborative publications share was 12.32 per cent during 2002-11, which decreased from 12.45 per cent during 2002-06 to 12.26 per cent during 2007-11.

Mishra A.K and Balhara Y.P.S (2013) conducted a study on statistical methodology for the scientometric study of the growth of medical sciences in India. The result indicates differential growth trajectory in many sub-disciplines of medical sciences. The specialties such as epidemiology, obstetrics and gynaecology, geriatrics and psychiatry and mental health need to be pursued more seriously.

Chitra V. Jeyshankar R and Abu K.S (2014) examined the research output of lung cancer in the G7 and the BRIC countries by scientometric method. Data were downloaded from Scopus database for a period of 10 years (2003–2012). This study compares the growth rate (CAGR), Collaboration Coefficient (CC) and Publication Activity (TAI) of the countries of both the groups. Two relative indicators– Absolute Citation Impact (ACI) and Relative Citation Impact (RCI) have been adopted to compare the quality and impact of the lung cancer research. They found that the BRIC countries had a significant
growth in both in the number of articles and their share in the recent years when compared with the G7 countries.

Dutt B and Nikam K (2014) examined the scientometrics of collaboration pattern in solar cell research in India. The paper looks into collaboration in solar cell research in India as reflected by the publications indexed in Web of Science for a period of 20 years from 1991-2010. The paper indicates among the prolific institutions National Physical Laboratory-Delhi of the Council of Scientific and Industrial Research had the highest publications emerging out of collaborative research. Indian researchers collaborated with their counterparts in 31 countries; however, South Korea, Japan, USA, Germany, England, France and Greece were dominant collaborating research partners. Various bibliometric indicators have been used to examine collaborative research activity. Research collaboration gained momentum during the later decade. International collaborative output had more impact compared to domestic collaboration in terms of citations per paper.

Mund, M. et al., (2014) examined global research on smoking and pregnancy: a scientometric and gender analysis. Furthermore the study result shows that out of 10,043 publications, the highest number of scientific works were published in the USA (35.5 per cent), followed by the UK (9.9 per cent) and Canada (5.3 per cent). These nations also achieve the highest modified h-indices of 128, 79 and 62 and the highest citation rates of 41.4 per cent, 8.6 per cent and 5.3 per cent, respectively. Out of 12,596 scientists 6,935 are female (55.1 per cent), however they account for no more than 49.7 per cent of publications (12,470) and 42.8 per cent of citations (172,733). The highest percentage of female experts about smoking and pregnancy is found in Australasia (60.7 per cent), while the lowest is found in Asia (41.9 per cent). The findings of the study indicate an increase in gender equality as well as in quantity and quality of international scientific research about smoking and pregnancy in the future.
Rashidi Ali (2014) studied the trend of Iran’s contribution in terms of number of publications indexed in the Web of Science in urology and nephrology between 2004 and 2013. He found that 173,628 papers affiliated to Iran were indexed in databases “SCI-Expanded, SSCI, A&HCI, CPCI-S, CPCI-SSH” in the English language between 2004 and 2013. Overall, 1,783 of those papers were related to urology and nephrology as a Web of Science Category. There were 20 papers from Iran in 2004, which increased to 305 in 2010 and decreases to 166 until November 21, 2013. The most prolific 10 authors accounted for 30 per cent of the literature set. The most productive authors were Basiri A with (n=93); Safarinejad MR (n=74); Kajbafzadeh AM (n=64); Simforoosh N (n=64). The Tehran University of Medical Sciences with (n=391); Shiraz University of Medical Sciences with (n=162) and Shahid Beheshti University of Medical Sciences with (n=158) produced the most publications. Iran’s rank also improved from 53, 47 and 38 to 14, 16 and 23 between 1996 and 2012 for the research areas of nephrology, transplantation and urology, respectively.

Sridevi T.R (2014) studied the research evaluation of bibliometric study of Indian Journal of cancer for the time frame of 2003-2012. The data were taken from the archives of the journal through online. This study highlights the evaluation of research carried out by the oncologist doctors. The analysis covers distribution of articles patterns, length of articles, authorship patterns, and citation distribution. The study has helped in finding out the publications published during the past ten years. The finding shows that 625 articles were published and joint author contributions were 569(91.04 per cent) and the rest were the single author 56(8.96%). The mathematical formula was used to find the degree of collaboration of authorship in the Indian journal of cancer. The study helps in finding out the strength and the weakness of the publication and necessary steps recommended for further development.
Reference


