

Scientometrics Analysis of Leprosy Research Publications During 2009 - 2018 from Scopus Database

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Abstract - The present study examines the leprosy research publications are contributed from the Scopus database during the study period of 2009-2018 with a total numbers of 6266 publications. This study aims to analyze scientometric tools such as frequency distribution, percentage analysis, relative growth rate and doubling time, degree of collaboration. During the study period maximum of 675(10.77%) research publications are contributed in the year 2015. The relative growth rate is identified decreasing trend and doubling time is increasing trend from 2009 to 2018. Maximum of 99(1.58%) research publications are contributed by Sarno, E.N. with top-ranking authors, the average degree of collaboration is 0.83 and 4218(67.32%) of research publications are articles. India is the most contributing top-ranking countries with 1522(24.29%) leprosy research publications. Even though India is top most productive country in the leprosy research, hardly any Indian institution is not listed among the most productive institutions.

Keyword: Scientometrics, Bibliometrics, Leprosy, degree of collaboration, relative growth rate and doubling time

Introduction

Scientometric is analysis of scientific research publications. Scientometrics analysis has been used to measure the scientific literature published online or offline through the scientometrics techniques and statistical tools. The research activities contain major changes over the last few decades and emerged as an established research in the discipline of “Library and Information Science” subsequently it becomes an interdisciplinary. In the late 1960^s, Alan Pritchard was coined the term bibliometrics, which is used for the application of mathematical and statistical methods for books and other media of communication (Pritchard, 1969)¹. According to Beck (1978)² “Scientometrics is defined as the quantitative evaluation and inter-comparison of scientific activity, productivity, and progress”. Bookstein (1995)³ defined “scientometrics as the science of measuring science. Scientometrics is also considered as a bibliometric measurement for evaluation of scientific development, social relevance and impact of the application of science and technology”. Ingwerson and Christensen (1997)⁴ defined the term “informatics designates a recent extension of the traditional bibliometric analysis, also to cover non-scholarly communities in which information is produced, communicated and used”. Leprosy is an infection disease caused by a bacillus,

mycobacterium leprae and it was mainly affected by skin, peripheral nerves mucosa of the upper respiratory tract and eyes. Leprosy is curable and treatment in the early stages with multidrug therapy. So that we have selected scientometrics analysis of leprosy research publications to identify the present status of leprosy research output.

Leprosy

Leprosy is a chronic infectious disease caused by Mycobacterium Leprae (M. Leprae). It usually affects the skin and peripheral nerves. It can also affect muscles, eyes, bones, testes and other internal organs. Leprosy has a wide range of clinical manifestations. Occurrence of the disease depends upon the immunological status of the individual which in turn is influenced by genetic factors. A complex disease such as leprosy has a correspondingly multi-faceted history ranging from medical scientific to social, legal and political. The present historical overview of the above facts does not claim to be exhaustive, since its focus is chiefly on the nineteenth and early twentieth century's⁵.

Among the communicable diseases, leprosy is one of the leading causes of permanent physical disability. Due to the involvement of peripheral nerves, there is a weakness of muscles and loss of sensations in hands, feet, and eyes leading to ulceration and deformity. However, timely detection and treatment of cases before nerve injury has occurred is the most effective way of preventing disability due to leprosy and its complications. Leprosy is eliminated from India in terms of statistical prevalence but from the disease problem point of view, it still poses many challenges, especially in view of integration approach⁶. World Health Organization stated that leprosy disease are affected by globally at end of the year 2018 with a total number of 1,84,212 people⁷.

Review of Literature

Fu, Hang et. al., (2015)⁸ examined his research in malaria research publications were retrieved from China National Knowledge Infrastructure, Wanfang database, Cqvip, and data has been retrieved from PubMed database between 2004 and 2014 with 5,126 publications. The study identified the first-author affiliation, journal name and high-frequency keywords were selected. The papers published 32.98% in overall articles by the top 12 Chinese journals in the field of malaria research.

Saed H. Zyoud (2016)⁹ analyzed his study of dengue research in Arab countries with 19,581 documents from the Scopus database during 1872 - 2015. Most contributed countries in dengue research publications were USA with 4,709(24.05%) publications, India with 1,942(9.92%) publications, Brazil with 1530(7.81%) publications and Thailand with 1,260(6.43%) publications. Arab region contributions are only 226 (1.16%) research publications in dengue research. The total numbers of 3, 52,710 citations were received with an average of 18 citations per publication. Kingdom of Saudi Arabia was the most prolific country in the Arab region with 102 (45.1%) publications.

Jeysankar R and Chithiravel S (2019)¹⁰ analyzed the Eosinophilia research output in India during the year 1998-2017 with 267 publications from the web of science online database. The study examined the different type of parameters like authorship pattern, growth of publications, time series analysis, degree of collaboration and most productivity journals. The overall growth rate was increasing trend, multi-authored papers were majority of contributions in Eosinophilia research in India.

Objectives

The major objectives of the studies are

- To find out the year-wise growth of Leprosy research publications
- To analysis relative growth rate and doubling time
- To analysis the top 10 authors contributions
- To analysis the authorship pattern and degree of collaboration
- To identify the bibliographic form of publications
- To identify the top 10 institutions and Countries contribution

Limitations

This study is confined that, only the Leprosy research publications for ten years from 2009 to 2018 indexed in SCOPUS database. The search was conducted with the following search strategy: TITTLE-ABS-KEY “Leprosy” AND PUBYEAR > 2008 AND PUBYEAR < 2019. The present study considers for few scientometrics techniques to analyze the research work.

Methodology

Bibliographic records related to the Leprosy research publications are identified and extracted from the SCOPUS multidisciplinary online database and classifying Microsoft Excel. Further some statistical tools such as percentage analysis, frequency distribution and Bibliometric techniques such as Relative Growth Rate and Doubling Time, degree of collaboration were used to analyze for this study.

Analysis and Interpretation

Year-Wise Growth of Publications

Table 1 shows that, the year-wise growth of leprosy research publications is contributed in the SCOPUS database for the selected ten years study period from 2009 to 2018. During the study period, it is identified that 6266 research publications are contributed in leprosy research. Out of that, a maximum of 675(10.77%) research publications are contributed in the year 2015. Followed by, 661(10.55%) research publications in the year 2012, 660(10.53%) publications in the year 2018. Minimum of 570(9.10%) research publications are contributed in the years 2009 and 2010.

Table 1 Year-wise growth of leprosy research publications

Sl. No	Year	Publications	%	Cum.	Cum.%
1	2009	570	9.10	570	9.10
2	2010	570	9.10	1140	18.19
3	2011	656	10.47	1796	28.66
4	2012	661	10.55	2457	39.21
5	2013	591	9.43	3048	48.64
6	2014	651	10.39	3699	59.03
7	2015	675	10.77	4374	69.81
8	2016	589	9.40	4963	79.21
9	2017	643	10.26	5606	89.47
10	2018	660	10.53	6266	100
Total		6266	100.00		

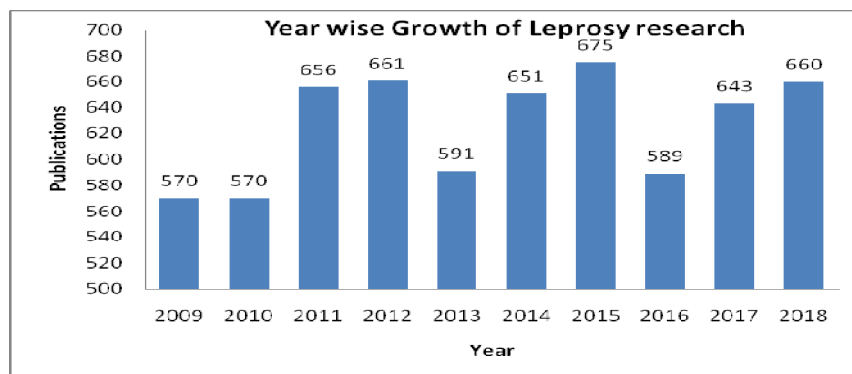


Figure.1 Year-wise growth of leprosy research publications

Relative Growth Rate and Doubling Time

The growth of publications were analyzed by using two types of parameters like Relative Growth Rate and Doubling time by the formula of (Mahapatra 1985)¹¹. RGR is a measure to study the increase in number of articles in a particular time. It is calculated as

$$R(a) = \frac{(W_2 - W_1)}{(T_2 - T_1)}$$

R(a) = RGR = the mean relative growth rate over the specific period of interval

W₁ = the logarithm of beginning number of publications/pages

W₂ = the logarithm of ending number of publications/pages after a specific period of interval

T₂ – T₁ = the unit difference between the beginning time and the ending time.

The relative growth rate (RGR) and the doubling time (Dt) were calculated and the result is presented in table 2. Doubling time is directly related to relative growth rate. It is the time required for articles to become double the existing amount of records. The corresponding doubling time for each specific period of interval can be calculated by the following formula and used by vivekanandhan S and Sivasamy K (2017)¹², Siva N, et al. (2019)¹³.

$$Dt = \frac{0.693}{R(a)}$$

Table 2 signifies the chronological distribution of relative growth rate and doubling time in the field of Leprosy research publications between 2009 and 2018. Doubling time can be calculated directly from the growth rate. The relative growth rate is found that a maximum of 0.69 in the year 2010 and a minimum of 0.11 in the year 2018 and it is identified that RGR is a decreasing trend. At the same time doubling time values are 1.00 in the year 2010 and 6.23 in the year 2018 and it is identified that doubling time is increasing trend from 2009 to 2018.

Table-2 Relative growth rate and doubling time in leprosy research

Sl. No	Year	Publications	Cum.	W ₁	W ₂	RGR=(W ₂ -W ₁)	Dt=(0.693/RGR)
1	2009	570	570		6.35	0	0
2	2010	570	1140	6.35	7.04	0.69	1.00
3	2011	656	1796	7.04	7.49	0.45	1.52
4	2012	661	2457	7.49	7.81	0.31	2.21
5	2013	591	3048	7.81	8.02	0.22	3.22
6	2014	651	3699	8.02	8.22	0.19	3.58
7	2015	675	4374	8.22	8.38	0.17	4.13
8	2016	589	4963	8.38	8.51	0.13	5.49

9	2017	643	5606	8.51	8.63	0.12	5.69
10	2018	660	6266	8.63	8.74	0.11	6.23
Total		6266					

Top 10 Authors Contributions

Table 3 and Figure 2 show that, top 10 author's contributions in the field of leprosy research publications from Scopus online database for the selected ten year study period. Author network visualization map has

Table-3 Top ten authors contributions

Sl. No	Author	Country	Publications	% of 6266	Rank
1	Sarno, E.N.	Brazil	99	1.58	1
2	Lockwood, D.N.J.	United Kingdom	60	0.96	2
3	Richardus, J.H.	Netherlands	60	0.96	2
4	Duthie, M.S.	United States	51	0.81	3
5	Ishii, N.	Japan	50	0.80	4
6	Geluk, A.	Netherlands	41	0.65	5
7	Pessolani, M.C.V.	Brazil	40	0.64	6
8	Moraes, M.O.	Brazil	39	0.62	7
9	Rosa, P.S.	Brazil	39	0.62	7
10	Brennan, P.J.	United States	35	0.56	8
Total			514	8.20	

been created using VOS viewer software¹⁴ and the author network visualization map has been display in the figure 2. During the study period, maximum numbers of 99(1.58%) research publications are contributed by Sarno, E.N. with top-ranking authors. Followed by Lockwood, D.N.J., and Richardus, J.H. contributed 60(0.96%) publications. The third-ranking contributed author is Duthie, M.S. with 51(0.81%) publications. The overall study identified that, out of 6266 publications top ten authors are contributed 514(8.20%) publications.

Author Network Visualization Map

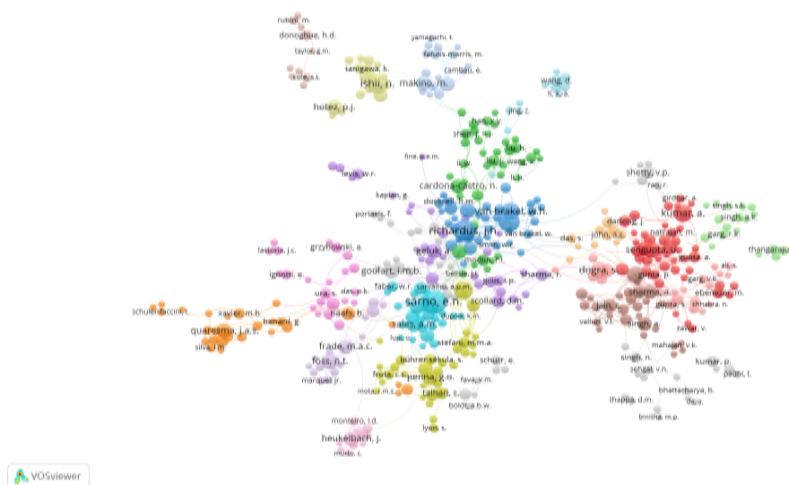


Figure.2 Author's network visualization

Authorship Pattern

Authorship pattern in the field of leprosy research publications are identified from the table 4. During the study period, maximum number of 1069(17.06%) research publications is contributed by single authors, followed by two authors are contribution is 938(14.97%) research publications, 904(14.43%) publications are three authors. Out of 6266 publications, more than 9 authors are contributed by 471(7.52%) research publications. The overall study identified that a maximum of 82.94% of publications are contributed by multi authors.

Table-4 Authorship pattern

Sl. No	Authorship Pattern	Publications	%
1	Single author	1069	17.06
2	Two Author	938	14.97
3	Three Author	904	14.43
4	Four Author	829	13.23
5	Five Author	710	11.33
6	Six Author	525	8.38
7	Seven Author	365	5.83
8	Eight Author	270	4.31
9	Nine Author	185	2.95
10	>9 Author	471	7.52
Total Publications		6266	100.00

Degree of Collaboration [DC]

Degree of collaboration denotes that the concentrations of single-authored publications are relation to the multi-authored publications, suggested by Subramanyam (1983)¹⁵ and used by Sivasamy (2015)¹⁶, Vivekanandhan (2016)¹⁷

$$DC = \frac{Nm}{(Nm + Ns)}$$

Where,

DC - Degree of Collaboration

Nm - Number of multiple-authored publications & Ns - Number of single-authored publications

Table-5 Degree of collaboration

Year	Single Author Publications (Ns)	Multi Authors Publications (Nm)	Degree of Collaboration DC = (Nm/(Ns+Nm))
2009	123	447	0.78
2010	132	438	0.77
2011	147	509	0.78
2012	109	552	0.84
2013	94	497	0.84
2014	106	545	0.84
2015	98	577	0.85
2016	92	497	0.84
2017	92	551	0.86
2018	76	584	0.88
Total	1069	5197	0.83

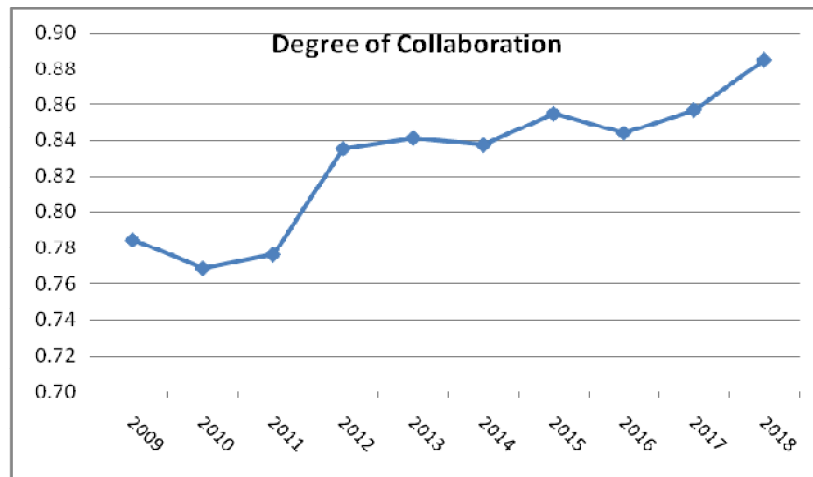


Figure.3 Degree of Collaboration

During the study period, it is identified from Table 5, the degree of collaboration between single author and multi author's publications in the field of Leprosy research. From the study, it is identified that degree of collaboration is 0.77 in the year 2010 to 0.88 in the year 2018. The average degree of collaboration is 0.83. This study confirmed that the majority of research publications are contributed by multi authors.

Bibliographic Form

Table 6 shows the bibliographic form of leprosy research publications from the Scopus database during 2009 – 2018 with 6266 publications. Out of that, maximum of 4218(67.32%) research publications are articles, followed by 851(13.58%) research publications are reviews, 375(5.98%) publications are letters and 218(3.48%) research publications are note. The overall study identified that, more than 90% of research publications are contributed by the top four types of documents.

Table-6 Bibliographic form of publications

S. No	Bibliographic Form	Publications	%	Cum.	Cum.%
1	Article	4218	67.32	4218	67.32
2	Review	851	13.58	5069	80.9
3	Letter	375	5.98	5444	86.88
4	Note	218	3.48	5662	90.36
5	Editorial	188	3	5850	93.36
6	Book Chapter	168	2.68	6018	96.04
7	Short Survey	108	1.72	6126	97.77
8	Conference Paper	79	1.26	6205	99.03
9	Erratum	31	0.49	6236	99.52
10	Book	23	0.37	6259	99.89
11	Retracted	3	0.05	6262	99.94
12	Conference Review	1	0.02	6263	99.95
13	Undefined	3	0.05	6266	100
Total Publications		6266	100		

Top 10 Institution Contributions

Table-7 Top 10 Institution contributions

Sl.No	Name of the Institution	Publications	%
1	Fundacao Oswaldo Cruz, Brazil	232	3.70
2	Universidade de Sao Paulo – USP, Brazil	194	3.10
3	London School of Hygiene & Tropical Medicine, United Kingdom	128	2.04
4	Instituto Lauro de Souza Lima, Brazil	104	1.66
5	National Institute of Infectious Diseases, Japan	102	1.63
6	Federal University of Rio de Janeiro, Brazil	90	1.44
7	Universidade Federal do Para, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil	78	1.24
8	Colorado State University, United States	78	1.24
9	Universidade Federal do Ceara, Brazil	76	1.21
10	Erasmus University Medical Center, Netherlands	70	1.12
Total Publications		1152	18.38

Table 7 shows that institution contribution during the ten year study period of leprosy research publications. This study identified that, out of 6266 research publications 1152 (18.38%) publications are contributed by the top ten institutions. A maximum of 232(3.70%) publications are contributed by Fundacao Oswaldo Cruz, Brazil, followed by Universidade de Sao Paulo – USP, Brazil with 194(3.1%) publications. The third-ranking institution is London School of Hygiene & Tropical Medicine, United Kingdom with 128(2.04%) publications.

Top 10 Countries Contributions

Table 8 shows that the top ten contributing countries in the field of leprosy research publications. From the study it is identified that, India is most contributing top-ranking countries with 1522(24.29%) leprosy research publications. Followed by Brazil with 1127(17.99%) research publications. Third-ranking country is United States with 1071(17.09%) publications and 4th ranking country is the United Kingdom with 513(8.19%) research publications. This study identified that top four countries are contributed more than 65% of overall publications and it is because research in the area of leprosy may scattered among the different Indian authors and Institutions.

Table-8 Top 10 Countries contributions

Sl. No	Country	Publications	% of 6266	Rank
1	India	1522	24.29	1
2	Brazil	1127	17.99	2
3	United States	1071	17.09	3
4	United Kingdom	513	8.19	4
5	Netherlands	260	4.15	5
6	Japan	217	3.46	6
7	China	209	3.34	7
8	France	195	3.11	8
9	Germany	157	2.51	9
10	Spain	130	2.07	10
Total Publications		5401	86.2	

Major Findings

- During the study period, the leprosy research publications are contributed in the SCOPUS database for the selected ten years study period with 6266 research publications and a maximum of 675(10.77%) research publications are contributed in the year 2015.
- The relative growth rate is found that, maximum of 0.696 in the year 2010 and minimum of 0.11 in the year 2018 and it is identified a decreasing trend. At the same time doubling time values are 1.00 in the year 2010 and 6.23 in the year 2018 and it is identified an increasing trend.
- Maximum of 99(1.58%) research publications are contributed by Sarno, E.N. with top-ranking authors and maximum of 1069(17.06%) publications are contributed by single authors.
- The degree of collaboration is 0.77 in 2010 and 0.88 in 2018. The average degree of collaboration is 0.83, and maximum of 4218(67.32%) research publications are articles
- Top ten institutions are contributed by 1152 (18.38%) research publications, maximum of 232(3.70%) publications are contributed by Fundacao Oswaldo Cruz, Brazil. India is most contributing top-ranking countries with 1522(24.29%) leprosy research publications.

Conclusion

During the ten year study period, it is identified that leprosy research is increasing and decreasing trend. Worldwide research publications in the field of leprosy research shows that India is most contributing countries. Many of the Indian authors and institutions are doing the leprosy research, but not in the top ranking list. In future the same study will be continued from the different database like web of science and PubMed database to identify the research trends in the field of leprosy research output. The comparison results are very useful to research scholar and scientist to do many more research and save the human life from the leprosy disease.

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