

CITATION ANALYSIS OF GLOBAL DENGUE RESEARCH PUBLICATION DURING 2010 TO 2017: A SCIENTOMETRIC APPROACH

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Dengue is presently viewed universally as the most significant mosquito-borne viral infection. The genuine effect of dengue universally is hard to determine because of elements, for example, insufficient illness observation, misdiagnosis, and low dimensions of revealing. Right now accessible information likely horribly thinks little of the social, financial, and ailment trouble. Appraisals of the worldwide occurrence of dengue contamination every year have gone between 50 million and 200 million; nonetheless, late gauges utilizing cartographic methodologies propose this number is nearer to right around 400 million. There are around 6,031 research papers altogether contributed by 22,234 researchers distributed in 6007 logical periodicals in late 8 years as the emphasis on this fever pulls in consideration of Scientists at the significant rate. The present paper endeavors to check the pertinence of Price's Law on the references of 6031 worldwide distributions on Dengue. The investigation lights on the pattern of scientific productivity, h-score and author's productivity, the total citation sum of top cited journals are scientifically analysed.

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Keywords: Scientometrics, Citation analysis, Price Index, h-index, Dengue research output

INTRODUCTION

Scientometric is an important field in information science as it represents a unique set of techniques and tools for screening and analysing of information resources and for the management of knowledge in social and organizational framework. The Present study is a Scientometric analysis of global Publications on Dengue fever Research over the recent period of 2010 to 2017. An attempt has been made in this study to find out the various characteristics of Dengue fever literature such as average growth rate of literature, the output of scientists in pursuit of h-index and their pattern of citation. In addition the price indexes on the citations that the scientists referred are analysed.

Objective quantifications of journal influence are based frequently on citation counts. The basic idea is that important journals are the beneficiaries of many citations from other journals. If a journal puts out an article that is cited by articles in other journals, it donates to the exchange of ideas in a field of inquiry and is thus measured influential.

“Several objective quantifications of journal influence based on citation counts are obtainable, such as the amount of citations received, the quantity of citations received per average article published, and the proportion of citations received to citations made” (Doreian 1988). “Representative studies in marketing using this approach” are Leong (1989), Pieters and colleagues (1999), and Zinkhan, Roth, and Saxton (1992).

REVIEW OF LITERATURE

“Citation-based methods of assessing journal influence also have several restrictions” Brown and Gardner (1985). One of the important issues is that articles may be cited for a diversity of reasons, not all of which reflect a transfer of knowledge or true acknowledgment of intellectual thankfulness. Although it is usually assumed that citing others ‘work signifies that the cited document served as a relevant source of information, other motives are possible. Small (1982) reviews seven studies that examine the functions that citation serve on the basis of an analysis of the context in which they appear. Although the schemes to classify the functions of citations vary, they usually contain functions such as use/application, affirmation/support, review, perfunctory mention, and negation. The various functions of references reflect the differential influence of the cited document, and some references, for example, perfunctory mention (Kotler 1972), may not be good indicators of influence. Perfunctory mentions were found to account for, on average, 20% to 60% of references. Related to this, authors may cite an article without using it, for example, when a cited source has not been consulted or is irrelevant to the argument (Wertsch 1995). In addition, authors may cite articles for strategic reasons, for example, because the authors of the cited articles are potential reviewers of the research (Tellis, Chandy, and Ackerman 1999). “To the extent that these mechanisms affect the journals in a discipline similarly, they lower the validity and reliability of citation-based measures of journal

influence”. “The scientometric studies of Narendra Kumar Amsaveni and Sadik Batcha corroborate with the citation analysis and they imply with the impact on recent researches”.

“Citation analysis is a major bibliometric approach (Osareh, 1996) originating from information sciences”. “Although still relatively new, bibliometric analysis has also found some advocates in the area of entrepreneurship” (Etemad & Lee, 2003). “Bibliometric analysis is founded on the assertion that citations can be used as indicators of present and past activities of scientific work” (Garfield, 1983) (Garfield, Sher, & Torpie, 1964). “Citation analysis has covered macro and micro studies. Macro studies are interested in the overall structure of disciplines and the laws that govern the evolution of science. Micro studies usually describe the structure and development of individual disciplines or schools of research and their interdependencies” (Gmur, 2003).

DENGUE DISEASE/FEVER: A STUDY OF IMPORTANCE

“Dengue is a mosquito-borne viral disease that has quickly spread in all regions of WHO in recent years. Severe dengue (also known as Dengue Haemorrhagic Fever) was first recognized in the 1950s during dengue epidemics in the Philippines and Thailand. Today, severe dengue affects most Asian and Latin American countries and has become a leading cause of hospitalization and death among children and adults in these regions. The incidence of dengue has grown dramatically around the world in recent decades. The actual numbers of dengue cases are underreported and many cases are misclassified. One recent estimate indicates 390 million dengue infections per year (95% credible interval 284–528 million), of which 96 million (67–136 million) manifest clinically (with any severity of disease). Another study, of the prevalence of dengue, estimates that 3.9 billion people, in 128 countries, are at risk of infection with dengue viruses”. -Dengue fever – Wikipedia.

METHODOLOGY

The present study fits in to the micro-oriented stream of research. The data for the present study was retrieved from WOS (Web of Science Data Base) from 2010 to 2017 (till October 2017). The data was downloaded on 05-11-2017. The searches were performed on the terms of Dengue Disease and Dengue fever with all probabilities and bibliographical details of 6031 research papers jointly contributed by 22,234 scientists published in 6007 scientific periodicals were collected taken for citation analysis.

OBJECTIVES OF THE STUDY

The study aims to fulfill the following objectives;

- Σ To identify the pattern of scientific productivity on Dengue publications,
- Σ To measure h-score and author's productivity in relation to Dengue literature,
- Σ To analyse scientifically the total citation sum of top cited journals
- Σ To check the pertinence of Price's Law on the references of 6031 worldwide distributions on Dengue

DATA ANALYSIS

To understand trends in Dengue research, Web of Science was used to rescue citation data, which indexed 6007 journals in medical disciplines, adding approximately 40,000 recent cited references per week. The search is primarily done with all articles with words beginning with "Dengue*" in their abstract, title, or keywords from the web of knowledge collection during the 2010 to 2017 period. This resulted in an initial data set of 6031 articles with over 1,01,100 cited references. The Year wise growth of literature is presented in table 1. The first 25 citation articles are presented in the table in year wise. The prolific authors in the field of Dengue research are presented in Table 2 with their publication count. The scientists who have been the source of information chain in the field of dengue are measured with 'h' index in Table 3. The Price index is calculated on the citations and found the currency of the dengue literature in Table 4. The publications to which the dengue scientists cited and brought out new ideas are measured with citation study in Table 5.

RESULTS

The table 1 explains the data on the research publication output given by the global scientists on Dengue fever in the recent years from 2010 to 2017. The growth rate from 2010 is found increasing year

Table 1. Year wise Research publication out put on Dengue Fever

Year	Res. Output	Percentage	Cum. Total	% of Cum Total
2010	545	9.04	545	9.04
2011	544	9.02	1089	18.06
2012	634	10.51	1723	28.57
2013	718	11.91	2441	40.47
2014	764	12.67	3205	53.14
2015	885	14.67	4090	67.82
2016	1107	18.36	5197	86.17
2017	834	13.83	6031	100.00
	6031	100.00		

by year. The year 2017 consists of data up to the month of October yet the growth trend is noted high. The years 2010 and 2011 show stagnate growth. The trend of publication growth is observed minimum of one 1.5% increase year by year. Recent years the attention towards Dengue fever seems to be high. Hence the increase in the publications from 2016 is noted dual fold. The mortality rate due to dengue fever is high in the developing countries in recent years in particular in India. So the trend analysis supports the fact.

Table 2 presents the prolific Scientists who have contributed more number of research publications in the field of Dengue diseases. The first rank prolific scientist Harris E is from India has given 64 research output gradually in all the years of Study. The majority of scientists are observed from USA in next proceeding ranks. Two scientists from USA and one from UK have given more than 50 research output. From the country Pakistan one scientist has contributed around 40 research publications. Overall table gives a clear picture that USA and UK Scientists are in a leading level in producing more number of Research output in the Dengue Diseases. Among them four Indian scientists are noted on the race trend.

“The h-index is an author-level metric that attempts to measure both the productivity and citation impact of the publications of a scientist or scholar. The index is based on the set of the scientist’s most cited papers and the number of citations that they have received in other publications. The index can also be applied to the productivity and impact of a scholarly journal as well as a group of scientists, such as a department or university or country” suggested in 2005 by Jorge E. Hirsch, a physicist at UCSD, as a tool for determining theoretical physicists’ relative quality and is sometimes called the Hirsch index or Hirsch number.

“A scholar with an index of h has published h papers each of which has been cited in other papers at least h times. Thus, the h -index reflects both the number of publications and the number of citations

per publication. The index is designed to improve upon simpler measures such as the total number of citations or publications. The index works properly only for comparing scientists working in the same field; citation conventions differ widely among different fields”.

If the function f ordered in decreasing order from the largest value to the lowest one, can compute the h index as follows:

$$h\text{-index}(f) = \max_i \min(f(i), i)$$

$$\text{for Example } f(A) = 10, f(B) = 8, f(C) = 5, f(D) = 4, f(E) = 3 \rightarrow h\text{-index} = 4$$

of which f = Author

A = Article 1

Table 3 represents the ranking of 25 top scored scientists according to their h-index calculation. The top h-index in the table starts with 9. It is an interesting thing to note that the top 35 prolific scientists who have contributed more number of publications i.e. up to 24 in table 2 are not found securing top 25 h-index position. Shah PS, the scientists from UK has been ranked first with 9 h-index score whose 17 publications have been cited by 218 followers. There are about 4 scientists fall in the second h-index rank with the score of 8. At the third rank come 2 scientists, at fourth rank falls 4 scientists, at fifth rank finds 11 scientists and in sixth rank comes 3 scientists. More than 200 citations are achieved by 5 scientists and between 100 and 200 citations are obtained by 6 scientists. The Indian scientists by name and birth are found achieving high h-index but their credits are highly going to UK and USA as they are found working in the research institutes of UK and USA.

Price, in his classic article(1970), defines the so called “Price Index” as “ the proportion of the references that are to the last five years of Literature”. It is hereby unimportant whether or not we use the references of one article, the references of all the articles in all the journals in a certain discipline. Glanzel and Schoepflin (1995) deal with

Table 2. Rank of Prolific Scientists and their year wise Research Publications

Pub. Rank	Row Labels	2010	2011	2012	2013	2014	2015	2016	2017	Grand Total
1.	Harris E, India	5	3	10	12	7	9	10	8	64
2.	Leo YS, USA	1	10	7	7	10	8	7	8	58
3.	Ooi EE, USA	3	10	5	10	3	5	9	7	52
4.	Simmons CP, UK	11	10	5	7	4	6	5	3	51
5.	Guzman MG, Pakistan	12	4	9	2	5	3	3	2	40
6.	Gibbons RV, USA	7	7	6	7	4	6	0	0	37
7.	Weaver SC, USA	2	4	4	6	8	4	8	1	37
8.	Ng LC, USA	3	7	6	4	3	6	3	3	35
9.	Lye DC, UK	1	4	4	5	7	4	4	5	34
10.	Wiwanitkit V, UK	1	1	3	4	6	5	7	7	34
11.	Wills B, UK	6	4	5	3	2	4	4	5	33
12.	Takasaki T, UK	4	4	6	3	4	5	4	3	33
13.	Wilder-Smith A, Netherland	1	3	5	4	6	3	6	4	32
14.	Farrar J, USA	8	7	7	5	1	2	1	0	31
15.	Balmaseda A, USA	3	4	5	8	1	4	4	2	31
16.	Rothman AL, USA	7	7	2	3	4	5	0	3	31
17.	Yoon IK, USA	3	1	1	5	6	9	4	1	30
18.	Thomas SJ, USA	4	5	2	5	6	4	1	3	30
19.	Tomashek KM, USA	4	2	4	3	6	3	6	2	30
20.	Lin YS, USA	1	3	2	8	3	4	4	5	30
21.	Halstead SB, India	4	1	3	4	4	4	8	1	29
22.	Thein TL, India	0	4	0	5	6	5	6	3	29
23.	Diamond MS, India	7	4	6	2	5	2	2	1	29
24.	Cummings DAT, UK	2	4	4	2	5	4	6	1	28
25.	Nogueira ML, UK	1	4	1	5	2	6	6	3	28
26.	Scott TW, UK	2	2	6	7	6	2	3	0	28
27.	Jarman RG, USA	3	3	5	3	5	5	1	2	27
28.	Srikiatkachorn A USA	6	2	1	3	5	5	3	2	27
29.	Hu WB, USA	1	2	4	5	3	2	5	4	26
30.	Nisalak A, USA	3	4	3	3	5	4	3	1	26
31.	Shi PY, USA	5	5	0	3	5	6	1	1	26
32.	Kalayanarooj S, UK	6	4	3	2	3	4	2	1	25
33.	Gubler DJ, UK	5	3	1	5	2	2	6	1	25
34.	AbuBakar S, UK	1	0	0	5	4	7	6	2	25
35.	Yoksan S, USA	4	4	4	2	3	5	2	0	24

Table 3. Ranking of Scientists According to Citation Score and h-index

Rank	h-index	Name of Author	Citation sum within h-core	All citations	All articles
1	9	Shah PS, UK	202	218	17
2	8	Sharma S, China	107	108	13
2	8	Cecilia D, USA	191	209	16
2	8	Govindarajan M, UK	188	207	13
2	8	Jain A, Malaysia	144	165	15
3	7	Garg RK, UK	115	127	13
3	7	Verma R, Germany	156	167	12
4	6	Rao PVL, UK	94	99	8
4	6	Kumar S, SriLanka	77	108	20
4	6	Murugan K, Germany	235	246	12
4	6	Sivakumar R, USA	105	105	6
5	5	Malhotra HS, UK	42	43	8
5	5	Parida MM, UK	65	67	7
5	5	Bachal RV, UK	53	55	8
5	5	Alagarasu K, UK	63	76	13
5	5	Dash PK, UK	73	75	8
5	5	Vijayachari P, UK	39	42	8
5	5	Sharma P, UK	78	79	8
5	5	Misra UK, UK	69	69	8
5	5	Warikoo R, UK	55	58	7
5	5	Kalita J, UK	69	69	8
5	5	Benelli G, USA	196	210	15
6	4	Singh MK, USA	84	84	4
6	4	Chakravarti A, USA	72	73	9
6	4	Wahab N, UK	49	52	6

the Price Index as the portion of references that are not older than 2 years. Therefore we can define more generally the Price Index (PI_d) as the fraction of references that are 0,1,2,... d years old. In Glanzel and Schoepflin(1995). A graph of PI₂(X100) versus the mean reference age is produced.

Price Index – the fraction of references published within five years of the article publication year:

$$PI = N_{\leq 5} / N_{\text{all}}$$

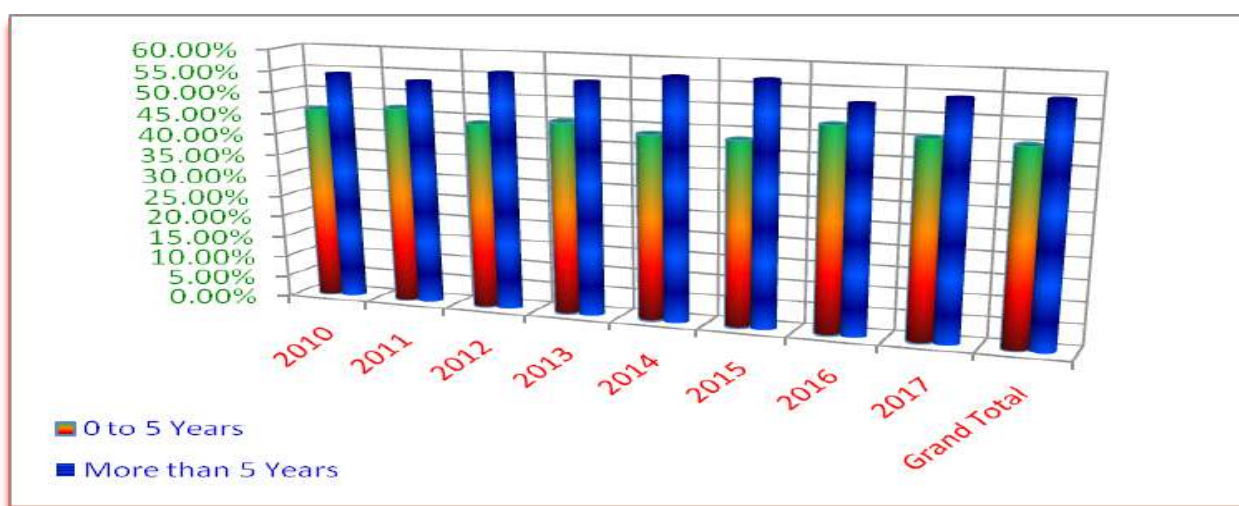
The considerable numbers of references have

been cited by the dengue scientists. It was calculated more than 18,000. The citation analysis according to Price index clearly pictures that publications contributed by the scientists are highly referred and cited the journals that were published more than 5 years time period. It is accounted more than 50 percentages in almost all the years of study.

Table 5 lists the top 25 journals that have been cited by the Dengue scientists for their 6013 publications. The list supports the price Index that more than 5 years publications have made an impact

Table 4 Citation Analysis of Dengue Research publication with Price Index Calculation

Years	0 to 5 Years	More than 5 Years	Total
2010	45.71%	54.29%	100.00%
2011	46.72%	53.28%	100.00%
2012	44.01%	55.99%	100.00%
2013	45.28%	54.72%	100.00%
2014	43.47%	56.53%	100.00%
2015	43.23%	56.77%	100.00%
2016	47.57%	52.43%	100.00%
2017	45.63%	54.37%	100.00%
Grand Total	45.05%	54.95%	100.00%



in keeping the information chain in to recent period. The Nature Journal has received 1948 citations ranks to be top and finds authored by an Indian author. There are 18 journals which have been secured between 200 to 685 citations. The other 6 journals among 25 ranks have got between 100 and 200 Journals.

DISCUSSION AND CONCLUSION

Macro studies are attracted in the overall construction of disciplines and the laws that govern the advancement of science. Micro studies generally portray the structure and development of particular disciplines or schools of research and their interdependencies. Due to increasing number of casualties reported in recent years. The Dengue

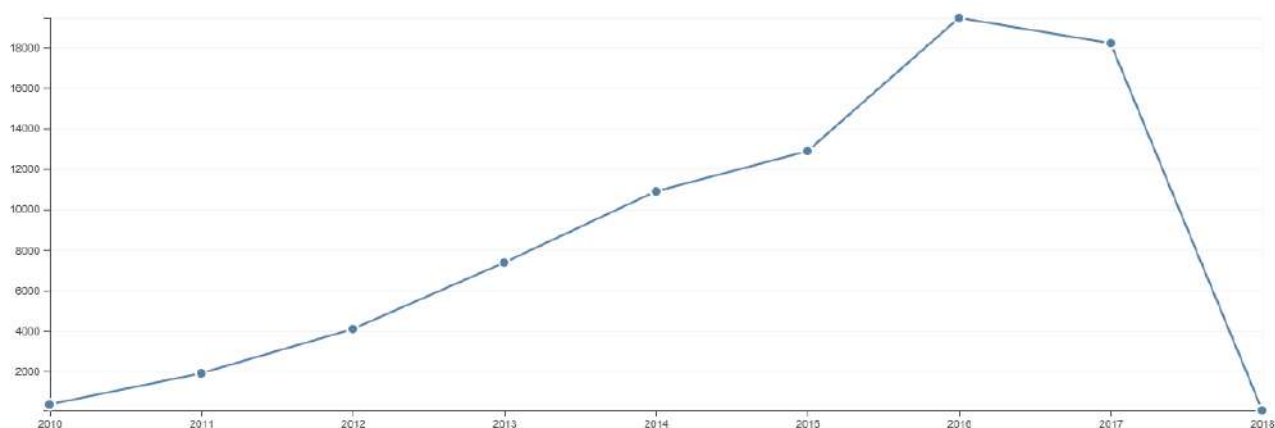
research publication is found in growing trend. The prolific scientists with appreciable publication counts at global level are observed in the study. More over the role of Scientists from India in the field of Dengue research is to be adored. Harris is noted to be top among the prolific authors in the field. The highest h-index secured by the scientists engaged in Dengue research is about 9. The scientists with more number of publications are not found recording the highest h-index score. The quality publications are contributed from UK and India. In addition, the Indian Scientists working in other nations have been in the top list of h-index. The price Index lights on the fact that more than 50 percentages of current scientists cite the journal publications published 5 years back. These sources seem to be roots of Dengue Information tree. The

Table 5. Year wise Citation Analysis of Top 25 Journals

SL No	Name of Journal and Author	Total Citations	Average per Year	2010	2011	2012	2013	2014	2015	2016	2017	Total of 2000-2007
1.	Bhatt, Samir et al., NATURE, v.496 (7446), 2013	1950	390	0	0	0	85	379	432	574	478	1948
2.	Guzman, Maria G et al., NATURE REVIEWS MICROBIOLOGY., Splmnt, 2010	685	85.63	0	19	80	126	112	125	130	93	685
3.	Simmons, Cameron P et al, NEW ENGLAND JOURNAL OF MEDICINE, v.366 (15), 2012	556	92.67	0	0	20	89	127	100	123	97	556
4.	Weaver, Scott C.and Reisen, William K.,ANTIVIRAL RESEARCH, v.85 (2), 2010	449	56.13	14	36	54	70	68	63	80	64	449
5.	Gire, Stephen K et al, SCIENCE, v.345 (6202), 2014	436	109	0	0	0	0	37	170	144	85	436
6.	Walker, T et al, NATURE, v.476 (7361), 2014	398	56.86	0	6	41	66	66	73	86	59	397
7.	Zanluca, Camila et al ,MEMORIAS DO INSTITUTO OSWALDO CRUZ, v.110 (4), 2015	313	104.33	0	0	0	0	0	6	209	98	313
8.	Rothman and Alan L NATURE REVIEWS IMMUNOLOGY, v.11 (8), 2011	270	38.57	0	2	27	50	46	48	56	41	270
9.	Hamel, Rodolphe et al, JOURNAL OF VIROLOGY, v.89 (17), 2015	267	89	0	0	0	0	0	2	136	129	267
10.	Beltramello, Martina et al, CELL HOST & MICROBE, v.8 (3), 2010	266	33.25	1	20	34	40	44	40	46	41	266
11.	Calvet, Guilherme et al, LANCET INFECTIOUS DISEASES, v.16 (6), 2016	249	124.5	0	0	0	0	0	0	126	123	249
12.	Brady, Oliver J et al, PLOS NEGLECTED TROPICAL DISEASES, v.6 (8), 2012	249	41.5	0	0	2	20	43	47	71	66	249
13.	Petersen, Lyle R et al, NEW ENGLAND JOURNAL OF MEDICINE, v.374 (16), 2016	237	118.5	0	0	0	0	0	0	92	145	237
14.	Musso, Didier and Gubler, Duane J. CLINICAL MICROBIOLOGY REVIEWS, v.29 (3), 2016	232	116	0	0	0	0	0	0	78	154	232
15.	Haddow, Andrew D et al, PLOS NEGLECTED TROPICAL DISEASES, v.6 (2), 2012	229	38.17	0	0	0	3	8	10	114	94	229

16.	Medlock, Jolyon M et al, VECTOR-BORNE AND ZOO NOTIC DISEASES, v.12 (6), 2012	213	35.5	0	0	6	26	38	58	49	36	213
17.	La Ruche, G et al, EURO SURVEILLANCE, v.15 (39), 2010	211	26.38	0	17	34	37	38	30	33	22	211
18.	Balsitis, Scott J et al, PLOS PATHOGENS, v.6 (2), 2010	211	26.38	14	23	29	30	27	32	34	22	211
19.	Luis San Martin, Jose et al, AMERICAN JOURNAL OF TROPICAL MEDICINE AND HYGIENE, v.82 (1), 2010	205	25.63	6	19	29	34	32	38	30	17	205
20.	Murphy, Brian R et al, ANNUAL REVIEW OF IMMUNOLOGY, v. 29, 2011	198	28.29	0	10	27	46	38	29	26	22	198
21.	Tisoncik, Jennifer R et al, MICROBIOLOGY AND MOLECULAR BIOLOGY REVIEWS, v.76 (1), 2012	197	32.83	0	0	4	31	43	34	40	45	197
22.	Guzman, Maria G and Harris, Eva, LANCET, v.385 (9966), 2015	194	64.67	0	0	0	0	0	27	94	73	194
23.	Faye, Oumar et al, PLOS NEGLECTED TROPICAL DISEASES, v.8 (1), 2014	174	43.5	0	0	0	0	3	5	104	62	174
24.	Zellweger, Raphael M et al, CELL HOST & MICROBE, v.7 (2), 2010	168	21	9	17	23	25	27	39	12	16	168
25.	Guzman, Maria G et al, NATURE REVIEWS IMMUNOLOGY, v.14 (2), 2014	164	41	0	0	0	0	19	55	42	48	164

Sum of times cited per year



publication given by Bhatt in Nature journal has been highly cited at about 1950 times. It shows its quality and strength among other publications. At the outset the role of Indian Scientists are exemplary in the field of Dengue fever.

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