A BIBLIOMETRIC ANALYSIS OF SCHOLARLY PUBLICATIONS ON DENGUE IN PUBMED DATABASE

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Abstract

Dengue is a re-emerging mosquito-borne infectious disease that seriously affects the population all over the world. However, there is no sufficient information on the bibliometric direction of dengue research output globally. Therefore, the main objective of this study is to provide a bibliometric analysis of research publications on "dengue" from 2013 to 2017 based on PubMed Database. The study analyzed the different aspects such as authorship pattern, degree of collaboration, year-wise distribution, language productivity, publication type and geographical distribution of publications on dengue. The research method used in this study was the bibliometric analytical method where the data were analyzed using the bibliometric tool, BibExcel. It was revealed that the majority of publications have been single-authored and the degree of collaboration has been low. Further, it was remarkable that a majority of the contributed research scholars are from United States (36.40%) and England (23.46%). Out of 6095 research publications, the majority (79.05%) of research output has been published as journal articles. In terms of Language, the most used language was English with 96%. Moreover, it was found that the maximum number of publications of year (28.26%) has been published in 2017.

Keywords: *Bibliometric, Dengue, PubMed, Degree of Collaboration, Bib Excel, Bibliometric Analytical Method.*

Introduction

Dengue is a mosquito-borne viral disease. According to WHO (2011), dengue has been identified as a rapidly growing and emerging serious public health problem globally, with 2.5 million people at risk and 50 million dengue infections occurring annually. It is estimated that each year 390 million people are affected with dengue, of which 96 million manifests clinically. About 500,000 people with severe dengue conditions are requiring hospitalization, and about 2.5% of those affected are facing death(WHO, 2010). Due to this alarming scenario of dengue across the world, the number of scholarly publications on the topic has been increasing. In this context, a bibliometric analysis can help characterize and measure the international research output of dengue. Bibliometric can be defined as the statistical analysis of publications; a method used to quantitatively analyze academic literature and scholarly communications mainly of journal publications and data deposited in major journal-indexing databases such as PubMed (Mota, e Fonseca, Galina, & da Silva, 2017). During the last two decades several bibliometric analyses have been conducted to evaluate the scientific research publications in other infectious diseases such as Chikungunya (er Polania et al., 2015), Zika virus (Delwiche, 2018), Malaria (Munoz ba et al., 2015) and Yellow Fever (Bundschuh et al., 2013). It was observed that there were few bibliometric profiles on dengue covering only the specific regions of the world. It is also worth noting that most of the previous studies have assessed the research output retrieved through other databases such as Science Citation Index, Scopus, and Web of Science. However, there were only few studies done using PubMed data to measure the research output on dengue.

In this study, different bibliometric parameters are used to measure the international contribution to research on dengue, covering PubMed data from 2013-2017. The study aims to analyze the literature on dengue through different aspects such as year wise productivity, authorship pattern, language preferred, publication type, and geographical distribution.

Objectives of the Study

In the scholarly literature on dengue available through PubMed database from 2013 to 2017;

- To examine the authorship pattern of the scholarly contributions
- To determine the degree of research collaboration on dengue
- To identify the research productivity by language
- To find out the year-wise distribution of publication and publication type
- To identify the geographical distribution of publications on dengue

Review of Literature

There are few bibliometric studies measuring the scientific research contribution on "dengue" in the published literature available in major indexing databases; Web of Science (WoS), Science Citation Index (SCI), and Scopus. These studies have been conducted during the time period from 2011 to 2015. Further, it was noticed that no sufficient studies have been retrieved through PubMed database as the source of data.

Kavitha and Kavitha (2014) analyzed literature on "dengue fever" available in the database "PubMed" covering the period of ten years from 2003 to 2012, and revealed that single-author research work was much less within the literature on dengue fever during this period. Further, they reported that the highest number of publications, 2807 (41.03%) were from USA, thus becomes the top country with respect to dengue research output. Ho, Siu and Chuang (2016) carried out a bibliometric analysis of dengue research from 1991-2014. The data was collected through the Science Citation Index for this study. The authors aimed to assess the relationship between the burden of dengue and scientific publications and found that most papers were classified under the topics of tropical medicine, virology, infectious diseases, parasitology or immunology. Further, they revealed that the regional specificity of dengue may also influence the bibliometric profile of dengue research.

In order to measure India's contribution to the research output on dengue fever, Bhardwaj (2014) carried out a bibliometric study using the Scopus database covering data from 1973 to 2012. It was revealed that India has the most prominent records in the world on dengue articles and citations to them.

Zyoud (2016) analyzed the dengue research worldwide and in Arab. The data for this study were retrieved from the Scopus database for the period of 1872-2015. It was concluded that the amount of literature related to dengue research has increased over the last decade. Further, it was revealed that the USA, India, Brazil, Thailand, the UK, and France play leading roles in dengue research while Arab region produced fewer publications related to dengue which is of lower quality than in other countries.

Dwivedi (2017), in her study, attempts to make a 3D bibliometric portfolio of global research output on dengue using the data retrieved from Web of Science covering the period 1989-2015. It was shown that Vietnam has the highest quality while India has the lowest quality of dengue research among the leading countries. Furthermore, Taiwan has a higher consistency in research on Dengue, whereas Germany has a lower consistency.

Mota, et al. (2017) conducted a bibliometric and network analysis to map the scientific scenario related to dengue research worldwide covering the period of 1945 to 2014. The results show a significant increase in publications on dengue during the recent years and highlighted virology as the most frequently researched area, and biochemistry and molecular biology as the most central areas of research in the network. Data were retrieved from the Web of Science Core Collection articles indexed in Science Citation Index Expanded.

Methodology

The Bibliometric analytical method was used as the research method for this study. Data were collected using a standardized search approach through PubMed and using the keyword "dengue", from the articles published during the five years, 2013 to 2017. The data was analyzed using the bibliographic toolbox named Bibexcel, which was developed by Olle

Persson, especially to assist research scholars in analyzing bibliographic data or any data of a textual nature, formatted in a similar manner.

Results and Discussion

Data analysis, findings and discussion are summarized below, in line with the objectives of the study.

Authorship pattern

Authorship pattern of the research output is presented in Figure 1. It is observed that a total number of 44793 authors have contributed to dengue-related publications during the study period.
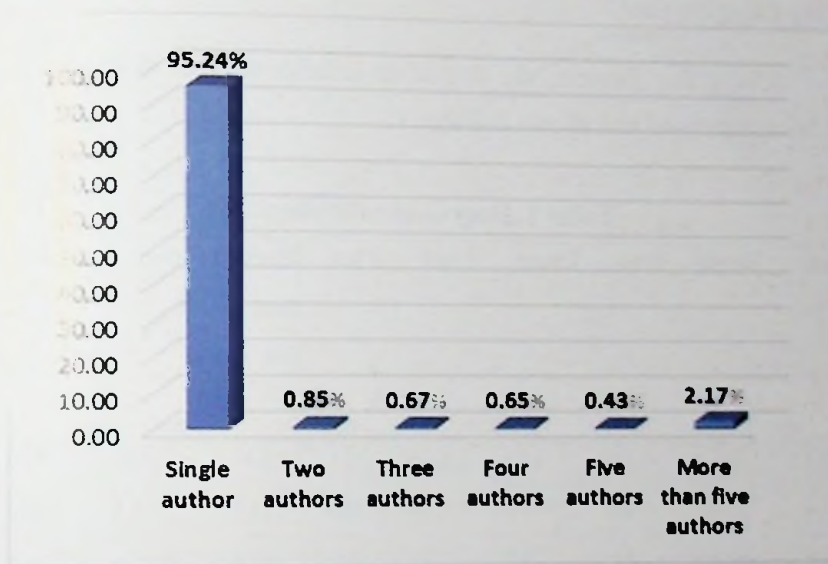
Figure 10: Authorship pattern

As per the Figure 1, 95.24% of the total articles are single-authored, followed by 2.17% contributed by more than five authors, 0.85% contributed by two authors, 0.67% contributed by three authors, and 0.65% contributed by four authors. The least percentage was recorded by five authors with 0.43%. It is significant that the majority (95.24%) of the articles are by single authors. It indicates that the number of multi-authored publications is much less than that of the single-authored articles.

Degree of collaboration

According to Subramanyam (1983), the degree of collaboration is defined as the ratio of the number of collaborative research papers to the total number of research papers in the discipline during a certain period of time. To measure the degree of collaboration, the formula suggested by Subramanyam (1983) is used for this study.

It is expressed as $C = Nm/Nm+Ns$,

Where C is the degree of collaboration in a discipline. Nm is the number of multi-authored research papers in the discipline published during a year. Ns is the number of single-authored papers in the discipline published during the same year.

Using this formula, the degree of collaboration in dengue research has been measured and shown in Table 1.

Table 1: Degree of collaboration

Year	Single	Two	Three	Four	Five	More than five	Total	More than one	Degree of collaboration
2013	2142	179	153	144	101	501	3220	1078	0.33
2014	6544	96	78	70	50	215	7053	509	0.07
2015	9239	67	37	47	17	116	9523	284	0.03
2016	12171	26	21	18	16	86	12338	167	0.01
2017	12563	11	11	11	10	53	12659	96	0.01
Total	42659	379	300	290	194	971	44793	2134	0.05

Table 1 reveals that the value of the degree of collaboration was 0.33 in the year 2013 and 0.01 in the year 2017. It was observed that the degree of collaboration has been decreasing over the years and the highest was recorded in the year 2013 with 0.33. Further, it is evident that there was a

decline in the degree of collaborations during the five year period. Accordingly, the degree of collaboration in research on dengue is 0.05 which clearly indicates its dominance upon individual contribution over the years.

Growth of literature on dengue

The Figure 2 depicts the year wise distribution of literature on dengue.
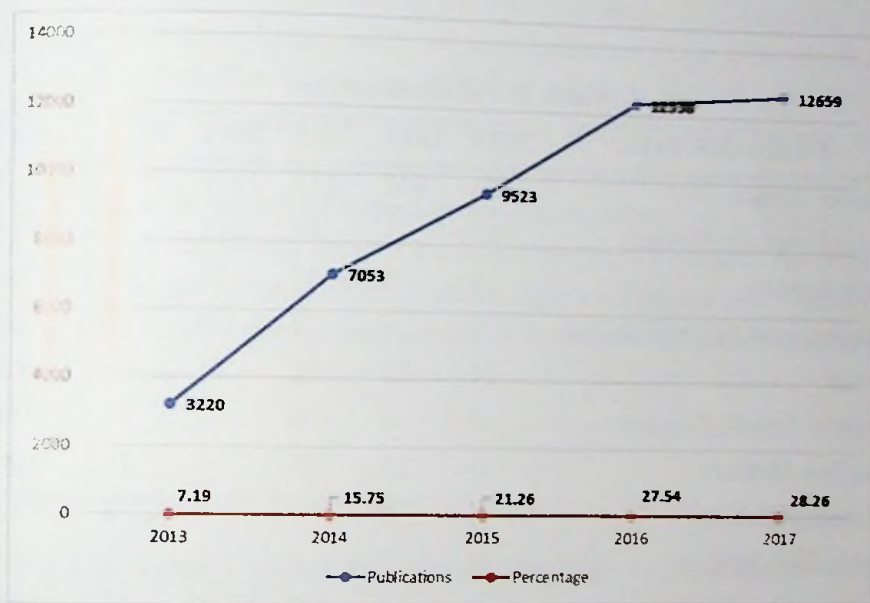
Figure 2: Year wise distribution of literature on dengue

According to Figure 2, Total number of articles published during the period 2013-2017 has been 44793. It was found that the maximum number of publications 12659 (28.26%) were published in 2017, followed by 27.54% (2016), 21.26% (2015), 15.75% (2014) and 7.19% (2013) in respective years. The range of publications published annually during the study period is in between 3220 -12659. This clearly indicates the significant increase in the number of research publications on dengue from 2013 to 2017.

Further, it is observed that 55.80% of entire research output has been published during 2016 to 2017, and the balance (44.20%) was published between 2013 and 2015. It is also evident that there is a drastic increase in the number of research publications published through 2013 (7.19%) to 2017 (28.26%).

Publication-wise distribution of literature on dengue

The Table 2 shows the publication-wise distribution of literature on dengue during the period of this study (2013-2017).

Table 2: Publication type

Publication Type	2013	2014	2015	2016	2017	Total	%
Journal Article	804	842	815	1079	127	4818	79.05
Journal Article; Review	67	75	51	143	8	424	6.96
Case Reports	29	76	47	27	56	235	3.86
Randomized Controlled Trial	0	0	0	0	23	23	0.38
Letter	24	22	16	35	22	119	1.95
Journal Article; Comment	0	0	0	3	12	15	0.25
English Abstract	31	35	25	5	10	106	1.74
Historical Article	4	0	3	3	8	18	0.30
Evaluation Studies	36	7	0	2	8	53	0.87
Comparative Study	9	8	2	3	6	28	0.46
Editorial	4	7	5	12	3	31	0.51
Review	0	3	0	17	0	20	0.33
Letter; Comment	0	0	0	19	0	19	0.31
News	8	7	5	11	0	31	0.51
Published Erratum	0	0	6	14	3	23	0.38
Newspaper Article	0	0	0	1	0	1	0.02
Letter; Review	0	0	0	1	0	1	0.02
Journal Article; Retraction of	0	0	0	1	0	1	0.02

Publication							
Clinical Trial	0	10	0	0	0	10	0.16
Biography	0	1	0	0	0	1	0.02
Autobiography	0	1	0	0	0	1	0.02
Congresses	3	0	0	0	0	3	0.05
Research Support	1	0	0	0	0	1	0.02
Comment	26	61	23	3	0	113	1.85
Total	**1046**	**1155**	**998**	**1379**	**1517**	**6095**	**100**

According to Table 2, total of 6095 scholarly work has been published in different forms during the period of study. It is also clear that the majority of the scholarly work has been published in the form of journal articles (79.05%). The remaining 20.95% of scholarly work is published in different forms of publication types such as journals article review, case reports, letter, abstract, and comments. This implies that journal articles are considered as an important approach for disseminating research output on dengue. Also, noted that despite the low strength-of-evidence, publication types such as case reports, letters, abstract and comments are also considered as important kind of publications for use in disseminating research output on dengue.

Research productivity by language

The Table 3 depicts the research productivity by language of the articles published on dengue.

Table 3: Research productivity by language

Language	2013	2014	2015	2016	2017	Total	Percentage
English	1375	1539	1613	1946	1905	8378	96
Spanish	26	28	37	25	19	135	1.55
Chinese	9	9	9	6	5	38	0.44
French	6	3	15	5	4	33	0.38
Japanese	6	2	7	4	1	20	0.23

Portuguese	6	7	4	0	1	18	0.21
Russian	2	4	1	0	0	7	0.08
German	2	10	1	4	3	20	0.23
Turkey	1	0	0	0	0	1	0.01
Czech	1	0	1	0	0	2	0.02
Polish	0	2	6	4	0	12	0.14
French	1	0	10	0	0	11	0.13
Italian	0	2	1	0	0	3	0.03
Dutch	0	2	2	0	0	4	0.05
Swedish	0	0	0	1	0	1	0.01
Multilingual	4	6	10	12	12	44	0.50
Hungarian	0	0	0	0	1	1	0.01
Total	**1439**	**1614**	**1717**	**2007**	**1951**	**8728**	**100**

Table 3 shows that English (8378, 96%) is the most used language for dengue-related articles found during this study period. The other languages such as Spanish, Chinese, French, Japanese, Portuguese, Russian, and German are used only in 4% of the publications. As shown in Table 3 above, it is evident that most of the publications have been published in English speaking countries and the English is the leading language among research publications on dengue.

Geographical distribution of literature

During the past decades, due to the emergent nature of dengue fever all over the world, the scientific literature has been emerging from almost all the countries of the world. In the present study, all these research publications were categorized according to their country of origin to find out the geographical distribution of research output on dengue during the study period. Table 4 depicts the scattering of research output on dengue all over the world.

Table 4: Country wise distribution of literature

Country	2013	2014	2015	2016	2017	Total	Percentage
United States	548	603	626	694	697	3168	36.40
England	329	320	377	478	538	2042	23.46
Netherlands	138	167	176	209	174	864	9.93
India	88	113	108	168	103	580	6.66
Switzerland	25	49	49	69	96	288	3.31
Germany	51	50	71	63	57	292	3.35
Brazil	34	51	36	58	53	232	2.67
Japan	14	23	28	25	21	111	1.28
Pakistan	6	11	11	11	17	56	0.64
Canada	18	19	6	15	16	74	0.85
France	12	17	16	21	14	80	0.92
Australia	5	10	9	14	13	51	0.59
China	20	24	24	17	12	97	1.11
Colombia	14	6	16	13	11	60	0.69
Egypt	9	9	6	10	11	45	0.52
Singapore	15	4	4	9	10	42	0.48
Austria	13	11	10	9	9	52	0.60
Italy	6	18	14	9	8	55	0.63
Malaysia	11	15	10	4	8	48	0.55
Iran	4	4	0	9	7	24	0.28
Chile	1	0	5	3	6	15	0.17
Denmark	3	0	1	2	6	12	0.14
Mexico	4	6	7	5	6	28	0.32
Philippines	3	3	3	2	6	17	0.20
United Arab Emirates	1	5	1	6	6	19	0.22
Korea (South)	3	4	3	9	5	24	0.28
New Zealand	5	4	4	6	5	24	0.28

Country							
Saudi Arabia	3	1	1	1	5	11	0.13
Spain	2	11	10	8	4	35	0.40
Sweden	6	10	4	15	4	39	0.45
Thailand	21	12	26	2	4	65	0.75
Ireland	0	3	0	1	3	7	0.08
Scotland	0	0	0	4	3	7	0.08
Nigeria	0	0	0	0	2	2	0.02
Argentina	0	1	0	2	1	4	0.05
Bangladesh	2	1	0	0	1	4	0.05
Indonesia	1	1	1	1	1	5	0.06
Papua New Guinea	0	1	0	4	1	6	0.07
Peru	4	3	9	0	1	17	0.20
Puerto Rico	1	0	2	1	1	5	0.06
Sri Lanka	3	3	1	4	1	12	0.14
Turkey	1	1	2	0	1	5	0.06
China (Republic)	0	0	2	3	1	6	0.07
Nepal	0	0	1	0	1	2	0.02
Hungary	0	0	0	1	1	2	0.02
Belgium	2	0	0	0	0	2	0.02
Boca Raton	0	1	0	0	0	1	0.01
Costa Rica	0	1	0	1	0	2	0.02
Czech Republic	1	0	1	0	0	2	0.02
Greece	1	2	2	5	0	10	0.11
Oman	1	0	0	1	0	2	0.02
Ottawa	0	1	0	0	0	1	0.01
Poland	1	4	6	3	0	14	0.16
Portugal	0	1	2	1	0	4	0.05
Romania	1	0	0	0	0	1	0.01
Russia	2	4	1	0	0	7	0.08

(Federation)							
Slovakia	1	2	0	3	0	6	0.07
Uganda	2	0	0	1	0	3	0.03
Venezuela	2	2	1	0	0	5	0.06
Jamaica	0	0	3	0	0	3	0.03
Ghana	0	0	0	1	0	1	0.01
Jamaica	0	0	0	2	0	2	0.02
South Africa	0	0	0	1	0	1	0.01
Washington	0	0	0	3	0	3	0.03
Total	1438	1612	1696	2007	1951	8704	100

Table 4 shows the country-wise distribution of literature on dengue during the study period. As proven by Ho, Siu and Chuang (2016), Kavitha and Kavitha (2014) and Zyoud (2016) in their bibliometric studies, United States of America has lead in publishing the literature on dengue. As shown in Table, USA has the highest percentage, 36.40% of published literature. England the next highest percentage, 23.46% of the total publications, followed by Netherland (9.93%) and India (6.66%). The total percentage of literature on Dengue published by above four countries is nearly 76.45%. The remaining 24% of publications are from all 61 countries. This also reflects the leading role that the USA, England and Netherland play in the research related to dengue.

Conclusion

The important findings of the study are that, the number of dengue-related publications has considerably increased over the last five years, and multiple-author contribution was low towards the dengue research output during the study period. This has been further tested with the degree of collaboration and it was found to be decreased over the study period. Moreover, it was evident that the USA and England play a leading role in the global research related to dengue. It was also revealed that the English was the widely used language for scholarly work on dengue. It was obvious that journal articles are considered as an important mode of disseminating

research output on dengue. The overall results of this study provide a clear direction for future research scholars who are interested in doing research on dengue. Especially researchers in non-English speaking countries where there is a severe risk of dengue epidemic need to take the lead and encourage research in the field of infectious diseases as it is an important public health problem.

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