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# ANALYSIS OF LITERATURE ON DENGUE: A BIBLIOMETRIC STUDY

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# ANALYSIS OF LITERATURE ON DENGUE: A BIBLIOMETRIC STUDY

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**Abstract:** This paper analysis a literature of Dengue using bibliometric techniques, the records published during the year 2008 to 2017 in the MEDLINE data, which are covered by Pubmed. On the whole, it is observed that from 2008 onwards there is a gradual increase in research on Dengue. It was examined that 41.4% data are journal articles. It was also studied that United States is the major producer, followed by England and Netherlands in the area of Dengue literature. The literary production is observed in almost all the major countries covered.  India has been ranked in the 4th position.  94.8% of the research output covered in English language and followed by Spanish, Portuguese and French. The Relative Growth Rate (RGR) has been decreased from 0.75 to 0.14 and the Doubling Time (Dt) increases from 0.92 to 5.02 in the study period. Indian efforts in Dengue research are greater in three years out of ten years of study, since the Activity Index is higher than 100, in those three years, which reflects higher activity of Dengue research than the World's average.

Key Words: DENGUE: MEDLINE: Relative Growth Rate: Doubling Time

## 1. INTRODUCTION:

Bibliometrics is the study dealing with the quantification of written communication, which helps in the measurement of the published knowledge. Bibliometric analysis throws light on the pattern of growth of literature, inter-relationship among different branches of knowledge, productivity, authorship pattern, and degree of collaboration, pattern of collection building, and their use. Gradually bibliometric studies are attaining the status of inter-disciplinary in nature.[1] Bibliometric techniques are now being vigorously pursued and with the result, it has been found that one-fourth of all the articles published in Library and Information Science Periodicals are on bibliometrics and its related topics.[2]

In this paper an effort has been prepared to identify the Growth rate of literature in the field of Dengue and also to compare the literature of India's performance with the world's performance.

## 2. REVIEW OF LITERATURE

Bibliometrics are applicable in many aspects of information storage and retrieval. Information science is an interdisciplinary field that encompasses the study of the production, organization, storage, retrieval, dissemination and use of information. There is numerous papers represents one aspect of the general growth of scientific communication. Ramesh Babu, and Ramakrishnan, (2007) studied on the trends in the Growth of Literature on Hepatitis (1984-2003) by using bibliometric indicators i.e Relative Growth Rate (RGR) and Doubling Time (Dt).[3]  The same techniques are also used by Ramakrishnan  and Thavamani in their studies on Hepatitis-C and Leptospiroisis. [4 & 5] Ramakrishnan, Ravisankar and Thavamani studies on Swine Flu.[6]

Studies are also conducted in large numbers by analyzing Activity Index for India has been calculated for different years to see how India's research activity changed during different years using the formula. First suggested by Frame[7] and used among others by Schubert and Braun[8], Price[9,] Karki and Garg[10], Nagpaul[11], Bharu Dutt et al [12] and Garg and Padhi[13].

## 3. DENGUE

Dengue fever is a mosquito-borne tropical disease caused by the dengue virus. Symptoms typically begin three to fourteen days after infection. This may include a high fever, headache, vomiting, muscle and joint pains, and a characteristic skin rash. Recovery generally takes two to seven days. A vaccine for dengue fever has been approved and is commercially available in a number of countries. Other methods of prevention are by reducing mosquito habitat and limiting exposure to bites. Dengue has become a global problem since the Second World War and is common in more than 110 countries. Each year between 50 and 528 million people are infected and approximately 10,000 to 20,000 die.[14]

## 4. OBJECTIVES

The Objectives of this paper are:

1. To identify the Quantum of Literature published in the field of Dengue.

2. To identify the publication types covered in the field of Dengue.

3. To examine the languages covered in the field of Dengue.

4. To identify the country of publication covered in the field of Dengue.

5. To identify the Growth Rate in the field of Dengue.

6. To compare the literature of India's performance with the world's performance.

**5. METHODOLOGY**

The records published during the year 2008 to 2017 in the area of Dengue literature in the "MEDLINE data which are covered in the Pubmed (www.pubmed.com) which is a free resource that is developed and maintained by the National Center for Biotechnology Information (NCBI), at the U.S. National Library of Medicine (NLM), located at the National Institutes of Health (NIH)" was searched and details like author, title, publication type, language, year; address of the contributors, country of publications, source etc. were collected.

The records in the area of Dengue literature were converted into FoxPro and loaded in SPSS. The keyword 'Dengue' has been used for retrieving the number of records available in the MEDLINE database.

The data thus retrieved from the database on the literature of 'Dengue' for the period 2008 - 2017 has been examined by using bibliometric techniques such as **Relative Growth Rate (RGR)[15 & 16] and Doubling Time (Dt)[17]** to identify the growth of the literature. **Activity Index[18 to 19]** used to show how India's research activity changed during different years compare to world.

This study is confined to a period from 2008 to 2017 using MEDLINE data which covered in Pubmed only.

**6. ANALYSIS AND INTERPRETATION OF DATA**

The literary production of 'Dengue' for the period 2008-2017 has been examined by using bibliometric techniques such as Relative Growth Rate (RGR), Doubling Time (Dt) and the Activity Index.

**6.1 QUANTUM OF DENGUE RESEARCH PRODUCTIVITY**

The research output on literature of Dengue in the database is presented in Table-1. It is noticed that total of 11826 records on literature of Dengue are covered for a period of ten years from 2008 to 2017. It is also noticed that the maximum number of records (1810) was published during year 2016, followed by 1540 in 2017 and 1520 in 2015. On the whole, it is observed that from the year 2008 onwards there is a gradual increase of Dengue research productivity every year except the year 2017 i.e. 1540 records at the time of saved the data from the database, but it may be expected, more data may be included in future. (Fig.1)

**Table 1**
**Quantum of Literature published in Dengue**

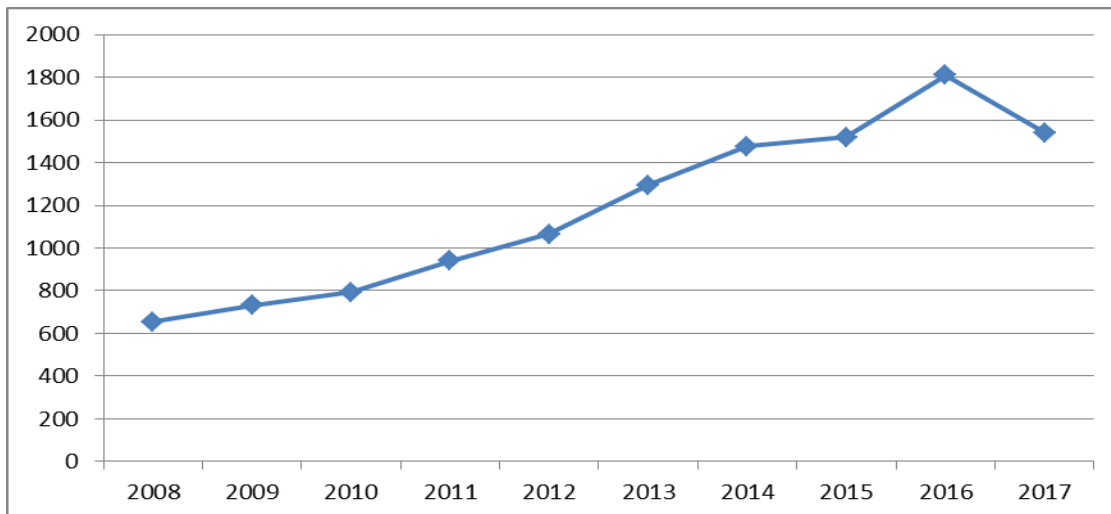| S.No. | Year | Frequency | % | Cumulative % |
|-------|------|-----------|-----|--------------|
| 1. | 2008 | 654 | 5.5 | 5.5 |
| 2. | 2009 | 732 | 6.2 | 11.7 |
| 3. | 2010 | 794 | 6.7 | 18.4 |
| 4. | 2011 | 940 | 7.9 | 26.4 |
| 5. | 2012 | 1065 | 9 | 35.4 |
| 6. | 2013 | 1296 | 11 | 46.3 |
| 7. | 2014 | 1475 | 12.5 | 58.8 |
| 8. | 2015 | 1520 | 12.9 | 71.7 |
| 9. | 2016 | 1810 | 15.3 | 87 |
| 10. | 2017 | 1540 | 13 | 100 |
| **Total** | | **11826** | **100** | |

**Figure 1 Year-wise Productivity of Dengue Research**

## 6.2 PUBLICATION TYPES DISTRIBUTION OF DENGUE RESEARCH

Table 2 reveals the distribution of the 'Dengue' research output according to various publication types of MEDLINE. It was found that Journal Article (41.4%), Research Support, Non-U.S. Gov't (33.81%), Review (10.69%), Letter (3.61%), Research Support, U.S. Gov't Non-P.H.S. (2.86%), Research Support, N.I.H., Extramural(2.65%), Research Support, U.S. Gov't P.H.S. (0.85%), Editorial (0.77), News (0.58), Research Support, N.I.H., Intramural (0.41%), Published Erratum (0.32%), Validation Studies (0.3%), Randomized Controlled Trial (0.25%), Observational Study (0.23%), Comment (0.2%), Introductory Journal Article (0.18%), Multicenter Study (0.15%), English Abstract (0.14%), Case Reports (0.13%), Congresses (0.08%), Video-Audio Media (0.06%), Retraction of Publication (0.05%), Meta-Analysis (0.04%), Book (0.03%), Retracted Publication (0.03%), Book Chapter (0.03%), Interview (0.03%), Portraits (0.03%), Historical Article (0.02%), Practice Guideline (0.02%), Bibliography

(0.01%),  Lectures (0.01%), Newspaper Article       (0.01%),       Personal    Narratives

(0.01%) and Technical Report (0.01%). (Fig.2)

**Table 2**
**Publication Types of Dengue Research**

| S.N | Pub. Type | No. of records | % | Cumulative % |
|---|---|---|---|---|
| 1. | Journal Article | 4896 | 41.4 | 41.4 |
| 2. | Research Support, Non-U.S. Gov't | 3998 | 33.81 | 75.21 |
| 3. | Review | 1264 | 10.69 | 85.9 |
| 4. | Letter | 427 | 3.61 | 89.51 |
| 5. | Research Support, U.S. Gov't Non-P.H.S. | 338 | 2.86 | 92.37 |
| 6. | Research Support, N.I.H., Extramural | 313 | 2.65 | 95.02 |
| 7. | Research Support, U.S. Gov't P.H.S. | 100 | 0.85 | 95.87 |
| 8. | Editorial | 91 | 0.77 | 96.64 |
| 9. | News | 68 | 0.58 | 97.22 |
| 10. | Research Support, N.I.H., Intramural | 49 | 0.41 | 97.63 |
| 11. | Published Erratum | 38 | 0.32 | 97.95 |
| 12. | Validation Studies | 36 | 0.3 | 98.25 |
| 13. | Randomized Controlled Trial | 31 | 0.25 | 98.5 |
| 14. | Observational Study | 27 | 0.23 | 98.73 |
| 15. | Comment | 24 | 0.2 | 98.93 |
| 16. | Introductory Journal Article | 23 | 0.18 | 99.11 |
| 17. | Multicenter Study | 18 | 0.15 | 99.26 |
| 18. | English Abstract | 16 | 0.14 | 99.4 |
| 19. | Case Reports | 15 | 0.13 | 99.53 |
| 20. | Congresses | 10 | 0.08 | 99.61 |
| 21. | Video-Audio Media | 7 | 0.06 | 99.67 |
| 22. | Retraction of Publication | 6 | 0.05 | 99.72 |
| 23. | Meta-Analysis | 5 | 0.04 | 99.76 |
| 24. | Book | 4 | 0.03 | 99.79 |
| 25. | Retracted Publication | 4 | 0.03 | 99.82 |
| 26. | Book Chapter | 3 | 0.03 | 99.85 |
| 27. | Interview | 3 | 0.03 | 99.88 |
| 28. | Portraits | 3 | 0.03 | 99.91 |
| 29. | Historical Article | 2 | 0.02 | 99.93 |
| 30. | Practice Guideline | 2 | 0.02 | 99.95 |
| 31. | Bibliography | 1 | 0.01 | 99.96 |
| 32. | Lectures | 1 | 0.01 | 99.97 |
| 33. | Newspaper Article | 1 | 0.01 | 99.98 |
| 34. | Personal Narratives | 1 | 0.01 | 99.99 |
| 35. | Technical Report | 1 | 0.01 | 100 |

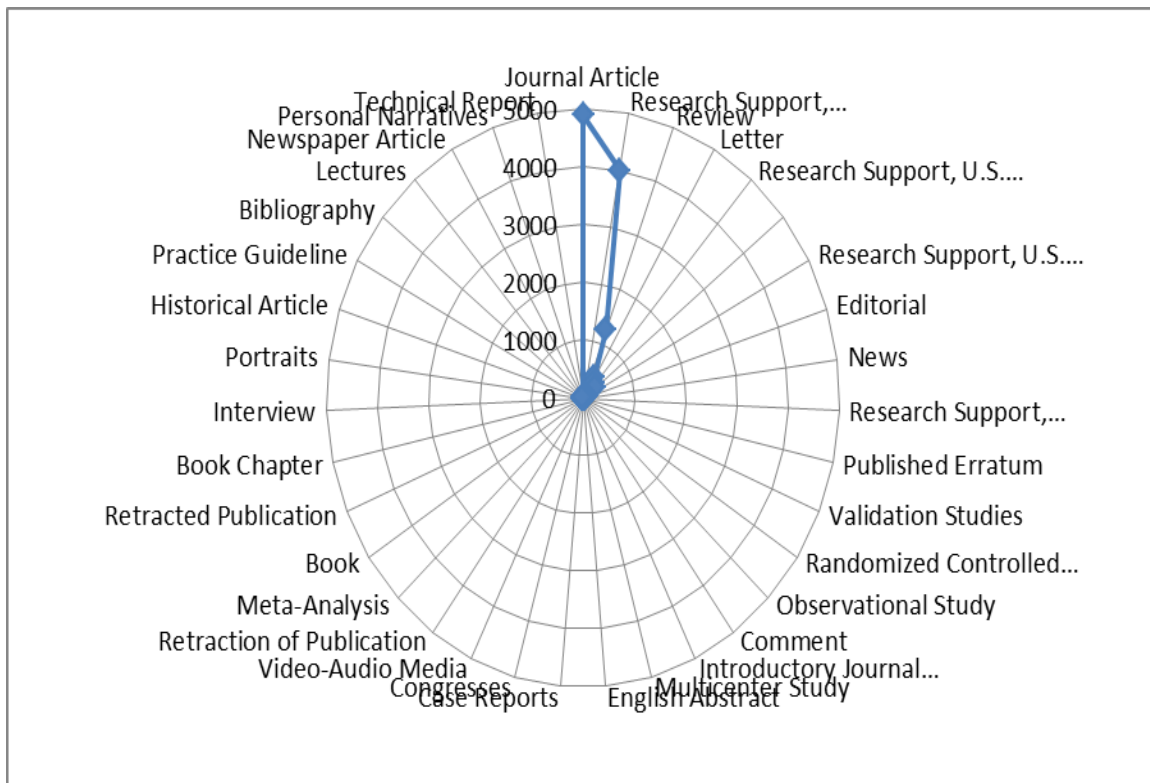| Total | 11826 | 100.00 | |
|---|---|---|---|



**Figure 2 Publication Types of Dengue Research**

## 6.3 QUANTUM OF DENGUE RESEARCH OUTPUT ACCORDING TO COUNTRY

The country-wise production of the 'Dengue' records was presented in Table 3. It is observed that United States is the major producer, followed by England and Netherlands. The literary production is observed in almost all the major countries covered. Indian contributions of 660 records have been ranked in the 4th position with 5.57% of total output.

**Table – 3:  Countries Vs Records**

| S.No. | Country | No. of records | % | Cumulative % |
|---|---|---|---|---|
| 1. | United States | 4496 | 38.02 | 38.02 |
| 2. | England | 2602 | 22 | 60.02 |
| 3. | Netherlands | 1124 | 9.5 | 69.52 |
| 4. | India | 660 | 5.57 | 75.09 |
| 5. | Brazil | 420 | 3.55 | 78.64 |
| 6. | Germany | 341 | 2.88 | 81.52 |
| 7. | Switzerland | 319 | 2.7 | 84.22 |
| 8. | China | 198 | 1.67 | 85.89 |
| 9. | Thailand | 140 | 1.18 | 87.07 |
| 10. | Japan | 134 | 1.13 | 88.2 |
| 11. | France | 133 | 1.12 | 89.32 |
| 12. | Canada | 92 | 0.78 | 90.1 |
| 13. | Colombia | 88 | 0.74 | 90.84 |
| 14. | Italy | 86 | 0.73 | 91.57 |
| 15. | Malaysia | 80 | 0.68 | 92.25 |
| 16. | Austria | 76 | 0.64 | 92.89 |
| 17. | Pakistan | 73 | 0.62 | 93.51 |
| 18. | Australia | 69 | 0.58 | 94.09 |
| 19. | Egypt | 64 | 0.54 | 94.63 |
| 20. | Sweden | 63 | 0.53 | 95.16 |
| 21. | Singapore | 60 | 0.51 | 95.67 |
| 22. | Spain | 41 | 0.35 | 96.02 |
| 23. | Mexico | 35 | 0.3 | 96.32 |
| 24. | Korea (South) | 30 | 0.25 | 96.57 |
| 25. | Peru | 27 | 0.23 | 96.8 |
| 26. | New Zealand | 26 | 0.22 | 97.02 |
| 27. | Iran | 25 | 0.21 | 97.23 |
| 28. | Cuba | 22 | 0.19 | 97.42 |
| 29. | Poland | 22 | 0.19 | 97.61 |
| 30. | Sri Lanka | 21 | 0.18 | 97.79 |
| 31. | Philippines | 19 | 0.16 | 97.95 |
| 32. | Chile | 17 | 0.14 | 98.09 |
| 33. | Denmark | 15 | 0.13 | 98.22 |

| | | | |
|---|---|---|---|
| 34. | Saudi Arabia | 14 | 0.12 | 98.34 |
| 35. | Greece | 12 | 0.1 | 98.44 |
| 36. | Jamaica | 12 | 0.1 | 98.54 |
| 37. | Argentina | 11 | 0.09 | 98.63 |
| 38. | Russia (Federation) | 11 | 0.09 | 98.72 |
| 39. | Turkey | 11 | 0.09 | 98.81 |
| 40. | Indonesia | 10 | 0.08 | 98.89 |
| 41. | Ireland | 10 | 0.08 | 98.97 |
| 42. | United Arab Emirates | 10 | 0.08 | 99.05 |
| 43. | Bangladesh | 9 | 0.08 | 99.13 |
| 44. | China (Republic : 1949- ) | 8 | 0.07 | 99.2 |
| 45. | Nepal | 8 | 0.07 | 99.27 |
| 46. | Scotland | 8 | 0.07 | 99.34 |
| 47. | Slovakia | 8 | 0.07 | 99.41 |
| 48. | Venezuela | 8 | 0.07 | 99.48 |
| 49. | Oman | 7 | 0.06 | 99.54 |
| 50. | Puerto Rico | 7 | 0.06 | 99.6 |
| 51. | Belgium | 5 | 0.04 | 99.64 |
| 52. | Norway | 5 | 0.04 | 99.68 |
| 53. | Costa Rica | 4 | 0.03 | 99.71 |
| 54. | Portugal | 4 | 0.03 | 99.74 |
| 55. | Papua New Guinea | 3 | 0.03 | 99.77 |
| 56. | Uganda | 3 | 0.03 | 99.8 |
| 57. | Washington (DC) | 3 | 0.03 | 99.83 |
| 58. | Czech Republic | 2 | 0.02 | 99.85 |
| 59. | Hungary | 2 | 0.02 | 99.87 |
| 60. | Israel | 2 | 0.02 | 99.89 |
| 61. | Boca Raton (FL) | 1 | 0.01 | 99.9 |
| 62. | Croatia | 1 | 0.01 | 99.91 |
| 63. | Geneva | 1 | 0.01 | 99.92 |
| 64. | Ghana | 1 | 0.01 | 99.93 |
| 65. | Kenya | 1 | 0.01 | 99.94 |
| 66. | Nigeria | 1 | 0.01 | 99.95 |
| 67. | Ottawa (ON) | 1 | 0.01 | 99.96 |
| 68. | Romania | 1 | 0.01 | 99.97 |
| 69. | South Africa | 1 | 0.01 | 99.98 |

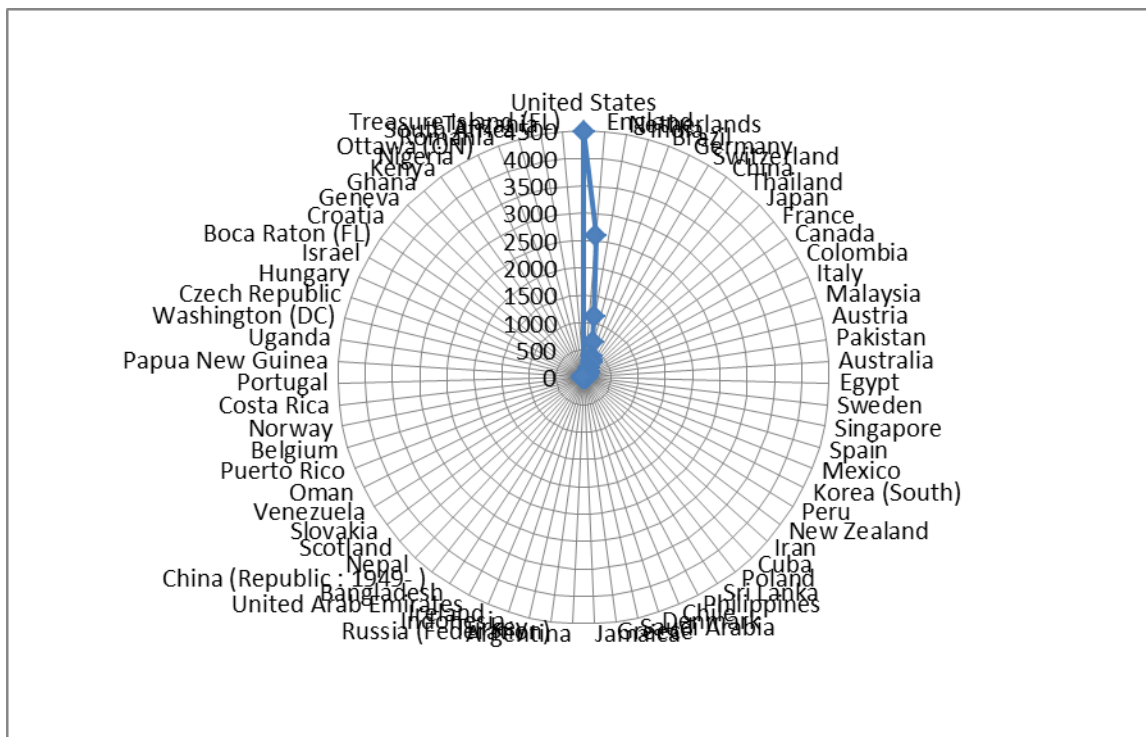| | | | | |
|---|---|---|---|---|
| 70. | Tanzania | 1 | 0.01 | 99.99 |
| 71. | Treasure Island (FL) | 1 | 0.01 | 100 |
| | **Total** | **11826** | **100.00** | |



**Figure-3: Countries Vs Records**

## 6.4 DISTRIBUTION OF RESEARCH PRODUCTION BY LANGUAGE

The distribution of 'Dengue' literature by language is shown in Table 4. The scholarly communication is effected through English language in almost all the countries irrespective of their native language of the country. This phenomenon is not an exception to the subject of 'Dengue' which published about 94.8% of the research output in English. This is followed by Spanish (1.94%) as second position, Portuguese (0.85%) as third position and French (0.82%) as fourth position. Therefore from the above analysis,

it is concluded that English language is dominating in the scholarly communication of 'Dengue' research.

**Table-4 Languages Vs Records**

| S.NO. | Languages | No. of records | % | Cumulative % |
|---|---|---|---|---|
| 1. | English | 11211 | 94.80 | 94.8 |
| 2. | Spanish | 229 | 1.94 | 96.74 |
| 3. | Portuguese | 101 | 0.85 | 97.59 |
| 4. | French | 97 | 0.82 | 98.41 |
| 5. | Chinese | 79 | 0.68 | 99.09 |
| 6. | German | 30 | 0.25 | 99.34 |
| 7. | Japanese | 25 | 0.21 | 99.55 |
| 8. | Polish | 11 | 0.09 | 99.64 |
| 9. | Russian | 11 | 0.09 | 99.73 |
| 10. | Dutch | 10 | 0.08 | 99.81 |
| 11. | Trukese | 5 | 0.04 | 99.85 |
| 12. | Italian | 4 | 0.03 | 99.88 |
| 13. | Norwegian | 4 | 0.03 | 99.91 |
| 14. | Czech | 2 | 0.02 | 99.93 |
| 15. | Danish | 2 | 0.02 | 99.95 |
| 16. | Hebrew | 2 | 0.02 | 99.97 |
| 17. | Croatian | 1 | 0.01 | 99.98 |
| 18. | Hungarian | 1 | 0.01 | 99.99 |
| 19. | Swedish | 1 | 0.01 | 100 |
| **Total** | | **11826** | **100.00** | |
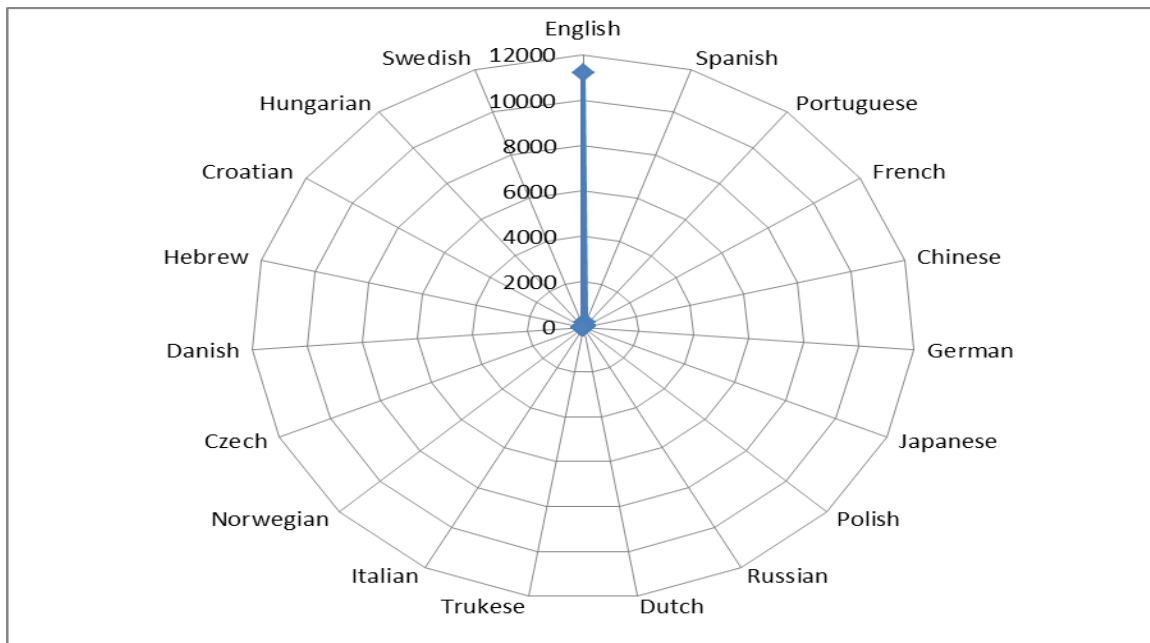
**Figure-4: Languages Vs Records**

## 6.5 RGR and Dt for 'Dengue' Research Output by year wise

It is seen from Table-5 that there is decrease in RGR by year wise. The Relative Growth Rate (RGR) has been decreased from 2009 (0.75) to 2017 (0.14) in the span of ten years. Thus the RGR by year wise revealed a decreased trend (Figure-5). The Dt increases from 0.92 in the year 2009 to 5.02 in the year 2017. The Doubling Time (Dt) has shown increased when calculated by year wise. Normally the doubling time always is in increasing trend. (Figure-6).

**Table – 5 RGR and Dt for 'Dengue' Research Output**

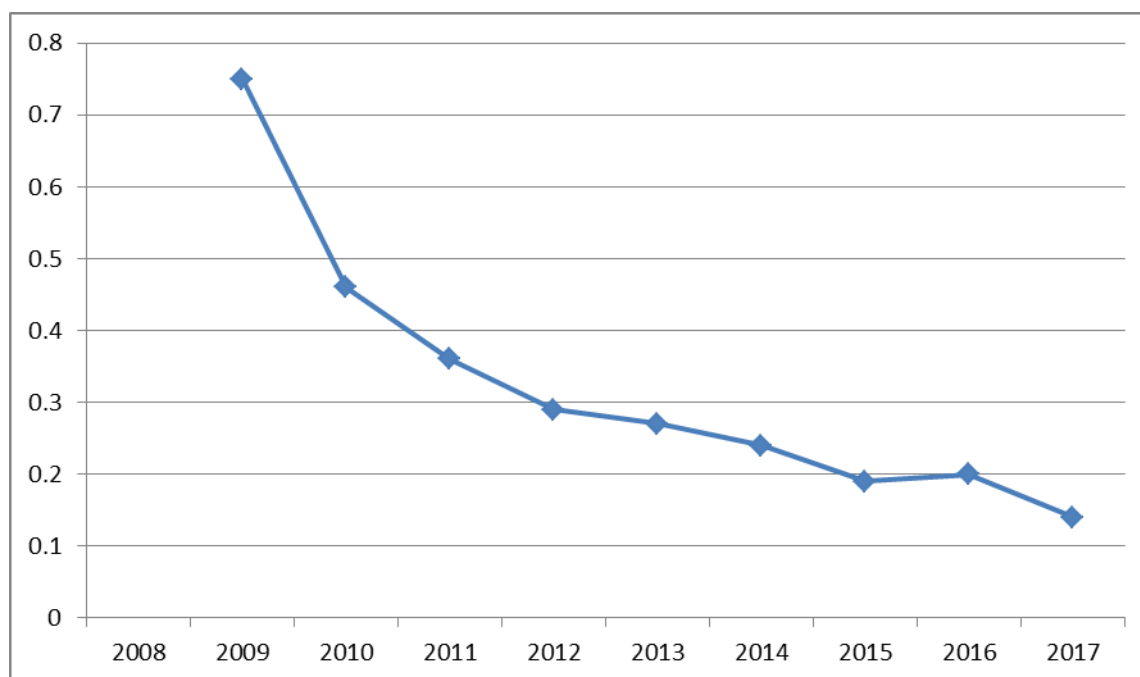| Year | Quantum of Output | Cumulative Total of Output | W₁ | W₂ | 1 - 2$\overline{R}^{(aa^{-1} year^{-1})}$ RGR | Dt(a) |
|------|------|------|------|------|------|------|
| 2008 | 654 | 654 | | 6.48 | | |
| 2009 | 732 | 1386 | 6.48 | 7.23 | 0.75 | 0.92 |
| 2010 | 794 | 2180 | 7.23 | 7.69 | 0.46 | 1.52 |
| 2011 | 940 | 3120 | 7.69 | 8.05 | 0.36 | 1.95 |
| 2012 | 1065 | 4185 | 8.05 | 8.34 | 0.29 | 2.40 |
| 2013 | 1296 | 5481 | 8.34 | 8.61 | 0.27 | 2.58 |
| 2014 | 1475 | 6956 | 8.61 | 8.85 | 0.24 | 2.92 |
| 2015 | 1520 | 8476 | 8.85 | 9.04 | 0.19 | 3.55 |
| 2016 | 1810 | 10286 | 9.04 | 9.24 | 0.20 | 3.49 |
| 2017 | 1540 | 11826 | 9.24 | 9.38 | 0.14 | 5.02 |



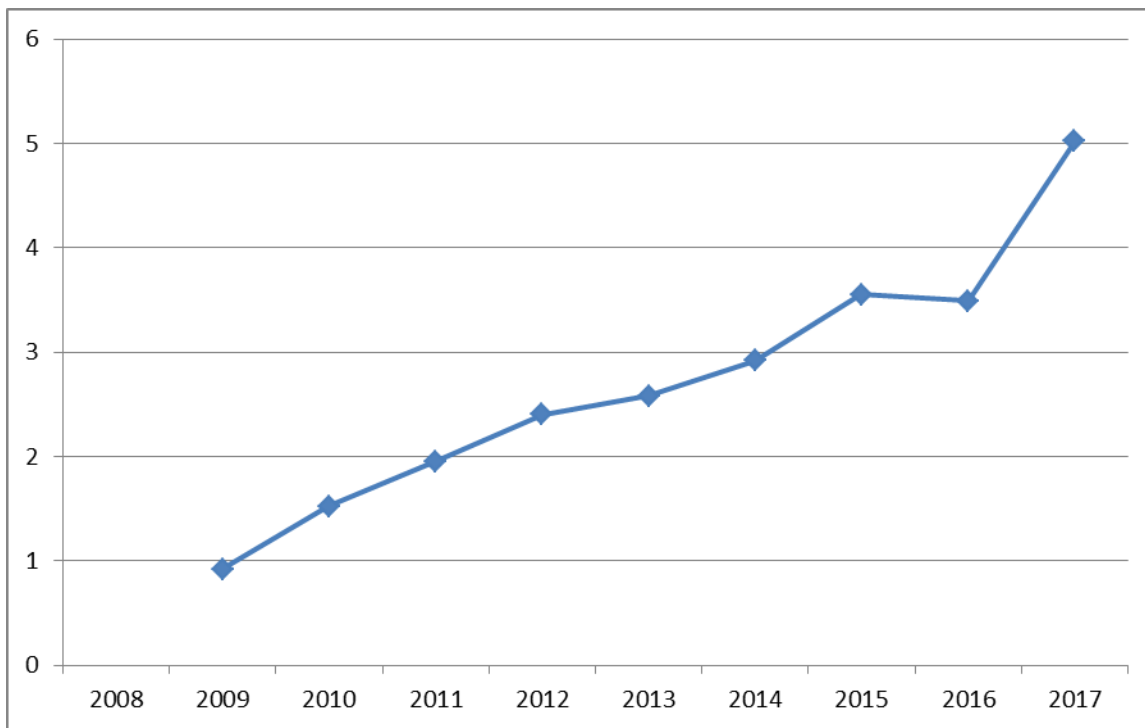**Figure-5: Relative Growth Rate for Research Output Vs. Year**

**Figure-6: Doubling time for Research output Vs. Year**

## 6.6    ACTIVITY INDEX

To compare India's research performance with the world's research output, Activity Index (AI) suggested by Price[35] and elaborated by Karki and Garg[17] has been used.  In Table 6, Activity Index for India has been calculated to examine the India's research performance changes over different years.  The data displays that Indian efforts in Dengue research are greater in three years out of ten years studied. In those three years the Activity Index are higher than 100. It shows that higher activity of Dengue research than the World's average. In the remaining seven years the Activity Index are less than 100, shows the lower activity of Dengue research than the world average.  The Activity Index (AI) for India was very high in the year 2016 (147.50).

The graph (Figure 7) displays that the world output on Dengue grew almost uniform rate by year after year and it was very high in the year 2016.  In the case of

Indian output (Figure 8) the growth reaches in inconsistent manner and reaches very high in the year 2016.

**Table 6: World and Indian output in Dengue**

| Year | World Output | Indian Output | Activity Index |
|------|------|------|------|
| 2008 | 654 | 28 | 76.71 |
| 2009 | 732 | 25 | 61.20 |
| 2010 | 794 | 39 | 88.01 |
| 2011 | 940 | 52 | 99.12 |
| 2012 | 1065 | 48 | 80.76 |
| 2013 | 1296 | 70 | 96.78 |
| 2014 | 1475 | 100 | 121.48 |
| 2015 | 1520 | 94 | 110.81 |
| 2016 | 1810 | 149 | 147.50 |
| 2017 | 1540 | 55 | 63.99 |
| **Total** | **11826** | **660 (5.58)\*** | **100.00\*\*** |

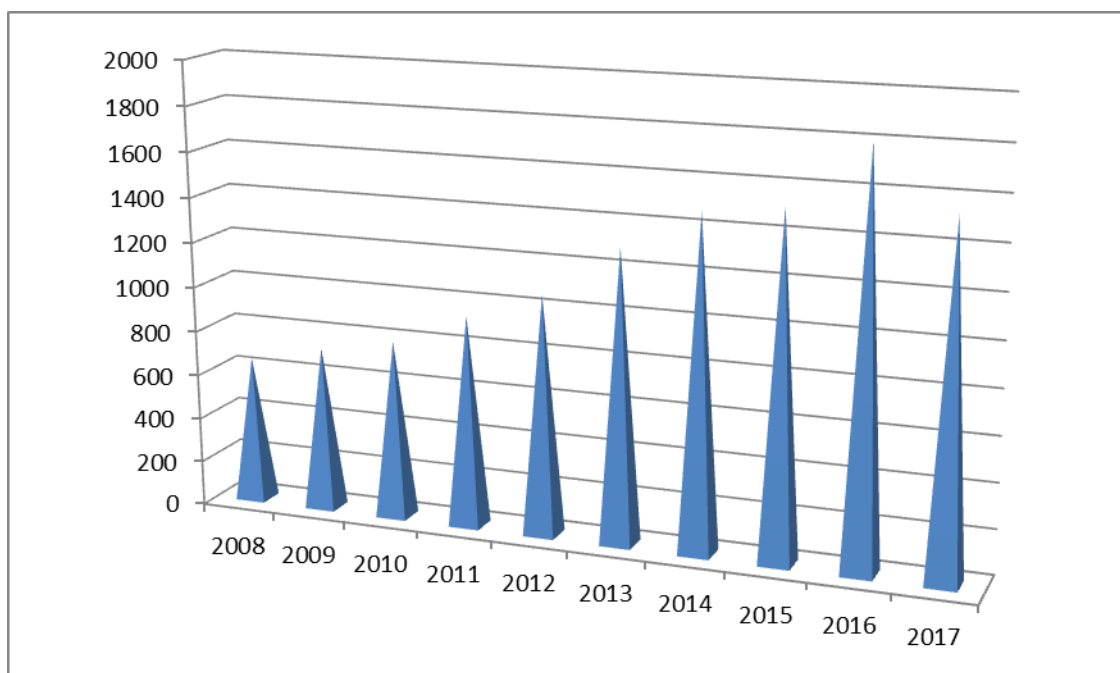* Percentage of world output ** Average of Activity Index
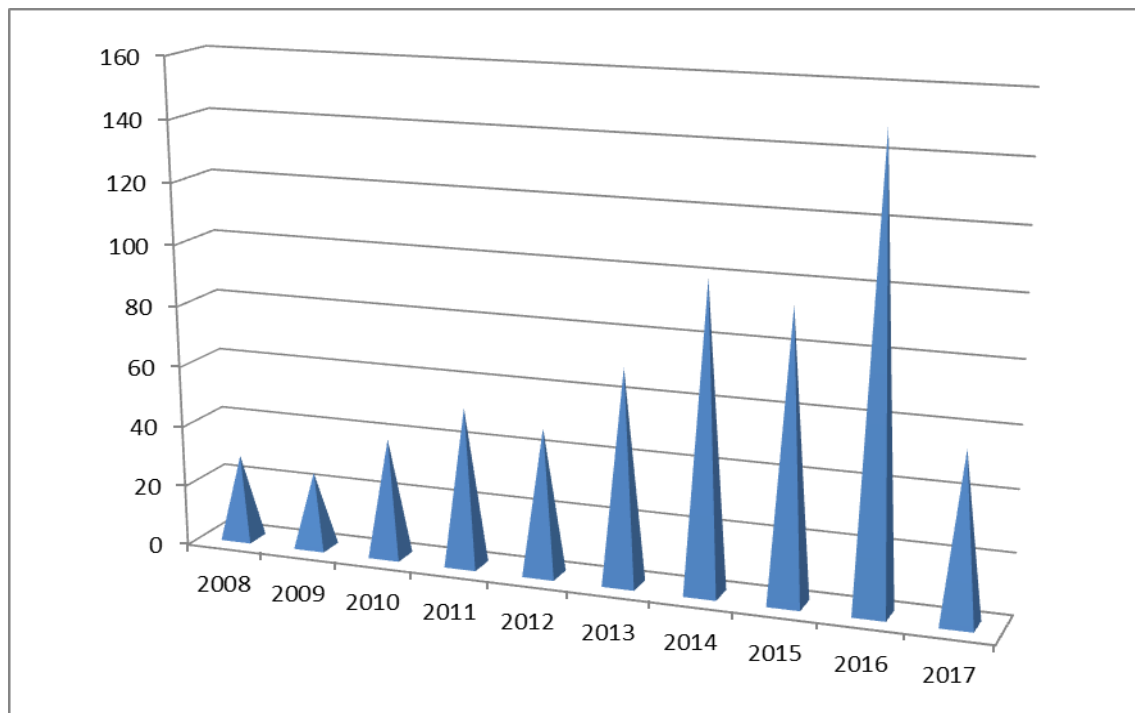


**Figure 7 World Output of Dengue research**

**Figure 8 Indian Output of Dengue research**

## 7. CONCLUSION:

The results display that Dengue literature is growing year after year. It also displays that maximum number of records concealed by journal articles in the field of Dengue literature. United States records on Dengue literature covered maximum numbers followed by England and Netherlands. India has been ranked in the 4th position. Indian efforts in Dengue research are greater in three years out of ten years of study.

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