

Bibliometric Analysis of Literature on Ebola (1995 – 2014)

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Abstract

The aim of this study is to present the bibliometric analysis of the literature in the field of Ebola as indexed in the MEDLINE database for the period of 1995-2014 which are covered in Pubmed. Maximum number of records (841) was published during the year 2014, followed by 153 in 2011 and 144 in 2012. On the whole, it is noticed that from 1995 onwards there is a gradual increase in research on Ebola except few years. The distribution of the 'Ebola' research output according to various publication types of MEDLINE shows that 32.63% were published in journals, 19.45% are Research Support, Non-U.S. Govt, 13.02% are Reviews and 8.97 are News. Relative Growth Rate (RGR) is in fluctuating trend. The Doubling Time (Dt) has also shown an fluctuating trend. Ranking of the journals along with the country of origin based on the research output on 'Ebola' for the year 1995-2014 is United States the first two ranks, Russia contributes to the third, England contributes to the fourth and fifth positions respectively. Frequently cited journals are United States titles with 45.46% out of the 11 journals in zone-1. 32 frequently cited journals are United States, 22 in England, 8 in Netherland, 5 each in Switzerland and France etc. in zone-2. It is also found that in zone-1 & 2 combined; 37 frequently cited journals are United States, 25 in England, 8 in Netherland, 6 in Switzerland, 5 in France, 4 each in Russia and Sweden etc. The research productivity of Ebola confirms the implication of Bradford's Law of Scattering.

Keywords: Bibliometric Analysis; Ebola Literature; PUBMED; MEDLINE.

Introduction

Bibliometrics is an academic discipline and much research is being carried out for a quantitative study of the various aspects of literature of a given subject. It is a branch of Information Science which analyses quantitatively the published information based on bibliographic data elements. It is the study and measurement of the patterns of all forms of published knowledge. It is coined to describe the studies dealing with the quantification of written communication. It analysis is the quantitative study of a subject growth by using bibliometric techniques.

This paper analysed the growth of literature in the field of Ebola covered in the MEDLINE database which

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is covered in the Pubmed and also to identify the core journals and their countries in the field of Ebola.

Objectives of the Study

The Objectives of this study are:

1. To study the growth of literature in the field of Ebola covered in the MEDLINE database which is covered in Pubmed.
2. To examine the Relative Growth Rate and Doubling Time of the literature on Ebola during the study period
3. To study the implications of the Bradford Law of Scattering on Ebola research
4. To identify the core journals and their countries in the field of Ebola.

Limitations

This study is confined to a period of twenty years from 1995 to 2014 in the field of Ebola in the MEDLINE database which is covered in the Pubmed only.

Review of Literature

Scientific growth has involved not only increase in manpower but also finance [1]. Wooster [2] has estimated the number of journals that existed in the world at any one time, whereas some estimate of the number of papers published annually at various time was done by Vickery [3] and Martyn [4]. Gottschalk and Desmond [5] have estimated the number of scientific and technical journals that existed in the world. Growth studies in scientific areas studied by Baker [6] in chemistry, Conard [7] in biology, May [8] and Lamb [9] in mathematics, Sengupta in microbiology [10], physiology [11], and biochemistry [12].

There are several studies on the growth of literature and its doubling [13-17] Rajendran, Ramesh Babu and Gopalakrishnan (2005) [18] analyzed the global output of “fiber optics” research. Articles covered in the Ei-Tech Index database covering the period of 1999-2003 have been studied. Growth of literature by year wise, country wise, authorship pattern, bibliographic forms, ranking of core journals and nature of research have been analysed. Ramesh babu and Ramakrishnan (2007) [19] studied the growth of literature on “Hepatitis” and Ramakrishnan and Thavamani (2013) [20] in the field of “Hepatitis-C”

There are number of studies on mapping and Bradford law in health sciences [21-32]. Schloman studied Mapping the literature of allied health [33]. Kundra [34] studied the behaviour of Bradford’s Law towards citation data on Indian Medical Journal. Ramesh Babu and Ramakrishnan [35] studied on Indian Contributions to the field of Hepatitis (1984-2003) and used Bradford law to identify the core journals. Patra and Prakash Chand [36] studied HIV/AIDS research in India. They used Bradford’s law of scattering to identify core journals. The review of literature on collaborative articles showed that so far no quantitative study on “Ebola” was conducted. Hence the present study.

Ebola: A Brief Note

Ebola virus disease (EVD; also Ebola hemorrhagic fever, or EHF), or simply Ebola, is a disease of human and other primates caused by Ebola viruses. Signs and symptoms typically start between two days and three weeks after contracting the virus with a fever,

sore throat, muscle pain, and headaches. Then vomiting, diarrhea and rash usually follow, along with decreased function of the liver and kidneys. At this time some people begin to bleed both internally and externally. The disease has a high risk of death, killing between 25 per cent and 90 per cent of those infected with an average of about 50 per cent. This is often due to low blood pressure from fluid loss, and typically follows six to sixteen days after symptoms appear [37].

Database and Methodology

The records published during the year 1995 to 2014 in the field of Ebola 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 bibliographic details like author, title, publication type, language, year; address of the contributors, country of publications, source etc. were collected.

The retrieved records were converted into FoxPro and loaded in SPSS for the purpose of analysis. The keyword ‘Ebola’ has been used for extracting the number of records available in the above said database. The data thus collected from the source database on the literary production of ‘Ebola’ for the period 1995 - 2014 has been analysed by using bibliometric techniques such as Relative Growth Rate (RGR), Doubling Time (Dt) and Bradford’s Law of Scattering.

Analysis and Discussion

Data collected from the source database namely MEDLINE on the literary production of ‘Ebola’ for the period 1995-2014 has been analysed by using various bibliometric indicators and techniques.

Quantum of ebola research productivity

The year wise research productivity on ‘Ebola’ covered in the database is shown in Table 1. Total of 2519 records are covered in the database MEDLINE on ‘Ebola’. It is found that the maximum number of records (841) was published during 2014, followed by 153 in 2011 and 144 in 2012. On the whole, it is noticed that from 1995 onwards there is a gradual increase of Ebola research

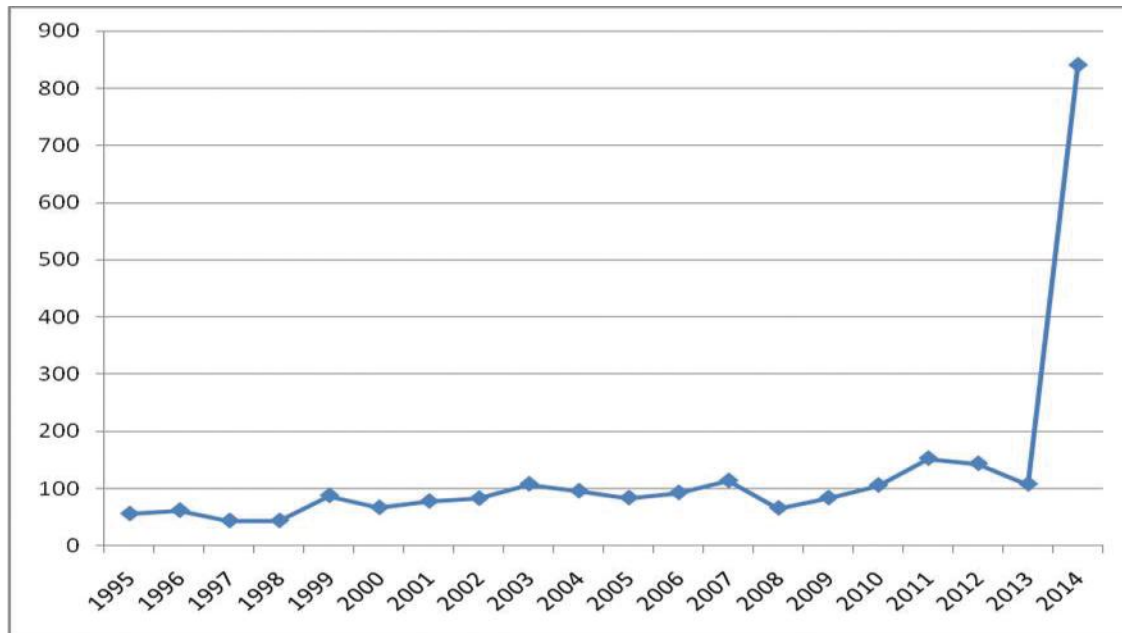
productivity every year except few years where the records low compare to previous years. Of course, the records in 2014 is very high compare to other years in the study period which shows that recent

year the research in Ebola is very active and also the disease is taken very serious recent year throughout the world.

Table 1: Quantum of Literature published in ‘Ebola’ Year wise

S. No.	Years	No. of Records on Ebola	Percentage	Cumulative Records	Cumulative Percentage
1.	1995	56	2.22	56	2.22
2.	1996	62	2.46	118	4.68
3.	1997	44	1.75	162	6.43
4.	1998	44	1.75	206	8.18
5.	1999	88	3.49	294	11.67
6.	2000	67	2.66	361	14.33
7.	2001	78	3.10	439	17.43
8.	2002	83	3.29	522	20.72
9.	2003	108	4.29	630	25.01
10.	2004	96	3.81	726	28.82
11.	2005	84	3.33	810	32.16
12.	2006	93	3.69	903	35.85
13.	2007	114	4.53	1017	40.37
14.	2008	66	2.62	1083	42.99
15.	2009	84	3.33	1167	46.33
16.	2010	106	4.21	1273	50.54
17.	2011	153	6.07	1426	56.61
18.	2012	144	5.72	1570	62.33
19.	2013	108	4.29	1678	66.61
20.	2014	841	33.39	2519	100.00
Total		2519	100.00		

Fig. 1: Quantum of Literature published in ‘Ebola’ Year wise



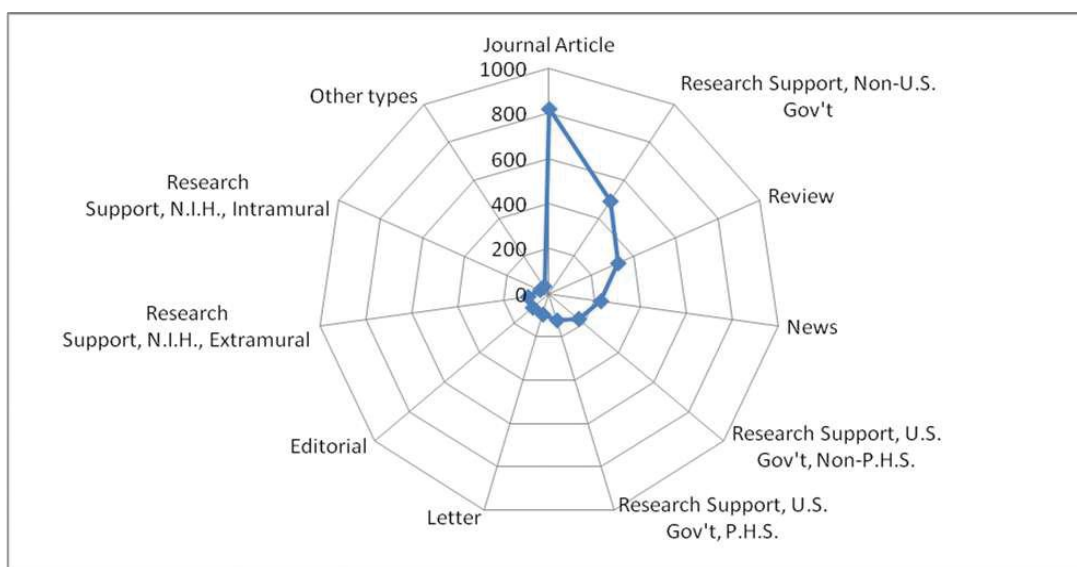
Publication Types Distribution of Ebola Research

Table 2 reveals the distribution of the ‘Ebola’ research output according to various publication types of MEDLINE. It was found that 32.63% are

journal articles, 19.45% are Research Support, Non-U.S. Gov’t, 13.02% are Review and 8.97 are News. The literature published as other Publication Type is 25.92%.

Table 2: Publication Type

Publication Type	Total	%
Journal Article	822	32.63
Research Support, Non-U.S. Gov't	490	19.45
Review	328	13.02
News	226	8.97
Research Support, U.S. Gov't, Non-P.H.S.	169	6.71
Research Support, U.S. Gov't, P.H.S.	122	4.84
Letter	95	3.77
Editorial	93	3.69
Research Support, N.I.H., Extramural	92	3.65
Research Support, N.I.H., Intramural	42	1.67
Other types	40	1.59
Total	2519	100.00

Fig. 2: Publication types distribution of Ebola Research**Table 3:** RGR and Dt for Ebola Research Output by Year-wise

Year	Quantum of Output	Cumulative Output	W ₁	W ₂	$1 - 2\bar{R}^{(aa^{-1} \text{ year}^{-1})}$ RGR	Dt(a)
1995	56	56		4.03		
1996	62	118	4.03	4.77	0.74	0.94
1997	44	162	4.77	5.09	0.32	2.18
1998	44	206	5.09	5.33	0.24	2.91
1999	88	294	5.33	5.68	0.35	1.96
2000	67	361	5.68	5.89	0.21	3.32
2001	78	439	5.89	6.08	0.19	3.56
2002	83	522	6.08	6.26	0.18	3.90
2003	108	630	6.26	6.45	0.19	3.73
2004	96	726	6.45	6.59	0.14	5.04
2005	84	810	6.59	6.70	0.11	6.47
2006	93	903	6.7	6.81	0.11	6.55
2007	114	1017	6.81	6.92	0.11	6.05
2008	66	1083	6.92	6.99	0.07	10.27
2009	84	1167	6.99	7.06	0.07	9.60
2010	106	1273	7.06	7.15	0.09	7.78
2011	153	1426	7.15	7.26	0.11	6.15
2012	144	1570	7.26	7.36	0.10	7.01
2013	108	1678	7.36	7.43	0.07	10.60
2014	841	2519	7.43	7.83	0.40	1.73

Relative Growth Rate (Rgr) and Doubling Time (Dt)

The analysis of data on the literary output in Ebola has been done with parameters such as Relative Growth Rate (RGR) and Doubling Time (Dt). It is seen from Table 3 and Figure 3 that RGR has been

fluctuating from 1995 (0.74) to 2014 (0.40). On the other hand, the Doubling Time (Dt) has also shown an fluctuating trend. The data in Table 3 reveals that Doubling time has increased from 0.94 in the year 1995 to 10.60 in the year 2013 except few years and suddenly reduced to 1.73 in the year 2014 (Figure 4).

Fig. 3: Relative Growth Rate for Research Output in Ebola

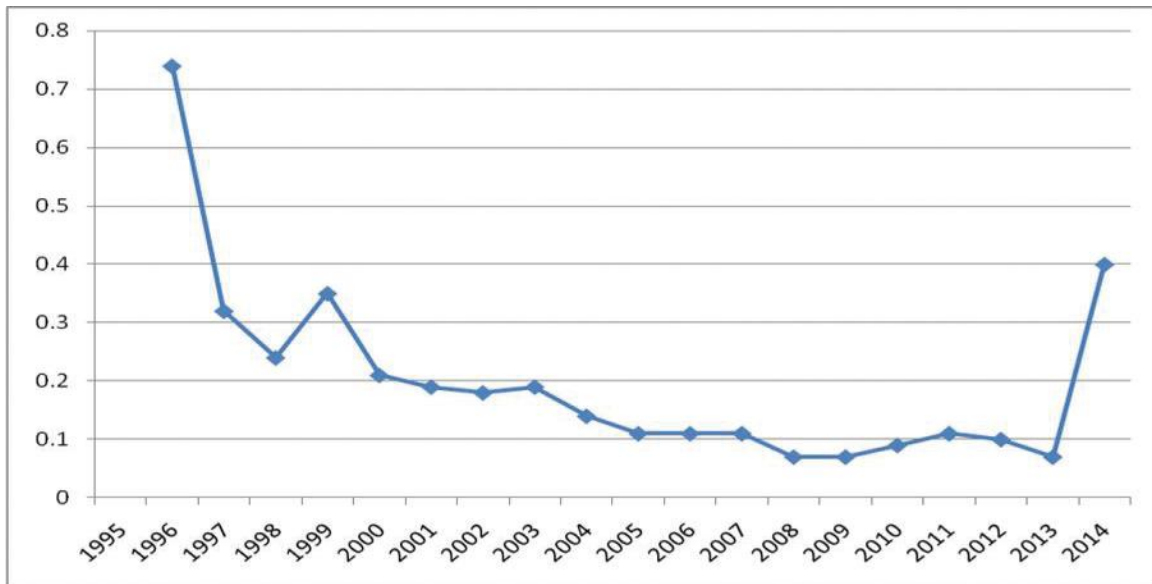
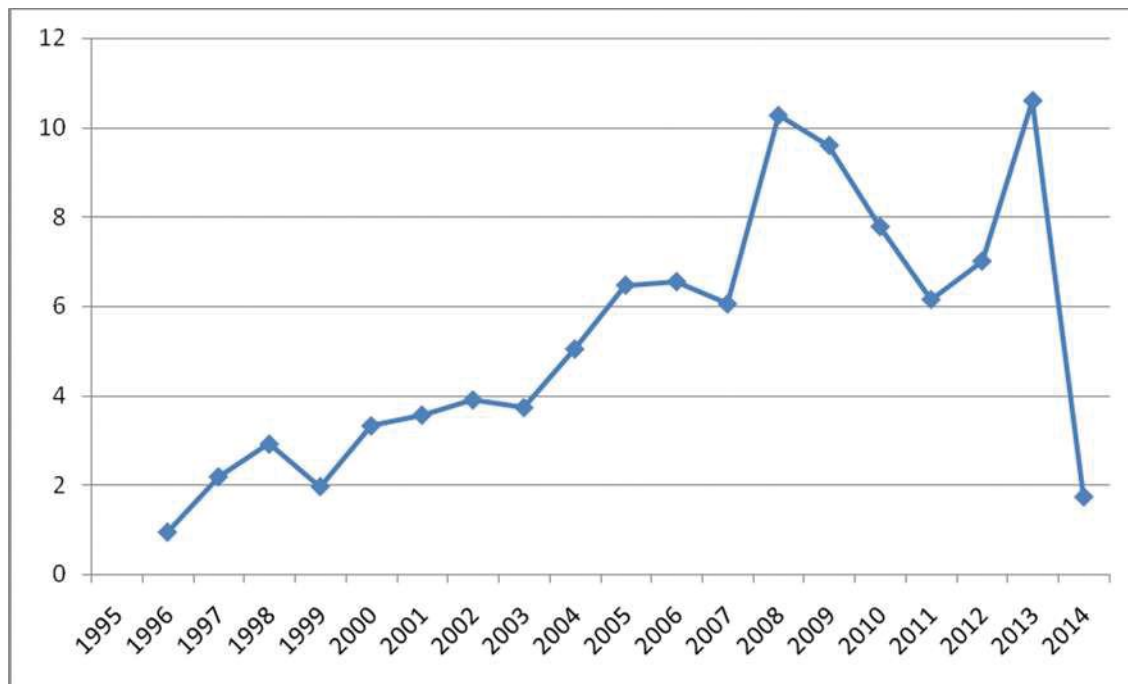


Fig. 4: Doubling time for Research output in Ebola



Distribution of journals in Ebola based on Bradford law of scattering

As per the Bradford Law, the journals are grouped into three zones producing similar number of articles.

The distribution of journal by zone wise is given in the Table 4. It is seen from Table 4 that 11 core journals grouped in zone 1 published 273 articles accounting for one third of the total output. Similarly

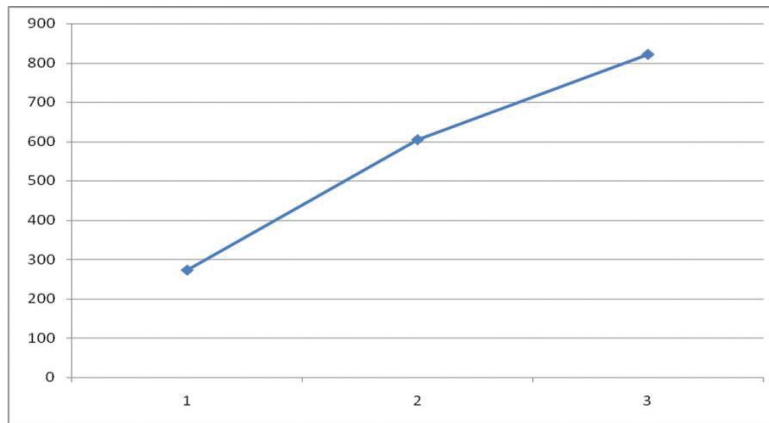
the second zone comprises of 104 journals and 217 journals grouped in third zone. The Bradford’s Law states that the number of periodicals in zones, the first zone and second zone will be 1: n₂...

Accordingly the relationship is the zone will be 11: 104: 217. On comparison with the data in Table 4, it is clear that the trend of research publication confirms the implication of Bradford’s Law (Figure 5).

Table 4: Distribution by Zone of cited journals and references in Ebola

Zone	No. of Journals		No. of Papers	
	No.	(%)	No.	(%)
Zone 1	11	3.31	273	33.21
Zone 2	104	31.33	332	40.39
Zone 3	217	65.36	217	26.40
Total	332	100.00	822	100.00

Fig. 5: Distributions of Journals by Zones



Country wise coverage of zone-1 journals in ebola

Table-5 shows that the most frequently cited journals are United States titles with 45.46%. Of the

11 titles in zone-1, 5 are associated with United States, 3 with England, 1 each in Russia and Switzerland. One journal not indexed the country. (Fig.-6)

Table 5: Country wise coverage of Zone-1 journals in Ebola

S. No.	Country	Frequency	%	Cumulative %
1	United States	5	45.46	45.46
2	England	3	27.27	72.73
3	Russia	1	9.09	81.82
4	Switzerland	1	9.09	90.91
5	Not mentioned	1	9.09	100.00
	Total	11	100.00	

Fig. 6: Country wise coverage of Zone-1 journals in Ebola

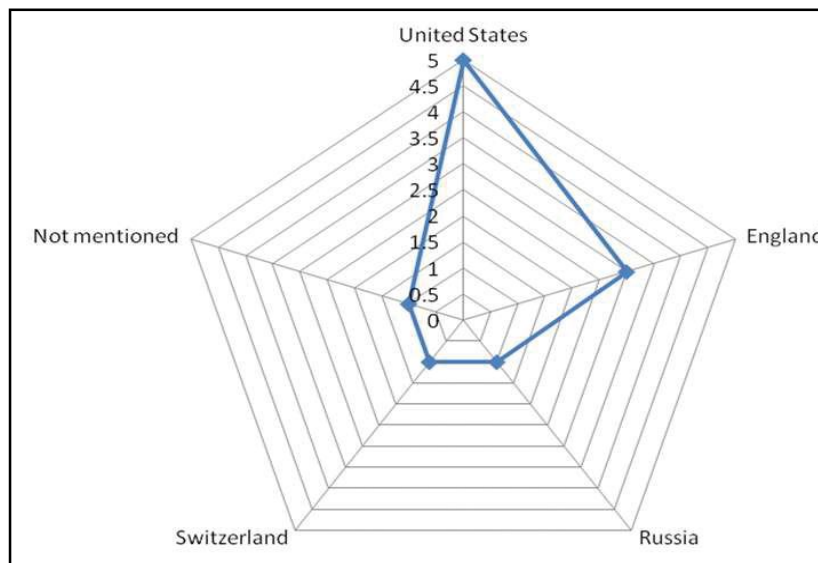


Table-6 shows that in zone-2 ; 32 frequently cited journals are United States, 22 in England, 8 in Netherland, 5 each in Switzerland and France, 4 in Sweden, 3 each in Canada and Russia, 2 each in

Austria, China, Germany and Korea, 1 each in Australia, Czech Republic, Denmark, India, Japan, Kenya, Nigeria, Norway, Romania, Scotland, Spain and Uganda. Two journals not indexed the country. (Fig.-7)

Table 6: Country wise coverage of Zone-2 journals in Ebola

S. No.	Country	Frequency	%	Cumulative %
1.	United States	32	30.77	30.77
2.	England	22	21.15	51.92
3.	Netherlands	8	7.69	59.62
4.	France	5	4.81	64.42
5.	Switzerland	5	4.81	69.23
6.	Sweden	4	3.85	73.08
7.	Canada	3	2.88	75.96
8.	Russia	3	2.88	78.85
9.	Austria	2	1.92	80.77
10.	China	2	1.92	82.69
11.	Germany	2	1.92	84.62
12.	Korea	2	1.92	86.54
13.	Australia	1	0.96	87.50
14.	Czech Republic	1	0.96	88.46
15.	Denmark	1	0.96	89.42
16.	India	1	0.96	90.38
17.	Japan	1	0.96	91.35
18.	Kenya	1	0.96	92.31
19.	Nigeria	1	0.96	93.27
20.	Norway	1	0.96	94.23
21.	Romania	1	0.96	95.19
22.	Scotland	1	0.96	96.15
23.	Spain	1	0.96	97.12
24.	Uganda	1	0.96	98.08
25.	Not mentioned	2	1.92	100.00
Total		104	100.00	

Fig. 7: Country wise coverage of Zone-2 journals in Ebola

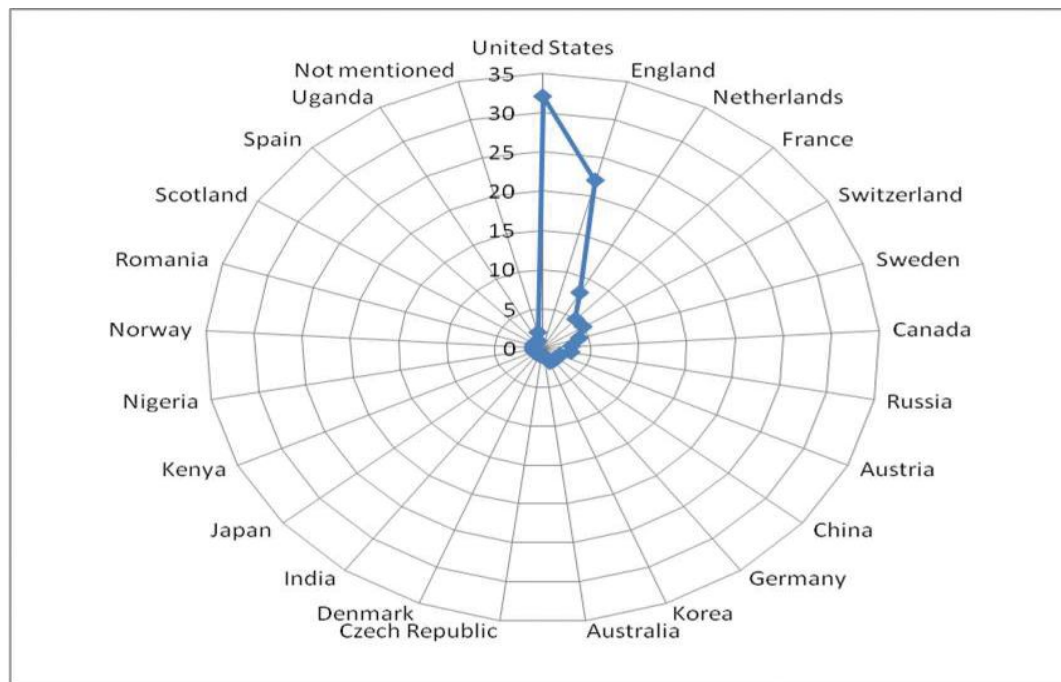


Table-7 shows that in zone-1 & 2 ; 37 frequently cited journals are United States, 25 in England, 8 in Netherland, 6 in Switzerland, 5 in France, 4 each in

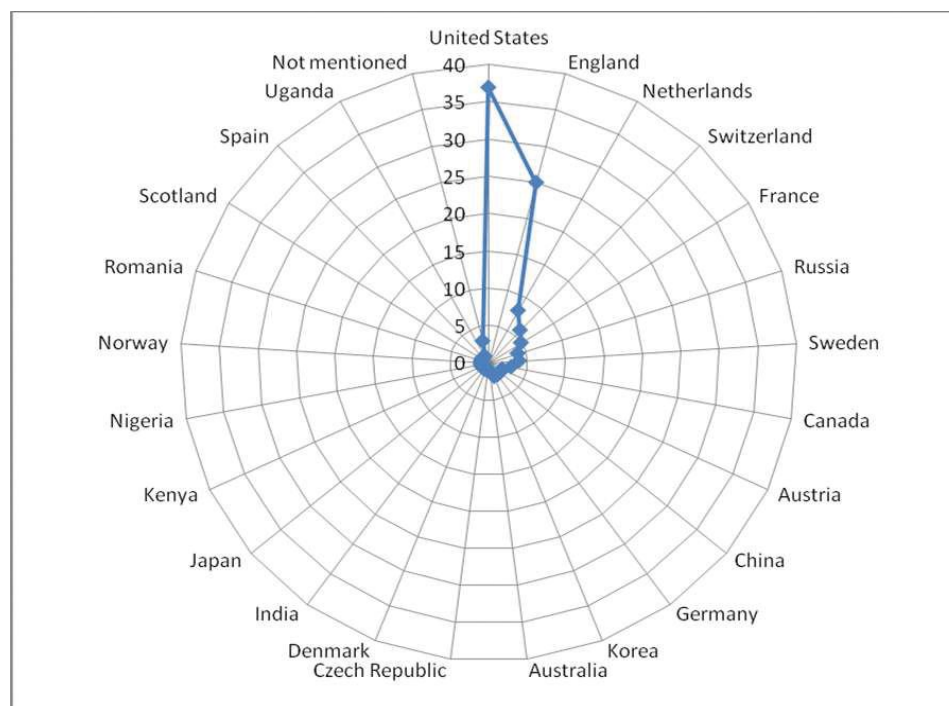
Russia and Sweden, 3 in Canada and 2 each in Austria, China, Germany and Korea, 1 each in Australia, Czech Republic, Denmark, India, Japan,

Kenya, Nigeria, Norway, Romania, Scotland, Spain and Uganda. Three journals not indexed the country. (Fig-8)

Table 7: Country wise coverage of Zone1 & 2 journals in Ebola

S. No.	Country	Frequency	Percent	Cumulative Percent
1.	United States	37	32.17	32.17
2.	England	25	21.74	53.91
3.	Netherlands	8	6.96	60.87
4.	Switzerland	6	5.22	66.09
5.	France	5	4.35	70.43
6.	Russia	4	3.48	73.91
7.	Sweden	4	3.48	77.39
8.	Canada	3	2.61	80.00
9.	Austria	2	1.74	81.74
10.	China	2	1.74	83.48
11.	Germany	2	1.74	85.22
12.	Korea	2	1.74	86.96
13.	Australia	1	0.87	87.83
14.	Czech Republic	1	0.87	88.70
15.	Denmark	1	0.87	89.57
16.	India	1	0.87	90.43
17.	Japan	1	0.87	91.30
18.	Kenya	1	0.87	92.17
19.	Nigeria	1	0.87	93.04
20.	Norway	1	0.87	93.91
21.	Romania	1	0.87	94.78
22.	Scotland	1	0.87	95.65
23.	Spain	1	0.87	96.52
24.	Uganda	1	0.87	97.39
25.	Not mentioned	3	2.61	100.00
Total		115	100.00	

Fig. 8: Country wise coverage of Zone1 & 2 journals in Ebola



Ranking of journals in ebola research

Ranking of the journals along with the country of origin based on the research output on 'Ebola' for the year 1995-2014 is given in Table 8. The highly productive journals up to five ranks are as follows:

1. 'Journal of Infectious Diseases' published from United States with 45 contributions amounting to 5.47% of total contributions.
2. 'MMWR Morb Mortal Wkly Rep' published from United States with 35 contributions amounting to 4.26%.

3. 'Vopr Virusol' published from Russia with 34 contributions amounting to 4.14%.
4. 'New England Journal of Medicine' published from England with 26 contributions amounting to 3.16%.
5. 'Lancet' published from England with 25 contributions amounting to 2.80%.

Out of the top five ranks United States is dominating the first two ranks, Russia contributes to the third position, and England contributes to the fourth and fifth positions respectively.

Table 8: Ranking of Journals in Ebola Research

S. No.	Name of the Journal	No. of Records	%	Country of origin	Rank
1.	Journal of Infectious Diseases	45	5.47	United States	1
2.	MMWR Morb Mortal Wkly Rep	35	4.26	United States	2
3.	Vopr Virusol	34	4.14	Russia	3
4.	New England Journal of Medicine	26	3.16	England	4
5.	Lancet	25	3.04	England	5
6.	Wkly Epidemiol Rec	23	2.80	Switzerland	6
7.	British Medical Journal (BMJ)	20	2.43	England	7
8.	Virology	20	2.43	United States	7
9.	Journal of Virology	19	2.31	United States	8
10.	JAMA	14	1.70	United States	9
11.	Disaster Med Public Health Prep	12	1.46	Not mentioned	10
12.	Am J Trop Med Hyg	10	1.22	United States	11
13.	Nature	10	1.22	England	11
14.	Nurs Stand	10	1.22	England	11
15.	Ann Intern Med	9	1.09	United States	12
16.	Antiviral Res	9	1.09	Netherlands	12
17.	Bull Soc Pathol Exot	8	0.97	France	13
18.	Rev Med Suisse	8	0.97	Switzerland	13
19.	Emerg Infect Dis	7	0.85	United States	14
20.	Med Trop (Mars)	7	0.85	France	14
21.	Biosecur Bioterror	6	0.73	United States	15
22.	J Bioeth Inq	6	0.73	Netherlands	15
23.	Virus Res	6	0.73	Netherlands	15
24.	CMAJ	5	0.61	Canada	16
25.	Euro Surveill	5	0.61	Sweden	16
26.	Br J Nurs	4	0.49	England	17
27.	Can Commun Dis Rep	4	0.49	Canada	17
28.	Clin Infect Dis	4	0.49	United States	17
29.	ED Manag	4	0.49	United States	17
30.	Emerg Nurse	4	0.49	England	17
31.	Future Virol	4	0.49	Not mentioned	17
32.	Glob Issues	4	0.49	United States	17
33.	Lancet Infect Dis	4	0.49	England	17
34.	Microbes Infect	4	0.49	France	17
35.	Nat Med	4	0.49	United States	17
36.	Sci China Life Sci	4	0.49	China	17
37.	Soc Sci Med	4	0.49	England	17
38.	Vestn Ross Akad Med Nauk	4	0.49	Russia	17
39.	Viruses	4	0.49	Switzerland	17
40.	Afr Health Sci	3	0.36	Uganda	18
41.	Arch Pathol Lab Med	3	0.36	United States	18
42.	Arch Virol Suppl	3	0.36	Austria	18
43.	Biull Eksp Biol Med	3	0.36	Russia	18
44.	Clin Microbiol Infect	3	0.36	England	18
45.	Commun Dis Rep CDR Wkly	3	0.36	England	18
46.	Dtsch Med Wochenschr	3	0.36	Germany	18
47.	Front Public Health	3	0.36	Switzerland	18
48.	Int J Nurs Stud	3	0.36	England	18
49.	Intensive Care Med	3	0.36	United States	18

50.	Lakartidningen	3	0.36	Sweden	18
51.	Mod Healthc	3	0.36	United States	18
52.	Ned Tijdschr Geneeskd	3	0.36	Netherlands	18
53.	Nurs Child Young People	3	0.36	England	18
54.	Prehosp Disaster Med	3	0.36	United States	18
55.	Travel Med Infect Dis	3	0.36	Netherlands	18
56.	Ugeskr Laeger	3	0.36	Denmark	18
57.	Viol Sin	3	0.36	China	18
58.	Afr J Health Sci	2	0.24	Kenya	19
59.	Afr J Med Med Sci	2	0.24	Nigeria	19
60.	Am J Epidemiol	2	0.24	United States	19
61.	Am J Nurs	2	0.24	United States	19
62.	Arch Virol	2	0.24	Austria	19
63.	Biochem Biophys Res Commun	2	0.24	United States	19
64.	BMC Biol	2	0.24	England	19
65.	Br Dent J	2	0.24	England	19
66.	Bull World Health Organ	2	0.24	Switzerland	19
67.	Cell Host Microbe	2	0.24	United States	19
68.	Curr Opin Mol Ther	2	0.24	England	19
69.	Ecol Evol	2	0.24	England	19
70.	Emerg Health Threats J	2	0.24	Sweden	19
71.	Epidemiol Bull	2	0.24	United States	19
72.	Epidemiol Health	2	0.24	Korea	19
73.	Epidemiol Infect	2	0.24	England	19
74.	Epidemiol Mikrobiol Imunol	2	0.24	Czech Republic	19
75.	Front Microbiol	2	0.24	Switzerland	19
76.	Genome Announc	2	0.24	United States	19
77.	Germes	2	0.24	Romania	19
78.	Glob Health Action	2	0.24	Sweden	19
79.	Int J Infect Dis	2	0.24	Canada	19
80.	J Biol Chem	2	0.24	United States	19
81.	J Bioterror Biodef	2	0.24	Not mentioned	19
82.	J Clin Virol	2	0.24	Netherlands	19
83.	J Comp Pathol	2	0.24	England	19
84.	J Gen Virol	2	0.24	England	19
85.	J Glob Infect Dis	2	0.24	India	19
86.	J Health Commun	2	0.24	United States	19
87.	J Immunol	2	0.24	United States	19
88.	J Spec Oper Med	2	0.24	United States	19
89.	J Virol Methods	2	0.24	Netherlands	19
90.	Kansenshogaku Zasshi	2	0.24	JAPAN	19
91.	Lab Med	2	0.24	United States	19
92.	Lancet Glob Health	2	0.24	England	19
93.	Med Clin (Barc)	2	0.24	Spain	19
94.	Med Hypotheses	2	0.24	Scotland	19
95.	Med J Aust	2	0.24	Australia	19
96.	Med Mal Infect	2	0.24	France	19
97.	Med Sci (Paris)	2	0.24	France	19
98.	Milbank Q	2	0.24	United States	19
99.	Mol Pharm	2	0.24	United States	19
100.	Nurs Times	2	0.24	England	19
101.	Nursing	2	0.24	United States	19

102.	Osong Public Health Res Perspect	2	0.24	Korea	19
103.	Pediatr Infect Dis J	2	0.24	United States	19
104.	Pharm Unserer Zeit	2	0.24	Germany	19
105.	PLoS Curr	2	0.24	United States	19
106.	PLoS One	2	0.24	United States	19
107.	Proc Natl Acad Sci U S A	2	0.24	United States	19
108.	Sci Am	2	0.24	United States	19
109.	Tidsskr Nor Laegeforen	2	0.24	Norway	19
110.	Trans R Soc Trop Med Hyg	2	0.24	England	19
111.	Trop Med Int Health	2	0.24	England	19
112.	Vaccine	2	0.24	Netherlands	19
113.	Vet Pathol	2	0.24	United States	19
114.	Vet Rec	2	0.24	England	19
115.	Zh Mikrobiol Epidemiol Immunobiol	2	0.24	Russia	19

Conclusion

In the field of medicine, the results show that Ebola literature is growing year after year in inconsistent manner. United States records on Ebola literature covered maximum numbers followed by England. Further the research productivity of Ebola confirms the implications of Bradford's Law of Scattering.

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