Research Article

SCIENTOMETRIC MEASURES OF SWINE FLU RESEARCH PERFORMANCE IN INDIA DURING 1971 TO 2010

N. Amsaveni and *A. Kalisdha
Department of Library & Information Science, Bharathidasan University,
Tiruchirappalli – 24, Tamil Nadu
*Author for Correspondence

ABSTRACT
With the advent of information and communication technology (ICT), web technology and availability of different databases online, the fields of bibliometrics gain a momentum. Increasing CPU speed and online availability of various databases makes bibliometrics research much easier and no longer a manual task. This study aims to find out the growth pattern, core journals, authorship pattern and productive authors in this field. The collection of swine flu article were collection from the various types of sources, such that Article; Review; Editorial Material; News Item; Letter; Proceeding Papers; Note; Meeting Abstract; Reprint; Book Review and correction. Only 64 conference proceedings were found from global level and just 4 articles from Indian level output. These records are further analysed using Microsoft Excel and Access for getting further bibliometrics indicators. The result shows that there is no definite pattern of literature growth in the field of bibliometrics. Scientometics is the core journal, which covers mostly 70.8 percents at global and 29.2 percents of the Indian literature coverage.

Key Words: Swine Flu, Scientometrics, Histriographic Analysis

INTRODUCTION
Pritchard defined the term 'Bibliometrics' as 'the application of mathematical and statistical methods to books and other communication medium. Nalimov and Mulchenko defined 'Scientometrics' as 'the application of those quantitative methods which are dealing with the analysis of science viewed as an information process'. So, scientometrics is the measurement of science communication, and bibliometrics deals with more general information processes. Although, famous Bradford's law (1934) of scattering, Lotka's law (1926) of scientific productivity are regarded as milestones in bibliometrics, but bibliometrics/scientometrics research actually started in late sixties. Later in the seventies and eighties, bibliometrics research took a distinct shape and emerged as a prominent discipline. Major boost to the scientometrics research was with the publication of the journal '*Scientometrics*' in late seventies particularly devoted to bibliometrics/scientometrics. With the advent of information and communication technology (ICT), web technology and availability of different databases online, the fields of bibliometrics gain a momentum. Increasing CPU speed and online availability of various databases makes bibliometrics research much easier and no longer a manual task. This study aims to find out the growth pattern, core journals, authorship pattern and productive authors in this field.

METHODOLOGY
In this research data were downloading from Web of Science. The research papers published by Researchers in the field of Swine Flu covered in the annual version of Science Citation index database were taken as the prime source for the present study. The papers published from 1971 to 2010 by the Researchers are accounted globally 1388 and Indian productivity is just 267.

Data Analysis
The retrieved data contains from different document types articles. The collection of swine flu article were collection from the various types of sources, such that Article; Review; Editorial Material; News Item; Letter; Proceeding Papers; Note; Meeting Abstract; Reprint; Book Review and correction. Only 64

Research Article

Table-1: Year-wise Distribution of Swine Flu Research comparison with comprehensive level to national level

	Comprehensive level					National Level			
S.No	Year	Recs.	TLCS	TGCS	S.No	Year	Recs.	TLCS	TGCS
1	1971	10	130	290	1	1971	-	-	-
2	1972	10	7	23	2	1972	-	-	-
3	1973	2	87	150	3	1973	-	-	-
4	1974	2	8	9	4	1974	-	-	-
5	1975	5	8	10	5	1975	-	-	-
6	1976	50	20	45	6	1976	17	1	30
7	1977	55	146	367	7	1977	17	0	45
8	1978	29	22	344	8	1978	5	3	8
9	1979	18	179	436	9	1979	5	1	86
10	1980	16	82	325	10	1980	7	0	9
11	1981	16	88	132	11	1981	2	1	14
12	1982	10	185	270	12	1982	2	0	2
13	1983	18	38	99	13	1983	4	1	11
14	1984	19	169	309	14	1984	6	4	32
15	1985	17	127	307	15	1985	-	-	-
16	1986	14	74	119	16	1986	2	0	1
17	1987	7	24	49	17	1987	-	-	-
18	1988	9	33	44	18	1988	-	-	-
19	1989	5	45	73	19	1989	-	-	-
20	1990	2	97	114	20	1990	-	-	-
21	1991	19	9	26	21	1991	3	1	71
22	1992	18	230	542	22	1992	1	1	48
23	1993	17	311	1355	23	1993	-	-	-
24	1994	36	260	661	24	1994	3	0	70
25	1995	23	397	1138	25	1995	1	0	1
26	1996	16	180	494	26	1996	-	-	-
27	1997	27	123	389	27	1997	-	-	-
28	1998	26	203	700	28	1998	-	-	-
29	1999	26	281	1263	29	1999	3	0	12
30	2000	41	210	729	30	2000	3	0	50
31	2001	34	498	1422	31	2001	4	3	84
32	2002	40	205	937	32	2002	1	0	4
33	2003	39	361	1018	33	2003	5	2	43
34	2004	41	160	699	34	2004	1	0	9
35	2005	35	206	655	35	2005	1	0	0
36	2006	57	63	321	36	2006	5	2	42
37	2007	77	229	566	37	2007	4	0	8
38	2008	81	162	454	38	2008	6	5	20
39	2009	193	79	249	39	2009	64	9	22
40	2010	228	144	379	40	2010	95	34	722
Total		1388	5880	17512	Total		267	68	1444

Research Article

conference proceedings were found from global level and just 4 articles from Indian level output. These records are further analysed using Microsoft Excel and Access for getting further bibliometrics indicators. The result shows that there is no definite pattern of literature growth in the field of bibliometrics. *Scientometics* is the core journal, which covers mostly 70.8 percents at global and 29.2 percents of the Indian literature coverage.

Growth of Literature

The *WoS* started indexing Bibliometrics literature in 1960s. After that there was a growth of literature. The highest literature growth occurs in 2009 and 2010 both the global and national where 228 and 95 records were indexed. It is clearly see that during the period 1971-2010 (forty years) a total of 1388 publications were published at International level and 267 publications were published at Indian level. The highest publication is 2010 and 2009. Followed by highest the highest Local Citation Scores is the years of 2001 (498) and 1995 (397) and the highest Global Citation Scores in the years of 2001 (1422) and 1993 (1355). The lowest publication is 1973, 1974 and 1990 with good Local and global Citation Scores. From national level outputs analysis, there is no issues at starting years of 1971, 1972, 1973, 1974 and 1975 then in between years of 1985, 1987, 1988, 1990, 1993, 1996, 1997 and 1998. The years of 2010 and 2009 are having the highest publications and the highest citation scores. The grand total of LCS is 5880 and grand total of GCS is 17512 is in international level and the national level grand total of LCS is 68 and GCS 1444.

Relative Growth Rate and Doubling Time of Swine Flu Output

The analysis of growth rate of Swine flu research output is one of the important aspects of discussion. This analysis aims to identify the trends and growth of prospects in the present research. However, proliferation of swine flue literature has made it extremely difficult for scientists to keep in touch with the recent advances in their fields. Hence the provision of information to information seekers is the prime duty of the library professionals who have to meet the information needs of scientists in various disciplines. In this connection, the published literature is taken as a target to measure the knowledge in a discipline, and the growth rate study of publications would provide some useful results. The rate of growth of swine flu literature is determined by calculating relative growth rates and doubling time for publications. In the research design, the details of this model have been explained.

Table 2: Relative Growth Rate of Swine Flu Research

Years	R. o/p	Cum. o/p	log_e1^p	log_e2^p	Rt(P)	Dt(P)
1971 - 1975	29	29	-	3.37	-	-
1976 – 1980	168	197	3.37	5.12	1.75	0.39
1981 – 1985	80	277	5.12	4.38	0.74	0.94
1986 – 1990	37	314	4.38	3.61	0.77	0.9
1991 – 1995	113	427	3.61	4.73	1.12	0.62
1996 – 2000	136	563	4.73	4.91	0.18	3.9
2001- 2005	189	752	4.91	5.24	0.33	2.1
2006 - 2010	636	**1388**	5.24	6.46	1.22	0.57
	1388		**31.36**	**37.82**	**6.11 (0.76)**	**9.42 (1.18)**

Table 4 predicts data of relative growth rate and doubling time for total research output on Swine flu disease. Forty years duration period had divided by five years group for convenience of this analysis, such that, 1971 to 1975; 1976 to 1980; 1981 to 1985; 1986 to 1990; 1991 to 1995; 1996 to 2000; 2001 to 2005 and 2006 to 2010. It is observed that its relative growth rates have gradually from 1.75 at the year group of 1971 to 1975 to 1.22 at the year group of 2006 to 2010. The whole study period records the mean relative growth rate of 0.76. Contrarily, the doubling time for publication of all sources of Swine flu

Research Article

research output has decrease from 0.39 to 0.57 at the duration. The doubling time for publications at the aggregate level has been computed as 1.18 years. It could be deducted from the above discussion that in generally progressive increase in the number of publications of research output on Swine flu disease literature. However, its relative growth rate has shown a declining trend, which means the rate of increase is low in terms of proportion, and this has been highlighted by doubling time for publications, which is more than the relative growth rate.

Core and Most Productive Journals

From the data analysis, it has been found that about 280 journals publish 1388 articles. "JOURNAL OF VIROLOGY" has published the highest number articles which is calculated to 45 articles (3.9 %); 733 local citation score and 2760 total global citation score 388 total cited references and it is dominated the first rank of research output in the field of Swine flu research output. "ARCHIVES OF VIROLOGY" journal has published 36 articles (3.1 %); 358 TLCS; 608 TGCS with 310 TLCR and dominated the second rank of research output in the field of Swine flu research output. "VETERINARY MICROBIOLOGY" journal has published 32 articles (2.8 %); 220 TLCS; 660 TGCS with 314 TLCR and dominated the third rank of research output. "JOURNAL OF GENERAL VIROLOGY" journal has published 31 articles (2.7 %); 505 TLCS; 1088 TGCS with 275 TLCR and dominated the fourth rank of research output. Remaining journals were having contributes below thirty articles published in the relevant field of Swine flu. Bradford's law has been employed to identify the core journals in a given field. Bradford's law reveals a pattern of how literature in a subject is distributed in journals. According to Bradford's law of scattering, Bradford's law is useful for the librarians because it helps in identifying the core sets of journals, which publish the most contents of a given field.

Table 3: Most productive journals (core journals)

S.no	Journals	Recs.	Rank	%	TLCS	TGCS	TLCR
1	JOURNAL OF VIROLOGY	45	1	3.9	733	2760	388
2	ARCHIVES OF VIROLOGY	36	2	3.1	358	608	310
3	VETERINARY MICROBIOLOGY	32	3	2.8	220	660	314
4	JRL. OF GENERAL VIROLOGY	31	4	2.7	505	1088	275
5	BRITISH MEDICAL JRL.	29	5	2.5	2	7	4
6	SCIENCE	27	6	2.3	93	656	41
7	VACCINE	26	7	2.2	94	240	182
8	JRL. OF INFECTIOUS DISEASES	24	8	2.1	46	283	86
9	JOURNAL OF CLINICAL	23	9	2.0	301	576	237
10	NEW ENGLAND JOURNAL OF	22	10	1.9	88	209	62
11	AMERICAN JOURNAL OF	20	11	1.7	137	217	113
12	JOURNAL OF VETERINARY	20	11	1.7	96	224	147
13	VIRUS RESEARCH	20	11	1.7	228	398	293
14	VIROLOGY	17	12	1.5	499	922	118
15	EMERGING INFECTIOUS DISEASES	15	13	1.3	139	267	144
16	VETERINARY RECORD	15	13	1.3	164	223	98
17	LANCET	14	14	1.2	58	111	11
18	AMERICAN JOURNAL	12	15	1.0	90	293	26
19	BULLETIN OF THE WORLD	12	15	1.0	212	334	33
20	CANADIAN JOURNAL OF	12	15	1.0	41	87	84
21	CANADIAN VETERINARY	12	15	1.0	33	79	33

Research Article

Authorship Pattern
Table 2 shows the number of authors and their corresponding publications. Lotka's Law, an inverse, square law, is used to find authors productivity patterns. It states that globally 20.9 percents of articles were from single authors, followed by 13.8% three authors and 13.3% by double authors etc. In Indian context 46.44 percents of single authors were contributed from India. 79.1 percents of multi-authored were globally contributes in this field of Swine Flu and 53.56 percents of collaborative authors were contributes from Indian country. There is general decrease in performance among a body of authors following 1:n2. This ratio shows that some produce much more than the average. According to Lotka's law of scientific productivity, only six percent of the authors in a field will produce more than 10 articles. The general form of Lotka's law can be expressed as: $y = c/x^n$.

The results depict that majority of papers are multi-authored. It clearly brings out collaborative research in the field It clearly brings out multi investigation is high compare than individual research in the field of swine flu.

Table 4: Shows Authorship Pattern of Swine Flue Research output

S.No	Authorship pattern	Comprehensive level			National Level		
		Recs.	Cum.	%	Recs.	Cum.	%
1	Single Authors	291 (20.9)	291	20.97	124	124	46.44
2	Double Authors	192 (13.8)	483	13.83	38	162	14.23
3	Three Authors	185(13.3)	668	13.33	27	189	10.11
4	Four Authors	176(12.7)	844	12.68	21	210	7.87
5	Five Authors	135 (9.73)	979	9.73	17	227	6.37
6	Six Authors	114 (8.21)	1093	8.21	13	240	4.87
7	Seven Authors	96 (6.92)	1189	6.92	9	249	3.37
8	Eight Authors	60 (4.32)	1249	4.32	1	250	0.37
9	Nine Authors	50 (3.6)	1299	3.60	3	253	1.12
10	10 & Above Authors	89 (6.41)	1388	6.41	14	267	5.24
Total		**1388**		**100**	**267**		**100**

Degree of Collaboration
The authorship pattern analyzed to determine the percentage of single and multi-authorship is denoted in (table 6).

Table 5: Shows Authorship Pattern of Degree of collobaration

S.No	Authorship pattern	Recs.	Cum.	%
1	Single Authors	291	291	20.97
2	Multi Authors	1097	1388	79.03
Total		**1388**		**100**
Degrees of collaboration				**0.79**

Individual contribution is just 20.97 percents in the field of swine flu research output. Multi author's contribution is 79.03 percents of the swine flu research output. The study interpreted that single author contributed papers maintained the low profile among Swine flu research scientists. It could be seen clearly from the above discussion that the degree of collaboration in producing research output on swine flu research has shown an increasing trend during the study period since it is a new discipline. Based on this study, the result of the degree of collaboration C = 0.79. i.e, 79 percent of collaborative authors' articles published during the study periods.

Research Article

HISTRIOGRAPHIC ANALYSIS

398th (Kida, 1994), 490th (Ito, 1998) and 553th (Webby, 2000) articles has nine cited links. 355th (Castrucci, 1993) and 504th (Reid, 1999) has eight cited links. 455th (Taubenberger, 1997) article has seven quoted links. 9th article by Kundin (1971) and 338th (Bean, 1992) are having six quoted links. 401st (Claas, 1994) and 554th (Matrosovich, 2000) has five cited links. 151st, 161st (Hinsha, 1978), 488th (Suarez, 1998), 558th (Fouchier, 2000) and 587th (Ha, 2001) articles have four and five links. 201st (Pensaert, 1981), 332nd (Ito, 1991), 561st (Suzuki, 2000) and 568th (Basler, 2001) articles has only three cited links. 629th (Seo, 2002) article has two quoted links. 362nd (Wang, 1993) and 676th (Webby, 2003) articles has only one cited links. 244th (Langmuir, 1984); 384th (Hinsha, 1994), 475th (Rossow, 1998) and 594th (Chen, 2001) articles has do not have any cited links.
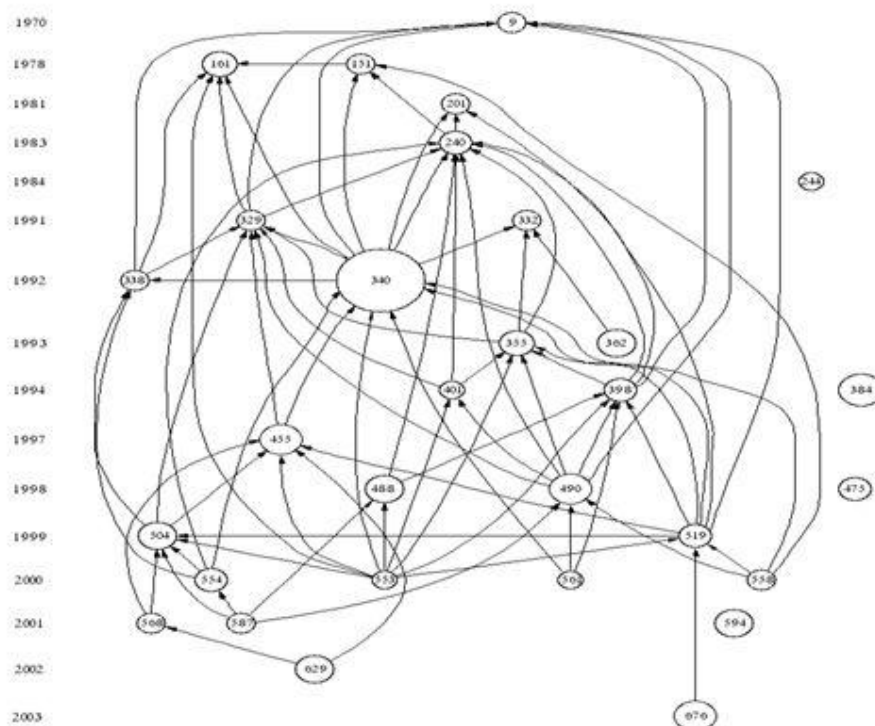

Figure 1: Historiograph map for Swine flue research output for top 30 GCS

Table 6: Shows the Prolific Authors by number of publications

S.No	Author	Recs.	Rank	%	TLCS	TGCS	TLCR
1	Webster RG	55	1	4.7	1377	4092	472
2	Kawaoka Y	28	2	2.4	905	2766	189
3	Olsen CW	28	2	2.4	602	1008	556
4	Van Reeth K	24	3	2.1	132	397	186
5	Pensaert M	23	4	2.0	239	474	153
6	Hinshaw VS	21	5	1.8	527	1175	137
7	Brown IH	19	6	1.6	345	536	312
8	Janke BH	19	6	1.6	140	259	281
9	Lager KM	19	6	1.6	108	273	333
10	Shortridge KF	17	7	1.5	340	634	131

Research Article

Authors are ranked by number of publications. Thus the most-cited authors are distinguished from the most-published ones. The individual citation frequencies for these papers are totaled. "Webster RG" has published the highest number articles which is calculated to 55 articles (4.7 %); 1377 local citation score and 4092 total global citation score 472 total cited references and it is dominated the first rank of research output in the field of Swine flu research output. "Kawaoka Y" and "Olsen CW" has published 28 articles (2.4 %); 905 and 2766 TLCS; 608 and 1008 TGCS with 189 and 556 TLCR and dominated the second rank of research output in the field of Swine flu research output.

REFERENCES
Bradford SC (1934). Sources of information on specific subjects. *Engineering: An Illustrated Weekly* **3550** 85-86.
Godin B On the origin of bibliometrics. *Scientometrics* **68**(1) 109-133.
Garfield E (2006). The history and meaning of the journal impact factor. *Journal of the American Medical Association* **295**(1) 90-93.
Srimurugan A and Nattar S (2009). D-LIB Magaine: A bibliometric Study. *Indian Journal of Information Science and Services* **3**(1) 1-4.
Thanuskodi S and Venkatalakshmi V (2009). The Growth and Development of Research output on ecology in India: A Bibliometric Study. *Indian Journal of Information Science and Services* **3**(1) 41-48.
Pritchard A (1969). Statistical bibliography or bibliometrics? *Journal of Documentation* **24** 348-49.
Nalimov VV and Mulchenko BM (1969). *Scientometrics*. Nauka, Moscow (in Russian).
Ungern-Sternberg SV (2000). Bradford's law in context of information provision. *Scientometrics* **49**(1) 161-86.
Lotka AJ (1926). The frequency distribution of scientific productivity. *Journal of the Washington Academy of Science* **16** 317-323.
Nichols PT (1986). Empirical validation of Lotka's law. *Information Processing and Management* **22**(5) 417-419.
Pao ML Lotka's law (1985). A testing procedure. *Information Processing and Management* **21**(4) 305-320.
Fang PH and Fang JM (1995). A modification of Lotka's function for scientific productivity. *Information Processing and Management* **31**(1) 133-137.