

3-22-2019

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N, SIVA; S, VIVEKANANDHAN; and P, RAJENDRAN, "Global Research Publications on Hepatitis C from SCOPUS Database (2009-2018): A Scientometric Study" (2019). *Library Philosophy and Practice (e-journal)*. 2454.
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Global Research Publications on Hepatitis C from SCOPUS Database (2009-2018): A Scientometric Study

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Abstract

This paper examines the Global publications on hepatitis C research during 2009-2018. This study aims to analyze the hepatitis c research publications, carried out by using the Scopus online database during the period of ten years from 2009 to 2018. From this study find out the year wise growth of publications, country, author, organization, document type, language-wise publications, and citation analysis and identified the impact factor (IF) of the journal productivity in the field of hepatitis C research.

During the ten year study period, it identified that 59926 publications contributed to the field of hepatitis C research. During the period, RGR is 0.71 to 0.10 and correspondingly the doubling time (Dt) is 0.98 to 7.28. Maximum of 41141 (68.65%) research publications are articles, and 55746 research publications are the English Language. Maximum of 18160 (23.10%) publications contributed by the United States and the relative citation index is varied from 0.95 to 3.3.

Keywords: Scientometric, Bibliometric, Hepatitis C, Scopus

Introduction

A disease is the biggest task to solve in this world to survive for the human begins, day by day the new infections are occupying in the human body. Diseases won't see the human to affect by global, regional, and national age-sex, etc., some disease is curable, some cause to death and some are unable to identify this may be due to the lack of facility available in the health. As per the 2016 data of World Health Organization 54% (i.e., more than half %) death were due to the top 10 causes of diseases worldwide. , These diseases have remained in the last 15 years for leading causes of death globally and were classified into three types (i) Communicable, maternal, per natal and nutritional conditions (ii) Noncommunicable diseases and (iii)Injuries [1]. Hepatitis is one of the types of disease causes to death worldwide. Global Burden of Diseases study updated on 2015 and ranked chronic viral hepatitis and its underlying conditions, among the top 20 causes of death caused by cirrhosis and liver cancer, and it's increasing steeply from 1990 to 2015 [2].

Since 2000, global public health stakeholders have increasingly recognized viral hepatitis as a major cause of death. In 2015, WHO's Global Health Estimates [GHE] indicated that acute liver failure, cirrhosis and hepatocellular carcinoma secondary to viral hepatitis lead to more deaths, and it has been increasing worldwide

than the human immunodeficiency virus [HIV], tuberculosis [TB] or malaria and also the data shows that in 2015, 29.7% of hepatitis deaths were attributable to infection with HCV [3]. According to Stedman's Medical Dictionary "Hepatitis is an inflammation of the liver, due usually to viral infection but sometimes to toxic agents. Previously endemic throughout much of the developing world, viral Hepatitis now ranks as a major public health problem in industrialized nations. The three most common type of viral Hepatitis were (A, B, and C) affects millions worldwide" [4].

Hepatitis C is a liver infection; most of them don't know the symptoms, but it causes few symptoms by the hepatitis C virus.[5] Hepatitis C found worldwide. Hepatitis C virus infection can be determined in certain populations it depends on the country, (for example people who inject drugs) and/or in general populations. [6] The World Health Organization (WHO) has stated by the year 2030 viral hepatitis will be eliminated as a public health threat. Global burden of hepatitis C virus (HCV) currently estimated at 71 million people [7]. The key recommendations and the elimination goals of WHO are to reduce new infections by 90% and HCV-related liver mortality by 65% [8].

Literature Review

Sangam et. al. (2018)⁹ have examined by collecting data from PubMed and the Web of Science (WoS) for the period 1976-2015 to find out the hepatitis literature in the world and its growth. The result shows in India that the cumulative number of publications doubled in the year 2008 and the publications were significantly increased. **Schmidt et. al. (2014)**¹⁰ focused on hepatitis B in his paper, he compares the research articles published in USA and Europe countries with the countries of China and Taiwan, Pubmed and ISI-Web used for research data for the period of 1971-2011. He examined that most productive supplier is the USA and the top ten ranking in most productivity authors in the field of publishing hepatitis B articles worldwide is China and Taiwan. **Miri, Raofi and Heidari (2012)**¹¹ carried out the citation analysis of Hepatitis monthly Journal, for his bibliometric study he used three databases (Web of Science, Google Scholar, and Scopus) among these three databases there is showing difference in the Impact Factor and also stated that publications of all articles never succeed to record.

Trapero Marugán et. al. (2002)¹², analyzed Spanish hospitals about the hepatitis C virus publications for the period 1980 to 2002. He used the Medline database to collect the data, he stated in his analysis that in 1980 no articles were published and in 1998 there were 121 articles published, and it decreased to 36 in 2002, while comparing to international journals articles Spanish journals published fewer articles related to hepatitis C Virus. **Siva, Vivekanandhan and Manickraj (2018)**¹³ analyze the digital library research publications in a scientometric analysis, which indexed in SCOPUS database, the period is between 2008 and 2017 with 10345 publications. The average degree of collaboration is 0.78, the relative growth rate is decreasing trend and doubling time is increasing trend. The United States ranked first with 2650 (25.62%) publications, and Giles C.L. stands with highest of 59 (0.57%) publications with 643(1.35%) citations and the h-index is 15.

Objective of the study

The main objectives of the studies are,

- To study the year wise growth of research publication in Hepatitis C.
- To analysis the relative growth rate and doubling time
- To study the type of document in hepatitis C research publications
- To examine the Language wise hepatitis C research publications
- To analysis the top 15 most productive countries, share and RCI
- To identify the top 15 most productive authors in Hepatitis C
- To examine the top 15 Journals and Organizations contributions.

Methodology

The Hepatitis C research publications are identified during the period from 2009 to 2018 were determined using the Scopus database. Using the following search Keyword (TITLE-ABS-KEY("hepatitis C") AND PUBYEAR > 2008 AND PUBYEAR < 2019. h-index and relative citation index are calculated for this study. The data was collected for this study is 20.02.2019. During the ten year study period 59926 research publications are identified and analyses the relative growth rate and doubling time of the study, document type and top 15 countries, authors, journals and institutions.

Data Analysis and Interpretations

Year Wise Growth of Publications

Table 1 shows that year wise growth of research publications in hepatitis C during the ten year study period between 2009 and 2018 with 59926 research publications. From the study, it identified that the maximum of 6547 (10.93%) publications in the year 2015, followed by 6482 (10.82%) publications in the year 2014 and 6302 (10.52%) publications in 2016. The average research publications for the ten year study period are 5992 publications. Last ten years hepatitis C studies are identified from 8.76% to 10.93% of research contributions.

Table 1 Year wise growth of Publications in hepatitis C

S. No	Year	Publications	%	Cum.	Cum. %
1	2009	5251	8.76	5251	8.76
2	2010	5396	9.00	10647	17.77
3	2011	5886	9.82	16533	27.59
4	2012	6155	10.27	22688	37.86
5	2013	6301	10.51	28989	48.38
6	2014	6482	10.82	35471	59.19
7	2015	6547	10.93	42018	70.12
8	2016	6302	10.52	48320	80.64
9	2017	6168	10.29	54488	90.93
10	2018	5438	9.07	59926	100.01
Total		59926	100.00		

Relative Growth Rate and Doubling Time

Relative Growth Rate (RGR)

The most important features of science and technology in recent years are calculated by the rate of growth. Scientific growth involved not only increase in the man power and financial investment. The relative growth rates are identified by the increase in the number of publications per unit of time. The mean relative growth rate over the particular period of an interval can be calculated in the following formula developed by Mahapatra (1985)¹⁴

$$R(a) = (W2 - W1) / (T2 - T1)$$

Where, R(a) = RGR = the mean relative growth rate over the specific period of interval

W1 = the logarithm of the beginning number of publications/pages

W2= the logarithm of ending number of publications/pages after a specific period of interval

T2 – T1 = the unit difference between the beginning time and the ending time.

Here the year can think about the unit of time. The relative growth rate for both publications and pages are calculated separately.

R(a) = Relative growth rate per unit of publications per unit of time

R(p) = Relative growth rate per unit of pages per unit of time

Doubling Time [Dt]

The doubling time is the time taken for the doubling of the number of records published within a stipulated period. The doubling time is calculated from the relative growth rate (the difference between the logarithms of beginning and end of the year from the study), and the natural logarithm number is used, the difference has a value of 0.693. Thus the corresponding doubling time for each specific period of interval and both publications and pages can be calculated by the following formula,

$$Dt = 0.693/ R(a)$$

Table 2 Year wise Relative Growth Rate and Doubling Time in Hepatitis C

S. No	Year	Publications	Cum.	W1	W2	RGR = (W2-W1)	Dt = (0.693/RGR)
1	2009	5251	5251	0.00	8.57	0	
2	2010	5396	10647	8.57	9.27	0.71	0.98
3	2011	5886	16533	9.27	9.71	0.44	1.57
4	2012	6155	22688	9.71	10.03	0.32	2.19
5	2013	6301	28989	10.03	10.27	0.25	2.83
6	2014	6482	35471	10.27	10.48	0.20	3.43
7	2015	6547	42018	10.48	10.65	0.17	4.09
8	2016	6302	48320	10.65	10.79	0.14	4.96
9	2017	6168	54488	10.79	10.91	0.12	5.77
10	2018	5438	59926	10.91	11.00	0.10	7.28
Total		59926					

From table 2, shows that RGR has been decreasing trend from (0.71) in the year 2009 to (0.10) in the year 2018.

Correspondingly the doubling time (Dt) has been increasing from 0.98 in the year 2010 to 7.28 in the year 2018.

Type of Document in Hepatitis C Research Publications

During the ten year study period on hepatitis C, research publications are identified from table 3. From the table 3 maximum of 41141 (68.65%) research publications are contributed by the article, followed by 8850 (14.77%) research publications are reviewed, 3310 (5.52%) research publications are a letter, etc.

Table 3 Document Type wise Publications in Hepatitis C

S. No	Document Type	Publications	%
1	Article	41141	68.65
2	Review	8850	14.77
3	Letter	3310	5.52
4	Note	2068	3.45
5	Editorial	1768	2.95
6	Conference Paper	906	1.51
7	Book Chapter	807	1.35
8	Short Survey	725	1.21
9	Erratum	289	0.48
10	Book	46	0.08
11	Conference Review	13	0.02
12	Retracted	3	0.01
Total		59926	100.00

This study confirmed that more than 83% of publications are contributed by article and review. From this study, it is identified that Less than 2% of contributions are conference paper, book chapter, short survey, erratum, book, conference review and retracted.

Language wise Hepatitis C Research Publications

Table 4 Language wise Publications in Hepatitis C

Language	Number of Publications			Share of Publications		
	2009-2013	2014-2018	2009-2018	2009-2013	2014-2018	2009-2018
English	26363	29383	55746	89.64	93.77	91.77
Spanish	489	304	793	1.66	0.97	1.31
German	398	324	722	1.35	1.03	1.19
Chinese	438	281	719	1.49	0.90	1.18
French	399	240	639	1.36	0.77	1.05
Japanese	290	258	548	0.99	0.82	0.90
Russian	203	206	409	0.69	0.66	0.67
Portuguese	127	46	173	0.43	0.15	0.28
Polish	134	32	166	0.46	0.10	0.27
Turkish	95	55	150	0.32	0.18	0.25
Czech	56	37	93	0.19	0.12	0.15
Italian	59	23	82	0.20	0.07	0.13
Hungarian	47	30	77	0.16	0.10	0.13
Croatian	49	25	74	0.17	0.08	0.12
Korean	40	18	58	0.14	0.06	0.10
Others	222	73	295	0.75	0.23	0.49
Total	29409	31335	60744	100.00	100.00	100.00

Language-wise research publications are identified in two five years block. From table 4, it is identified that 29409 research publications are contributed in the first block years of 2009 – 2013. Out of that, the maximum of 26363 publications are the English language, followed by 489 publications are Spanish, 438 publications are Chinese, etc. From the 2nd block years of 2014 – 2019 identified that 31335 research publications. Out of that, the maximum of 29383 publications are the English language, followed by 324 publications are German, 304 publications are Spanish, etc. From the overall ten year study period identified that maximum of 55746 (91.77%) research publications are the English language, followed by 793 (1,31%) publications are Spanish, 722 (1.19%) publications are German, etc.

Global Publication Share and Citations of Top 15 Most Productive Countries

Relative citation index (RCI) was developed by the Institute of Scientific Information (now Thomson Reuters, USA) and examined the impact of different countries and institutions in the field of Pollution Control research publications. The scientific impact of leading countries is analyzed by using two relative indicators, namely citations per paper (CPP) and relative citations index (RCI). Citations per paper (CPP) is a relative indicator computed as the average number of citation per paper. It has been broadly used into the bibliometric studies as it normalizes a large difference in the volumes of publications among most productive countries, institutions, and authors. To measure both, influence and visibility of country research in global wise, the following formula has been used by Bharvi Dutt and Khaiser Nikam (2016)¹⁵

$$\text{RCI} = \frac{\text{A Country share of the World Citations}}{\text{A Country share of the World Publications}}$$

Here

RCI = 1 indicates that a country's citation rate is equal to the world citation rate

RCI > 1 indicates that a country's citation rate is greater than the world citation rate

RCI < 1 indicates that a country's citation rate is lower than the world citation rate

$$\text{CPP} = \frac{\text{Total Citations}}{\text{Total Publications}}$$

Table 5 Country wise Publications in Hepatitis C

S. No	Country Name	Number of Publications			Share of Publications			TC	%	CPP	RCI
		2009-2013	2014-2018	2009-2018	2009-2013	2014-2018	2009-2018				
1	United States	8545	9615	18160	23.50	22.76	23.10	460751	48.96	25.37	2.12
2	Italy	2252	2410	4662	6.19	5.70	5.93	102637	10.91	22.02	1.84
3	Japan	2313	2172	4485	6.36	5.14	5.70	73018	7.76	16.28	1.36
4	China	1533	2299	3832	4.22	5.44	4.87	54146	5.75	14.13	1.18
5	France	1952	1879	3831	5.37	4.45	4.87	114535	12.17	29.90	2.5
6	United Kingdom	1829	1980	3809	5.03	4.69	4.84	106002	11.26	27.83	2.33
7	Germany	1790	1804	3594	4.92	4.27	4.57	107593	11.43	29.94	2.5
8	Spain	1548	1536	3084	4.26	3.64	3.92	74590	7.93	24.19	2.02
9	Canada	1037	1334	2371	2.85	3.16	3.02	72018	7.65	30.37	2.54
10	Australia	904	1159	2063	2.49	2.74	2.62	56138	5.97	27.21	2.27
11	Egypt	774	1149	1923	2.13	2.72	2.45	21769	2.31	11.32	0.95
12	Taiwan	709	862	1571	1.95	2.04	2.00	31762	3.38	20.22	1.69
13	India	581	896	1477	1.60	2.12	1.88	19325	2.05	13.08	1.09
14	Brazil	659	805	1464	1.81	1.91	1.86	21149	2.25	14.45	1.21
15	Switzerland	538	671	1209	1.48	1.59	1.54	47712	5.07	39.46	3.3
16	Others	9405	11683	21088	25.86	27.65	26.82				
Total		28989	30937	78623	100.00	100.00	100.00	941034			

Table 5 shows that block year wise top 15 countries research publications, share, citations, CPP and RCI for hepatitis C research publications during 2009-18. The publications contribution of top 15 most productive countries and others in hepatitis C was identified during 2009-18, which increased from 1st block year 2009-13 with 28989 publications to 2nd block year 2014 - 2018 with 30937 publications. Individually, the global publication share of these 15 countries varied from 1.54% to 23.10% during 2009-18, with highest contribution share of 18160 (23.10%) publications with 460751 citations, CPP is 25.37 and RCI is 2.12 by the United States, followed by Italy 4662 (5.93%) publications with 102637 citations, CPP is 22.02 and RCI is 1.81, Japan 4485(5.70%) publications with 73018 citations, CPP is 16.28 and RCI is 1.36, China 3832(4.87%) publications with 54146 citations, CPP is 14.13 and RCI is 1.18 etc.

During the study period the global publications share has been increased from 1st block years to 2nd block years by 1.23% in China, Egypt (0.59%), India (0.52%), etc. And the same time decreased by 1.22% by Japan, (0.92%) by France and (0.74%) by the United States. The top 15 most productive countries relative citation index are more than the world average of 1 expect Egypt.

Top 15 Authors Contributions in Hepatitis C

Table 6 Top 15 Authors Contributions in Hepatitis C

S. No	Author	Country	Publications	%	Total Citations	%	CPP	h-Index	RCI
1	Zeuzem, S.	Germany	355	11.56	28757	23.95	81.01	73	2.07
2	Alavian, S.M.	Iran	231	7.52	2546	2.12	11.02	26	0.28
3	Chayama, K.	Japan	224	7.29	6159	5.13	27.50	38	0.70
4	Dore, G.J.	Australia	207	6.74	9783	8.15	47.26	49	1.21
5	Pol, S.	France	205	6.68	9554	7.96	46.60	45	1.19
6	Berg, T.	Germany	203	6.61	10375	8.64	51.11	42	1.31
7	Sarrazin, C.	Germany	198	6.45	6398	5.33	32.31	41	0.83
8	Chung, R.T.	USA	196	6.38	6851	5.71	34.95	45	0.89
9	Manns, M.P.	Germany	196	6.38	9654	8.04	49.26	42	1.26
10	Soriano, V.	Spain	191	6.22	3797	3.16	19.88	32	0.51
11	Colombo, M.	Italy	185	6.02	1116	0.93	6.03	35	0.15
12	Grebely, J.	Australia	184	5.99	5764	4.80	31.33	39	0.80
13	Wedemeyer, H.	Germany	174	5.67	7246	6.03	41.64	42	1.07
14	Forns, X.	Spain	165	5.37	6828	5.69	41.38	38	1.06
15	Younossi, Z.M.	USA	157	5.11	5243	4.37	33.39	33	0.85

From the table 6, identified that Zeuzem S., Germany contributed a maximum of 355 (11.56%) publications, followed by Alavian, S.M., Iran contributed 231(7.52%), Chayama K., Japan is 224 (7.29%). Based on the citation contribution maximum of Zeuzem S., Germany 28757(23.95%) citations, citation per paper is 81.01, h-index is 73, and relative citation index is 2.07, followed by Berg T. 10375 (8.64%) citations with CPP is 51.11, h-index is 42, RCI is 1.31. Manns M.P., Germany 9654(8.04%) citations with Cpp is 49.26, h-index is 42, RCI is 1.26. The RCI of top 15 authors is identified that 7 authors are greater than the world average and the remaining 8 authors are below the world average.

Top 15 Most Productive Journals

Table 7 Top 15 Journals Contributions in Hepatitis C

Name of the Journal	Country	No. of Publications			Share of Publications			Impact Factor (2017)
		2009-2013	2014-2018	2009-2018	2009-2013	2014-2018	2009-2018	
Plos One	United States	563	880	1443	1.94	2.84	2.39	2.766
Hepatology	United States	783	619	1402	2.70	2.00	2.35	14.049
Journal Of Hepatology	Netherland	620	584	1204	2.14	1.89	2.01	15.040
Journal Of Viral Hepatitis	UK	470	476	946	1.62	1.54	1.58	4.237
World JI of Gastroenterology	China	329	450	779	1.13	1.45	1.29	3.300
Liver International	UK	310	420	730	1.07	1.36	1.21	4.500
Gastroenterology	UK	315	264	579	1.09	0.85	0.97	20.877
Journal Of Virology	United States	323	255	578	1.11	0.82	0.97	4.663
Transplantation Proceedings	United States	276	203	479	0.95	0.66	0.80	0.806
Journal of Medical Virology	United States	238	226	464	0.82	0.73	0.78	1.988
Hepatitis Monthly	Netherland	268	185	453	0.92	0.60	0.76	1.810
Hepatology Research	UK	207	239	446	0.71	0.77	0.74	3.418
Alimentary Pharmacology & Therapeutics	UK	142	274	416	0.49	0.89	0.69	7.357
Clinical Infectious Diseases	United States	172	241	413	0.59	0.78	0.69	9.117
Liver Transplantation	United States	261	152	413	0.90	0.49	0.70	3.752
Others		23712	25469	49181	81.80	82.33	82.06	
Total World Publications		28989	30937	59926				

Top 15 most productive journals identified in table 7. During the study period maximum of contribution in the journal Plos One, United States is 1443 (2.39%) publications, followed by Hepatology; the United States is 1402 (2.35%) publications, Journal of Hepatology, Netherland is 1204(2.01%).

Top 15 Institutions Contribution in Hepatitis C

Table 8 Top 15 Institutions Contribution in Hepatitis C

Name of the Organizations	Country	Pub.	%	Citation	%	CPP	h-Index	RCI
INSERM	France	1826	17.35	55515	14.91	30.40	104	0.86
AP-HP Assistance Publique - Hopitaux de Paris	France	806	7.66	24306	6.53	30.16	80	0.85
University of California, San Francisco	United States	790	7.51	26624	7.15	33.70	71	0.95
University of New South Wales UNSW Australia	Australia	745	7.08	25116	6.75	33.71	63	0.95
Harvard Medical School	United States	718	6.82	29102	7.82	40.53	78	1.15
VA Medical Center	United States	707	6.72	26477	7.11	37.45	65	1.06
National Institutes of Health, Bethesda	United States	644	6.12	31212	8.39	48.47	80	1.37
Cairo University	Egypt	612	5.82	11567	3.11	18.90	34	0.53
Massachusetts General Hospital	United States	556	5.28	19179	5.15	34.49	70	0.98
Hospital Clinic Barcelona	Spain	549	5.22	22731	6.11	41.40	62	1.17
Icahn School of Medicine at Mount Sinai	United States	548	5.21	21924	5.89	40.01	70	1.13
University of Toronto	Canada	515	4.89	24276	6.52	47.14	59	1.33
Università Degli Studi di Milano	Italy	511	4.86	12843	3.45	25.13	59	0.71
Centers for Disease Control and Prevention	United States	500	4.75	19112	5.13	38.22	57	1.08
UCL	UK	495	4.70	22232	5.97	44.91	55	1.27
Total		10522	100	372216	100	35.38		

During the study period top 15 institutions contribution is identified from table 8, From the study maximum of contribution by INSERM, France is 1826 (17.35%) publications with 55515 (14.91%) citations, 30.40 CPP, h-index is 104, RCI is 0.86., followed by AP-HP Assistance Publique - Hopitaux de Paris, France is 806(7.66%) publications with 24306 (6.53%) citations, 30.16 CPP, h-index is 80, RCI is 0.85. The third place is the University of California, San Francisco; the United States is 790(7.51%) publications with 26624 (7.15%) citations, 33.70CPP, h-index is 71, RCI is 0.95. The Relative Citation Index of top 15 institutions identified in that 8 institutions are greater than the world average and remaining 7 institutions are below the world average.

Major Findings and Conclusion

- There are 59926 research publications identified in hepatitis C during the study period, and maximum of 6547 (10.93%) publications are contributed in the year 2015.
- The RGR has been decreasing trend from (0.71) in 2009 to (0.10) in 2018. Correspondingly the doubling time (Dt) has been increasing from 0.98 in 2010 to 7.28 in 2018.
- This study identified that a maximum of 41141 (68.65%) research publications are contributed by article and 55746 (91.77%) research publications are the English language.
- From this study highest contribution share of 18160 (23.10%) publications with 460751 citations, CPP is 25.37 and RCI is 2.12 by the United States and expect Egypt top 15 most productive countries relative citation index is more than the world average.
- During the study it is identified that Zeuzem S., Germany contributed a maximum of 355 (11.56%) publications with 28757 (23.95%) citations, citation per paper is 81.01, h-index is 73, and relative citation index is 2.07.
- During the study period maximum of 1443 (2.39%) publications in the journal of Plos One and the institution INSERM, France is 1826 (17.35%) publications with 55515 (14.91%) citations, 30.40 CPP, h-index is 104 and RCI is 0.86.
- The overall ten year study period identified that the contributions of hepatitis C from SCOPUS database is average growth. The disease is the biggest task to solve in this world to survive for the human begins, day by day the new infections are occupying in the human body. Hepatitis C is one of the types of disease that causes death worldwide. So this study concludes that must increase in the field of hepatitis C research in the world wild.

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