



## SCIENTO METRIC ANALYSIS OF HEMATOLOGY RESEARCH PERFORMANCE

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### **Abstract**

*This paper discusses on Scientometric analysis on hematology research performance, objective of the study; to find out year wise publications on hematology research during the study period, to examine authorship pattern, to find out top ten institutions contributed in on hematology research, to identify top twenty countries contributed in on hematology research. The data have been collected from the Web of Science database; the study period is during (2011-2020).The study reveals that, year wise research publications on hematology in the year 2020 have published 13.13 per cent publications, single author contributions are less compare with multi authored contribution. language wise research publication on hematology research 92.24 per cent of papers ware contributed in English language, 2.89 per cent of papers were contributed in German language, in Spanish 1.43 per cent of papers published, 2.35 per cent of papers were contributed in French language. Institutions wise contributed in hematology research Harvard University has first position with 90 contributions, Mayo Clinic has Second position with 64 contributions, University of Texas System has third position with 63 contributions.*

**Keywords:** *Hematology, blood diseases, Anemia, Pneumonia, Para influenza.*

### **Introduction**

Hematology is the study of blood and blood-forming organs, including the diagnosis, treatment, and prevention of diseases of the blood, bone marrow, and immunologic, hemostatic, and vascular systems. Hematology has become more important for disease recognition and treatment (Ida M. Washington, Gerald Van Hoosier 2012). **Hematology**, also spelled **haematology**, branch of medical science concerned with the nature, function, and diseases of the blood (Britannica 2019). Hematology deals with blood diseases like Anemia, Sickle Cell Disease, Thalassaemia, Hemophilia, Platelet disorders, various cancers like Leukemia, Myelomas, Lymphomas, Myeloproliferative Neoplasms (MPNs) and Chronic Lympho-proliferative Disorders (CLPD) etc. (<https://scbmch.in/clinical-hematology-dept/>). Blood disorders in lupus include anemia, platelet disorders, white blood cell disorders, and clotting disorders. The most common types of anemia are anemia of chronic disease, iron deficiency anemia, and hemolytic anemia. Commonly encountered platelet disorders include ITP and antiphospholipid syndrome (Zuzana Uhrin). Anaemia is a serious global public health problem that particularly affects young children and pregnant women. WHO estimates that 42% of children less than 5 years of age and 40% of pregnant women worldwide are anaemic (World Health Organization). Hematology aims to understand how these problems occur, how they affect a person's health, and how to treat them (Aaron Kandola 2020).

### **Methodology**

The data have been collected from the Web of Science database; the study period is during (2011-2020). The search string was used 'hematology' in the Title search box, field was used, and the time span field was select from 2011 to 2020. A total of 3016 records were retrieved, the data downloaded and analyzed using MS office-Excel as per objectives of the present study.



**Relative Growth Rate (RGT) and Doubling Time (DT)**

The relative growth rate is the increase in the number of publications/pages per unit of time. Here, one year is taken as the unit of time. The mean relative growth rate R (1-2) over a specified period of interval can be calculated from the following equation suggested by Mahapatra (1985).

$$R (1 - 2) = \frac{W2 - W1}{T2 - T1}$$

Where,

- R = Mean relative growth rate over the specific period of interval;
- W1 = log w1 (Natural log of initial number of publications/ pages);
- W2 = log w2 (Natural log of initial number of publications/pages);
- T2-T1 = Unit difference between the initial time and final time.

Therefore,

- R (a) = Relative growth rate per unit of publications per unit of time (year)
- R (p) = Relative growth rate per unit of pages per unit of time (year)

**Doubling Time (DT)**

A direct equivalence exists between the relative growth rate and doubling time. If the number of publications/pages of a subject doubles during a given period, then the difference between the logarithms of the numbers at the beginning and at the end of the period must be the logarithms of the number 2. This difference has a value of 0.693. Thus, the corresponding doubling time for publication and pages can be calculated by the following formula:

$$\text{Doubling time (Dt)} = \frac{0.693}{R}$$

Therefore,

$$\text{Doubling time for publications Dt (a)} = \frac{0.693}{R(a)}$$

**Objectives**

The following objectives are framed for the present study;

- To find out year wise publications on hematology research during the study period
- To identify document types wise hematology research publications
- To examine authorship pattern on hematology research performance
- To find out top ten institutions contributed on hematology research
- To find top ten sources contributions on hematology research
- To identify top twenty countries contributed on hematology research publications



**Analysis and Interpretation**

**Table 1 year wise research publications on hematology research**

Sl. No.	Publication Years	No. of Records	Percentages
1	2011	201	6.66
2	2012	230	7.63
3	2013	261	8.65
4	2014	273	9.05
5	2015	290	9.62
6	2016	297	9.85
7	2017	356	11.80
8	2018	349	11.57
9	2019	363	12.04
10	2020	396	13.13
	Total	3016	100.00

Table 1 shows that year wise research publications on hematology during the study period,2020 have published 13.13 percent publications, 2019 have 12.04 percent publications, 2018 have published 11.57 per cent publications, followed by 2017 have published 11.80 percent publications, 2016 have published 9.85 per cent publications, 2015 have published 9.62 per cent publications, 2014 have 9.05 per cent publications, 2013 have published 8.65 per cent publications, 2012 have published 7.63 per cent publications, 2011 have published 6.66 per cent publication. It found that the year wise publications on hematology research during from 2011 to 2020 shows on Increasing trend.

**Table 2 Relative Growth Rate and Doubling Time of hematology research publications**

Sl. No.	Publication Years	No. of Records	Cumulative	W1	W2	W2 - W1 (Ra)	Mean (Ra) W2-W1	Doubling Time	Mean Dt (a)
1	2011	201	201		5.30				
2	2012	230	431	5.30	5.43	0.13		5.33	
3	2013	261	692	5.43	5.56	0.13		5.33	
4	2014	273	965	5.56	5.60	0.04		17.33	
5	2015	290	1255	5.60	5.67	0.07	0.09	9.90	9.47
6	2016	297	1552	5.67	5.69	0.02		34.65	
7	2017	356	1908	5.69	5.87	0.18		3.85	
8	2018	349	2257	5.87	5.85	-0.02		-34.65	
9	2019	363	2620	5.85	5.89	0.04		17.33	
10	2020	396	3016	5.89	5.98	0.09	0.06	7.70	5.77
	Total	3016					0.08		7.62

Table 2 shows that, Relative Growth Rate and Doubling Time of hematology research publications during from 2011 to 2020. It can be seen in the table, the value of average relative growth rate of publications [R(a)] decreased and increased gradually from 0.05 to 0.38 during 2011 to 2020, the corresponding mean doubling time [Dt(a)] for the period increasing from 5.00 to 16.58.



**Table 3 document type wise research publications on hematology research**

Sl. No.	Document types	No. of Records	Percentages
1	Articles	1270	42.10
2	Meeting Abstracts	1168	38.73
3	Editorial Materials	213	7.06
4	Review Articles	155	5.14
5	Letters	117	3.88
6	News Items	22	0.73
7	Corrections	20	0.66
8	Proceedings Papers	19	0.63
9	Book Reviews	11	0.37
10	Biographical-Items	10	0.33
11	Early Access	6	0.20
12	Reprints	2	0.07
13	Book Chapters	1	0.03
14	Meeting Summary	1	0.03
15	Poetry	1	0.03
	Total	3016	100.00

Table 3 shows that document types wise research papers published in hematology research, totally fifteen document types are contributed in this research, among the fifteen document types, Articles are highly contributed with 42.10 per cent of publications. Meeting abstracts has 38.73 percent contributions, Editorial Materials are contributed 7.06 per cent, Review articles are 5.14 per cent, Letters types are contributed 3.88 per cent, followed by News Items, Corrections, Proceedings Papers, Book Reviews, Biographical-Items, Early Access, Reprints, Book Chapters, Meeting Summary and Poetry are contributed below 1.0 per cent. It found that the document types wise papers published on hematology research, articles are more contributions compare to other document type of publications.

**Table 4 top ten prolific authors contributed on hematology research**

Sl. No.	Authors	No. of Records	% of 3016
1	Cesaro S	28	0.93
2	Maschmeyer G	22	0.73
3	Buchheidt D	18	0.60
4	Marshall AL	18	0.60
5	Azoulay E	15	0.50
6	Penack O	15	0.50
7	Schmidt-hieber M	13	0.43
8	Bracco D	12	0.40
9	Cornely OA	12	0.40
10	Engelhardt M	12	0.40



Table 4 shows that top ten prolific authors contributed on hematology research, totally 13836 authors were contributed in this research during the study period, Among the ten authors, Cesaro Shas first position with 28 contributions, Maschmeyer G has second position with 22 contributions, followed by Buchheidt D, and Marshall AL has third place with 18 contributions respectively, Azoulay E, and Penack O has 15 contribution with fourth place respectively, Schmidt-hieber M, has fifth place with 13 contributions respectively and Bracco D, Cornely OA, and Engelhardt M has sixth position with 12 contributions, the remaining 13826 authors were contributed below 12 contributions.

**Table 5 authorship pattern on hematology research publications**

Sl. No.	Authorship pattern	No. of papers	Percentages
1	Single	136	4.51
2	Double	197	6.53
3	Three	242	8.02
4	Four	427	14.16
5	Five	963	31.93
6	Six and Above	1051	34.85
	Total	3016	100.00

Table 5 shows that authorship pattern on hematology research performance, 3016 papers were contributed by 13836 authors. Among the authorship pattern, Six and above authors collaborative contributions are high with 1051 papers, five authors collaborative contributions are 963 papers, four authors collaborative contributions are 427 papers, three authors collaborative contributions are 242 papers, double authors collaborative are 197 papers, and Single author contributions are 136 papers. It reveals that single author contributions are less compare with multi authored papers.

**Table 6 language wise publication on hematology research**

Sl. No.	Languages	No. of Records	% of 3016
1	English	2782	92.24
2	German	87	2.89
3	Spanish	71	2.35
4	French	43	1.43
5	Russian	14	0.46
6	Portuguese	11	0.37
7	Hungarian	3	0.10
8	Croatian	2	0.07
9	Polish	1	0.03
10	Serbian	1	0.03
11	Turkish	1	0.03
	Total	3016	100.00

Table 6 shows that language wise research publication on hematology research, 3016 papers are contributed in eleven languages. Among the eleven languages, 92.24 per cent of papers were contributed in English language, 2.89 per cent of papers were contributed in German language, in Spanish 1.43 per cent of papers published, 2.35 per cent of papers were contributed in French



language, 0.43 per cent of papers are in Russian language, 0.37 per cent of papers are in Portuguese languages, 0.10 per cent of papers are in Hungarian language, 0.07 percent papers are in Croatian, 0.03 per cent of papers are in Polish, Serbian and ,Turkish language.

**Table 7 top ten institutions contributed in hematology research publications**

Sl. No.	Institutions	No. of Records	% of 3016
1	Harvard University	90	2.98
2	Mayo Clinic	64	2.12
3	University of Texas System	63	2.09
4	University of Toronto	59	1.96
5	University of California System	58	1.92
6	Assistance Publique Hopitaux Paris APHP	49	1.63
7	State University System of Florida	49	1.63
8	Dana Farber Cancer Institute	45	1.49
9	St Jude Children s Research Hospital	45	1.49
10	University of Pennsylvania	43	1.43
11	Ruprecht Karls University Heidelberg	41	1.36
12	Unicancer	38	1.26

Table 7 shows that top ten institutions contributed in hematology research publications, totally 3679 institutions were contributed in hematology research, among the top ten institutions, Harvard University has first position with 90 contributions, Mayo Clinic has Second position with 64 contributions, University of Texas System has third position with 63 contributions, University of Toronto has fourth position with 59 contributions, University of California System has fifth position with 58 contributions, Assistance Publique Hopitaux Paris APHP, and State University System of Florida has sixth position with 49 contributions respectively, Dana Farber Cancer Institute, and St Jude Children s Research Hospital has seventh position with 45 contributions, University of Pennsylvania has eighth position with 43 contributions, Ruprecht Karls University Heidelberg has ninth position with 41 contributions, Unicancer and has tenth position with 38 contributions. It found that institutions wise contributed in hematology research publications universities are more contributed in this research.

**Table 8 top ten sources contributed in hematology research**

Sl. No.	Sources name	No. of Records	% of 3016
1	Pediatric Blood Cancer	258	8.55
2	International Journal of Laboratory Hematology	239	7.92
3	Blood	183	6.07
4	Haematologica	145	4.81
5	Journal of Clinical Oncology	104	3.45
6	Oncology Nursing Forum	64	2.12
7	Bone Marrow Transplantation	46	1.53
8	Oncology Research and Treatment	46	1.53



9	Blood Advances	41	1.36
10	Transfusion	41	1.36
11	Veterinary Clinical Pathology	41	1.36
12	Clinical Chemistry and Laboratory Medicine	38	1.26
13	Journal of Zoo and Wildlife Medicine	32	1.06

Table 8 indicates that top ten sources contributed in hematology research publications; totally 665 sources were contributed 3016 papers in hematology research. Among the top ten sources Pediatric Blood Cancer have occupies first place with 258 papers, International Journal of Laboratory Hematology has second place with 239 papers, Blood has third place with 183 papers, Hematological has fourth place with 145 papers, Journal of Clinical Oncology has fifth place with 38 publications, Oncology Nursing Forum has sixth place with 64 paper published, Bone Marrow Transplantation, and Oncology Research and Treatment has seventh place with 46 papers respectively, Blood Advances, Transfusion, and Veterinary Clinical Pathology has eighth place 41 papers, Clinical Chemistry and Laboratory Medicine has ninth place with 38 papers, and Journal of Zoo and Wildlife Medicine has tenth place with 32paper publications in hematology research during the study period.

**Table 9 Top Twenty Countries contributed on hematology research publications**

Sl. No.	Countries/Regions	No. of Records	% of 3016
1	USA	1036	34.35
2	Germany	229	7.59
3	Italy	200	6.63
4	Canada	164	5.44
5	France	145	4.81
6	Spain	141	4.68
7	Peoples R China	130	4.31
8	Japan	103	3.42
9	Brazil	95	3.15
10	South Korea	86	2.85
11	England	84	2.79
12	Netherlands	80	2.65
13	India	76	2.52
14	Turkey	71	2.35
15	Australia	64	2.12
16	Belgium	52	1.72
17	Pakistan	46	1.53
18	Austria	39	1.29
19	Sweden	39	1.29
20	Russia	36	1.19
21	Iran	35	1.16
22	Switzerland	35	1.16



Table 9 shows that top twenty countries contributed in hematology research publications, totally 144 countries contributed in hematology research publications during 2011- 2020, USA has occupies first position with 1036 contributions in hematology research publications, followed by Germany has second place with 229 contributions, Italy has third place with contributions, Canada has fourth place with 164 contributions, France has fifth place with 145 contributions, Spain has sixth place with 141 contributions, Peoples R China has seventh place with 130 contributions, Japan has eighth place with 130 papers, Brazil has ninth place with 105 paper contributions, South Korea has tenth place with 86 papers, England has occupies eleventh position with 84 contributions in hematology research publications, Netherlands has twelfth place with 80 contributions, India has thirteenth place with 76 contributions, Turkey has fourteenth place with 71 contributions, Australia has fifteenth place with 64 contributions, Belgium has sixteenth place with 52 contributions, Pakistan has seventeenth place with 46 contributions, Austria, and Sweden has eighteenth place with 39 papers, Russia has nineteenth place with 36 paper contributions, Iran and Switzerland has tenth place with 35 paper contributions, the remaining 122 counties were contributed below 35 contributions in hematology research.

### Conclusion

Conclude from the present study, hematology research performance the year wise, 2020 have published 13.13 percent publications, 2019 has 12.04 percent publications, 2018 have published 11.57 per cent publications, followed by 2017 have published 11.80 percent publications and the remaining years have published below 10 per cent. The document types wise papers published on hematology research, articles are more contributions compare to other document type of publications. Totally 13836 authors were contributed in this research during the study period, among the authors, Cesaro S has first position with 28 contributions, single author contributions are less compare with multi authored papers, totally 3679 institutions were contributed in hematology research, among the institutions, Harvard University has first position with 90 contributions, Mayo Clinic has Second position with 64 contributions, University of Texas System has third position with 63 contributions, University of Toronto has fourth position with 59 contributions, University of California System has fifth position with 58 contributions, the institutions wise contributed in hematology research publications universities are more contributed in this research. Totally 144 countries contributed in hematology research publications research. USA has occupied first position with 1036 contributions in hematology research publications, Germany has second place with 229 contributions, Italy has third place with contributions, Canada has fourth place with 164 contributions, India has thirteenth place with 76 contributions.

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