

# MAPPING THE RESEARCH OUTPUT ON 'BLOOD CANCER' LITERATURE USING SCOPUS DATABASE: A BIBLIOMETRIC ANALYSIS DURING 2009-2018

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## ABSTRACT

This paper presents a bibliometric study of Blood Cancer for the period of 10 years (2009-2018). The total number of publications during the period of study was 19662. Blood cancer is being increasingly identified in patients, and many relevant articles have been published in this field. However, no bibliometric analysis has been conducted on blood cancer. The aim of this paper was to analyze the authorship pattern, subject wise distribution, geographical distribution, annual growth rate of publications with number of citations and found that 5678 publications were contributed by single authors, followed by 2792 records by two authors. M.W Saif was the most productive author with a maximum number of publications i.e. 190 with 8193 total citations, followed by A. Maitra has contributed to 166 publications with a total 50976 citations in the period of study.

**Keywords:** Human, Article, Blood Cancer, Blood Tumerous cells, Leukemia, Lymphoma, Myeloma, Blood Cancer, Priority Journal, Female /Male Blood Cancer.

## 1. INTRODUCTION

It is the type of cancer that occurs in the blood cells. The tumorous cells start forming in bone marrow where blood is produced. The stem cells in bone marrow mature and later develop into three types of cells namely: red blood cells, white blood cells and platelets. In blood cancer, mostly the normal blood cell development process is interrupted by uncontrolled growth of an abnormal type of blood cell and then, these abnormal tumorous cells prevent the blood of body from performing many of its normal functions like fighting off infections or serious bleeding. There are three main types of blood cancers i.e. Leukemia, a type of cancer found in blood and bone marrow and is caused by the rapid growth of abnormal white blood cells that loose the ability of the bone marrow to produce red blood cells and platelets. Another type is Lymphoma which removes excess fluids from your body and produces immune cells. The third main type is Myeloma i.e. the cancer of plasma cells. Plasma cells are white blood cells that produce disease- and infection-fighting antibodies in your body. Myeloma cells prevent the normal production of antibodies, leaving your body's immune system weakened and susceptible to infection. Some common bone marrow and blood cancer symptoms include fever, chills, persistent fatigue, weakness, loss of appetite, nausea, weight loss, joint pain, headaches, shortness of breath, frequent infections, swollen lymph nodes in the neck, etc. Many tests like biopsy, imaging scans, blood tests are further carried out by the doctor for the early detection of the cancer. "Around 3 percent of all cancers in the united states are pancreatic cancers. In 2018, they reached about 55,440 people to receive a diagnosis of blood cancer."

The term bibliometrics is given by Allan Pritchard in 1969. The term is comprised of two words 'biblio' and 'metrics'. The word 'biblio' is derived from the Greek word "biblion" which means book and the word 'metrics' is derived from the word "metricos" which means measurement. Bibliometrics is the study of

statistical analysis of texts, especially of published literature. Bibliometrics is that part of information theory that quantitatively analyze the properties and behavior of recorded knowledge.

## **2. SCOPE OF THE STUDY**

The scope of the present study is limited to analyze the publications of blood cancer and it is limited to ten years i.e. (2009-2018). It covers the authorship pattern of publications with citations covering geographical distribution of country wise publications. It focuses to analyze the overall literature growth on the Blood Cancer.

## **3. LITERATURE REVIEW**

Ram (2017) conducted a bibliometric study on Indian contribution to breast cancer research during the period (1975-2014) and the primary data was collected by using the Scopus database. The study examine various bibliometric parameters such as Indian contribution in breast cancer, Indian institutions in the particular research field, most productive authors, preferred journal and geographical distribution of publications in the particular research field and found that the contribution of India increasing year by year and the maximum 80% increasing in the last ten years, the most productive Indian institution was Tata Memorial Hospital i.e. 428 contribution, however, the prolific author was Sachdanandam, P. from the University of Madras with 50 publications. The most dynamic source having maximum number of contributions is the Indian Journal of Cancer with 205 total publications and it is the most preferred journal of Indians for cancer literature.

Glynn, R.W. et al (2010) carried out a bibliometric analysis on breast cancer research from the marked period of (1945-2008) and source of data were Web of Science (WOS) and Science Citation Expanded database. The study analyze various parameters like the growth of literature published, authorship pattern, most preferred journal, and the leading countries that have maximum contribution to the study and found that the 180126 publications are being produced on the topic during the period. It is seen that publications are increasing yearly where the journal with maximum output is Cancer Research having 5,290 records. About 155 countries contributed to the literature where US is the leading country with maximum output of 77101 publications.

Gong, Z. & others (2006) accomplished an article concerning relationship between obesity, diabetes and prostate cancer. The data was being derived based on about 10,258 participants including 1,936 prostate cancer patients. The study investigates the relation of obesity, including body mass index (BMI) and abdominal obesity, and diabetes with pancreatic risk using data from Prostate Cancer Prevention Trial (PCPT). "Obesity increases the risk of high-grade but decreases the risk of low-grade prostate cancer, and this relationship is independent of the lower risk for prostate cancer among men with diabetes." It also considered demographic distribution, anthropometric impact, health related variables of cases, its control, associations of diabetes with prostate cancer, associations between anthropometric measures and prostate cancer risk and inspected that from the sample of 10,258 men, 18.9% (1,936) were resulted with prostate cancer and 95.3% of these were local stage cancers and 23.6% were high grade. It states that men with diabetes had a 34% lower risk of prostate cancer in comparison to men without diabetes and the study came out with a major finding that height also influences prostate cancer risk. The men in highest quartiles had 22% increased risk of prostate cancer compared to men in the lowest quartiles but it can be controlled by maintaining static body mass index (BMI).

Patra, S.K. & Bhattacharya, P. (2005) conducted a bibliometric study of cancer research in India and the source of data was Pub Med database. The study examine the various parameters such as growth trend of cancer literature, country wise distribution of literature, authorship pattern and found that there is uneven

variations in the growth rate of cancer but on an average around 500 papers were published yearly. The study analyze the country with maximum number of publications was USA i.e. 153341; however, the prolific author was Nair, M.K. from Regional Cancer Centre with 167 publications.

Moodley, J. & others (2015) performed cancer research in South Africa and he focused on the research publication trends, pattern of collaboration, pattern author affiliations and institutional contributions. The data of the research has been retrieved from various databases like PubMed, SCOPUS, Web of Science and EBSCO and so the conclusions has been derived on basis of data from these databases. In this paper they concluded that the cancer is emerging as a critical health problem and is rising globally. It is critically affecting a vast area of population over the world. This paper provides an analysis of measure of productivity, determination of quantity and quality of research publications and the identification of gaps in cancer research and it states that the research is carried out to identify all the causes of the disease and the preventions are mentioned to be taken to reduce the risk of cancer and early diagnosis of cancer so that it can be cured.

Finocchiaro-Kessler, S. & others (2016) conducted a study of cancer concerned with the lowermost part of uterus i.e. cervical cancer in which he gave a systematic review from a public health perspective. They searched many online databases including PubMed/ MEDLINE (NCBI), Embase (Elsevier), African Index Medicus (AIM) and Google scholar for data retrieval. The paper is mentioned with the growth of cancer among women and its causes, prevention and treatment are being discussed. It shows that cervical cancer is the second most common cancer among women worldwide with 528,000 new cases and 266,000 deaths among women each year from which 87% deaths occur among low and middle income countries. Africa is the continent with the maximum cases where the disease is immensely increasing and they also analyzed the articles/reports published over a particular period and mentioned that 56.6% of cervical cancer research is focused on secondary prevention (i.e. screening) and there were 23.4% publications that focus on primary prevention of cancer. From the past decade HPV vaccination is the most used prevention against it. He concluded that 11.3% publications are linked to cervical cancer among HIV infected women while, 17.1% are focused on aspects of feasibility for cervical cancer control. It also states that research regarding the treatment of cancer lesions and invasive cervical cancer is steadily increasing over the past decade but still there are many infected countries in Africa with little or no research on cervical cancer.

Sitarz, R. & others (2018) presented a paper on cancer related to gastric cancer and discussed its epidemiology, prevention, classification and treatment. Various parameters had taken into consideration like standards of hygiene, age groups of affected population, type of gastric cancer and the main cause of infection with their primary, secondary and later stage preventions. The study resulted with the findings that gastric carcinoma is found with 989,600 new cases per year and second cause of deaths with 738,000 deaths among world. The high risk areas are East Asia (China and Japan), Eastern Europe, Central and South America and area with low risk are southern Asia, north and east Africa, North America, Australia and New Zealand. In 1982, Marshal and warren discovered the association between H. pylori and gastritis and in 1992, International agency for research on research classified H. pylori as class first carcinogen and further it is accused of main environmental organism causing gastric cancer. The article is also given with a description of cancer types and its causes which results into 80% of GC are sporadic gastric cancer, 10% are early onset, 7% are gastric stump cancer and 3% are hereditary diffuse gastric cancer but a steady decline in gastric cancer incidence rate is observed that may be explained by the effect of increased standards of hygiene, improved food conservation, high intake of fresh fruits and by eradication of Helicobacter pylori.

#### **4. OBJECTIVES OF THE STUDY**

The objectives of the study are as follows:-

1. To analyze the year wise contribution and annual growth rate (AGR) of research publications during the selected period .

2. To examine authorship pattern of publications with their citations.
3. To find out country wise distribution of publications during the study period.
4. To examine source titles with their number of publications.
5. To analyze the reference distribution, a number of references per article and authorship pattern.

**5. METHODOLOGY**

The data is retrieved from Scopus database and it is International online database from Elsevier. It is available on subscription basis covering about 36,377 titles of which 34,346 are peer reviewed journals. The following keyword were used to retrieve the primary data ("BLOOD CANCER") AND (LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2015) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2012) OR LIMIT-TO (PUBYEAR, 2011) OR LIMIT-TO (PUBYEAR, 2010) OR LIMIT-TO (PUBYEAR, 2009)) AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (AFFILCOUNTRY, "United States") OR LIMIT-TO (AFFILCOUNTRY, "China" ) OR LIMIT-TO (AFFILCOUNTRY, "Japan") OR LIMIT-TO (AFFILCOUNTRY, "Germany") OR LIMIT-TO (AFFILCOUNTRY, "United Kingdom") OR LIMIT-TO (AFFILCOUNTRY, "Italy") OR LIMIT-TO (AFFILCOUNTRY, "France") OR LIMIT-TO (AFFILCOUNTRY, "South Korea") OR LIMIT-TO (AFFILCOUNTRY, "Spain") OR LIMIT-TO (AFFILCOUNTRY, "Canada")) AND (LIMIT-TO LANGUAGE, "English" ))) . The data is retrieved from the Scopus database and the total record of 19662 publications were found with proper bibliographical details like year wise distribution, authors contributions, geographical distribution, affiliations, document types etc. then it is tabulated in MS Excel software where many graphical representations are being added for better understanding of extracted findings. All the tables and figures are copied from the Excel sheet to the final work in MS Word.

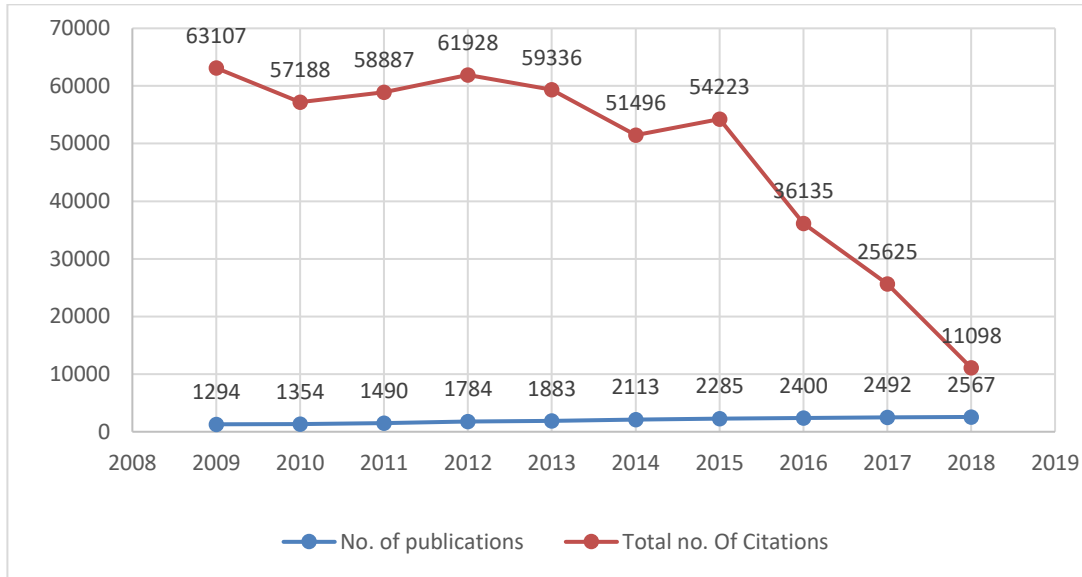
**6. DATA ANALYSIS**

**6.1 YEARB WISE DISTRIBUTION OF PUBLICATIONS**

Table and Figure 1 describes the year wise number of publications with annual growth rate and found that 19662 publications were published during the period of 10 years (2009-2018).The highest number of publications were during the year of 2018 i.e.2567 with annual growth rate(AGR) 3. The second highest number of publications during the year of 2017 i.e. 2492with the annual growth rate (AGR) 3.83. The lowest numbers of publications were during the year of 2009 i.e.1294 with the annual growth rate (AGR) 0. The complete distribution of number of publications with citations is depicted in the below mentioned graph.

<b>Years</b>	<b>No. of publications</b>	<b>Annual Growth Rate</b>	<b>Total no. Of Citations</b>
2009	1294	0	63107
2010	1354	4.63	57188
2011	1490	10.04	58887
2012	1784	19.73	61928
2013	1883	5.54	59336
2014	2113	12.21	51496
2015	2285	8.14	54223
2016	2400	5.03	36135

2017	2492	3.83	25625
2018	2567	3	11098
<b>Total</b>	<b>19662</b>		<b>479023</b>



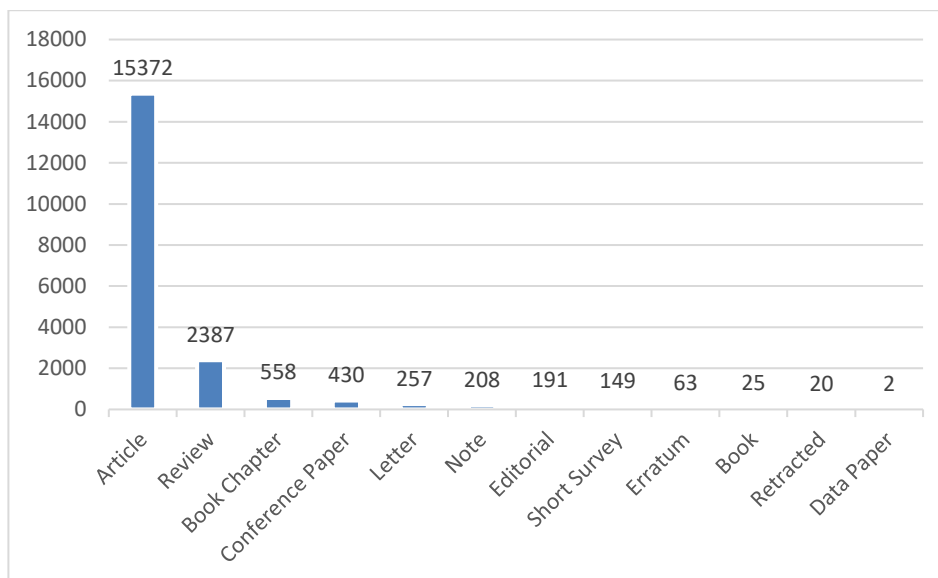
**Figure 1: Year Wise Distribution of Publications**

**6.2 TYPE OF DOUCUMENTS PUBLISHED IN THE STUDY PERIOD**

Table 2 presents the data on Article/ Review/ Book Chapter/ Conference Paper/ Letter/ Note/ Editorial and data paper published during the year 2009-2018. It indicates that 15372 (78.18%) of articles were published during the year 2009-2018. In addition to research articles 2387 reviews records were published, 430 Conference papers, 257 Letters, 208 Notes, 191 Editorial and 149 short surveys has been published. The below table has been shown that the format of publications and the maximum numbers of publications are published as articles during the period of study.

Document Type	No. of publications	Percentage (%)
Article	15372	78.18%
Review	2387	12.14%
Book Chapter	558	2.84%
Conference Paper	430	2.19%
Letter	257	1.31%
Note	208	1.06%
Editorial	191	0.97%
Short Survey	149	0.76%
Erratum	63	0.32%
Book	25	0.13%
Retracted	20	0.10%
Data Paper	2	0.01%

<b>Total</b>	<b>19662</b>	<b>100.00%</b>
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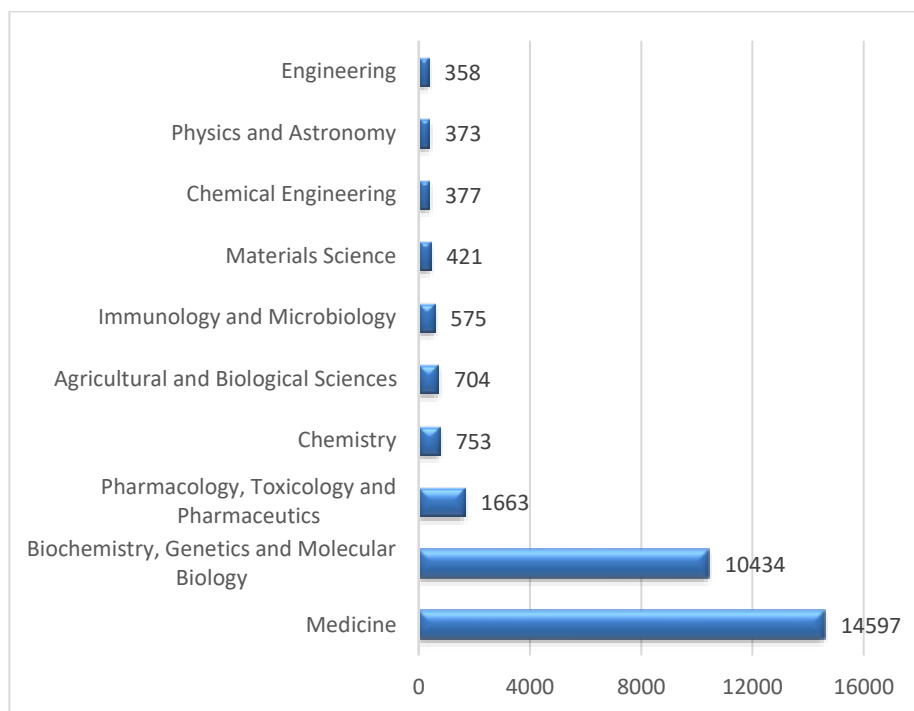


**Figure 2: Types of documents with their no. of publications**

**6.3 SUBJECT WISE DISTRIBUTION OF PUBLICATIONS**

Table 3 describes the subject wise distribution during the period of study (2009-2018). This table shows that the highest numbers of publication were 14597 from Medicine. The number of publications by Biochemistry, Genetics and Molecular Biology were 10434. The lowest numbers of publications were 358 from engineering. This table shows the top 10 subject wise distribution with their number of publications and it is observed that medicine is the subject contributing maximum to the research.

<b>Subject Area</b>	<b>No. Of Publications</b>
Medicine	14597
Biochemistry, Genetics and Molecular Biology	10434
Pharmacology, Toxicology and Pharmaceutics	1663
Chemistry	753
Agricultural and Biological Sciences	704
Immunology and Microbiology	575
Materials Science	421
Chemical Engineering	377
Physics and Astronomy	373
Engineering	358



**Figure 3: Subject area with no. of publications**

**6.4 AUTHORS WITH THEIR AFFILIATIONS**

Table 4 describes the top 20 author’s affiliations, h-index and a total number of citations from the marked period of study. The maximum number of publications were 190 done by Saif, M.W. from the Tufts Medical Center, Boston, United States with 8193 citations and 42 h-index followed by Maitra, A. from University of Texas MD Anderson Cancer Center, Houston, United States with 160 publications, 50976 citations and having 109 h index. The minimum numbers of publications were 81 done by Yu, X. with 3222 cited articles and 33 h-index. The overall data of the top 20 author’s affiliations, h-index and a total number of citations was shown in below table 4.

<b>Table 4: TOP 20 AUTHORS WITH THEIR AFFILIATIONS, NO. OF PUBLICATIONS, h-INDEX AND NO. OF CITATIONS</b>				
<b>Author Name</b>	<b>Affiliations</b>	<b>No. of Publications</b>	<b>h-index</b>	<b>Total Citations</b>
Saif, M.W.	Tufts Medical Center, Boston, United States	190	42	8193
Maitra, A.	University of Texas MD Anderson Cancer Center, Houston, United States	166	109	50976
Hruban, R.H.	Johns Hopkins Medical Institutions, Baltimore, United States	153	166	108909
Buchler, M.W.	Universität Heidelberg, Heidelberg, Germany	121	136	88328
Friess, H.	Technical University of Munich, Munich, Germany	117	113	55263
Petersen, G.M.	Mayo Clinic, Rochester, United States	113	96	42657
Wolfgang, C.L.	Johns Hopkins Medical Institutions, Baltimore,	113	76	23130

	United States			
Fleming, J.B.	Moffitt Cancer Center, Tampa, United States	99	52	12831
Werner, J.	German Cancer Research Center, Heidelberg, Germany	97	56	11025
Hoffman, R.M.	AntiCancer Incorporated, San Diego, United States	96	91	34214
Kleeff, J.	Martin-Universität Halle-Wittenberg, Halle, Germany	96	71	18206
Batra, S.K.	University of Nebraska Medical Center, Omaha, United States	93	72	19095
Herman, J.M.	University of Texas MD Anderson Cancer Center, Houston, United States	93	57	12086
Goggins, M.	The Johns Hopkins School of Medicine, Baltimore, United States	88	102	35998
Wang, H.	University of Texas MD Anderson Cancer Center, Houston, United States	84	61	13100
Neoptolemos, J.P.	University of Liverpool, Liverpool, United Kingdom	83	94	38788
Bouvet, M.	University of California, San Diego, San Diego, United States	81	57	10323
Hackert, T.	Universitysklinikum Heidelberg, Heidelberg, Germany	81	38	5873
Ma, Q.	Chinese Academy of Medical Sciences, Beijing, China	81	36	4330
Yu, X.	Fudan University Shanghai Medical College, Shanghai, China	81	33	3222

**6.5 AUTHORSHIP PATTERN OF THE ‘BLOOD CANCER’ LITERATURE RESEARCH**

Table 5 describes the clear picture of articles published by authors. Total number of publications published during the period of study is 19662 from which the number of articles published by single authors is 5687 publications, followed by 2792 records were contributed by two authors and 2317 research papers were published by three authors while 2167 articles are published by four authors and the overall data of author wise publications are represented in the below mentioned table 5.

Years	Single	Two	Three	Four	Five	More than Five	Total
2009	323	205	155	144	130	337	1294
2010	355	209	138	147	144	361	1354
2011	396	186	172	145	193	398	1490

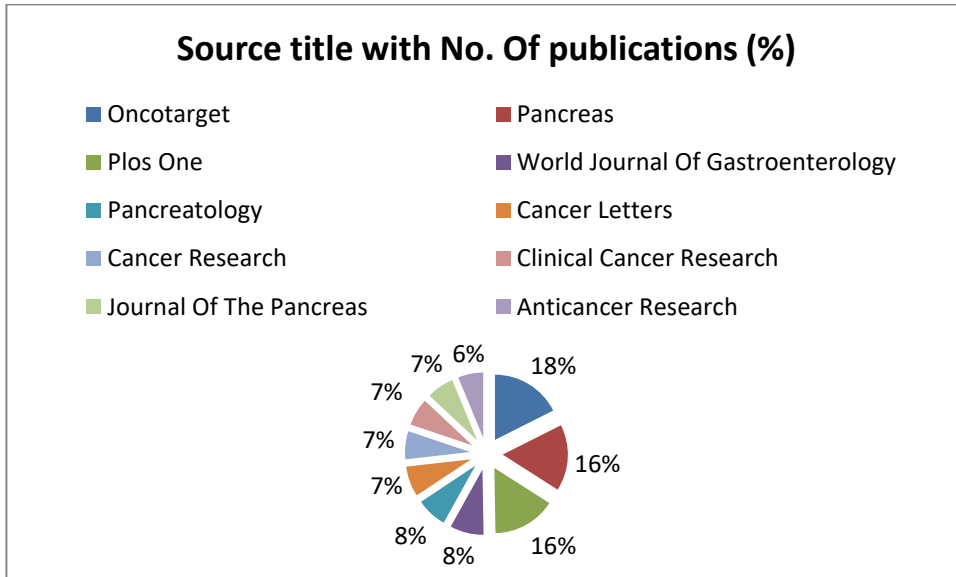


2012	506	264	215	205	198	396	1784
2013	530	259	231	195	222	446	1883
2014	616	291	255	233	229	489	2113
2015	661	343	280	247	255	499	2285
2016	730	350	282	278	262	498	2400
2017	779	337	302	270	278	526	2492
2018	791	348	287	303	304	534	2567
<b>Total</b>	<b>5687</b>	<b>2792</b>	<b>2317</b>	<b>2167</b>	<b>2215</b>	<b>4484</b>	<b>19662</b>

6.6 NUMBER OF PUBLICATIONS WITH THEIR SOURCES

Table 6 presents the top 10 sources with their number of publications during the period of study. The source with maximum number of publications in 10 years (2009-2018) is Oncotarget with 611 publications followed by Pancreas with 572 publications and the source with least number of publications is Anticancer Research with 217 publications. This shows that the most preferred source is Oncotarget journal with maximum publication.

<b>Source Title</b>	<b>No. of publications</b>
Oncotarget	611
Pancreas	572
Plos One	545
World Journal Of Gastroenterology	290
Pancreatology	264
Cancer Letters	262
Cancer Research	242
Clinical Cancer Research	237
Journal Of The Pancreas	235
Anticancer Research	217

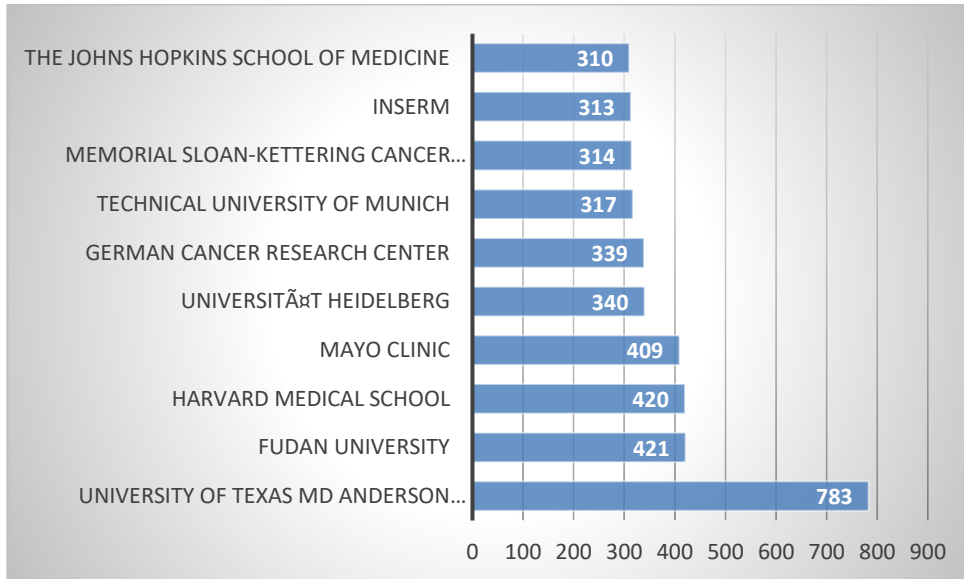


**Figure 4: Source title with no. of publications**

**6.7 TOP AFFILIATIONS WITH THEIR PUBLICATIONS**

Table 7 presents the top 10 affiliations with their number of publications and it is represented that the affiliation with maximum number of publications is University of Texas MD Anderson Cancer Center with 783 publications followed by Fudan University with 421 publications and the affiliation listed with minimum number of publications is The Johns Hopkins School of Medicine with 310 publications. Detailed records of publications with concerned affiliations are represented in below mentioned graph.

<b>Affiliation</b>	<b>No. of Publications</b>
University of Texas MD Anderson Cancer Center	783
Fudan University	421
Harvard Medical School	420
Mayo Clinic	409
Universitat Heidelberg	340
German Cancer Research Center	339
Technical University of Munich	317
Memorial Sloan-Kettering Cancer Center	314
Inserm	313
The Johns Hopkins School of Medicine	310



**Figure 5: Top 10 affiliations with their no. of publications**

**6.8 FUNDING AGENCIES WITH THEIR PUBLICATIONS**

Table 8 represents the top 10 funding agencies with their number of publications in ‘Blood Cancer’ research. The top funding agency with the maximum number of 1618 publications were contributed by National Institutes of Health, followed by National Natural Science Foundation of China with 1276 publications and the agency with least number of publications is National Research Foundation of Korea with 130 publications.

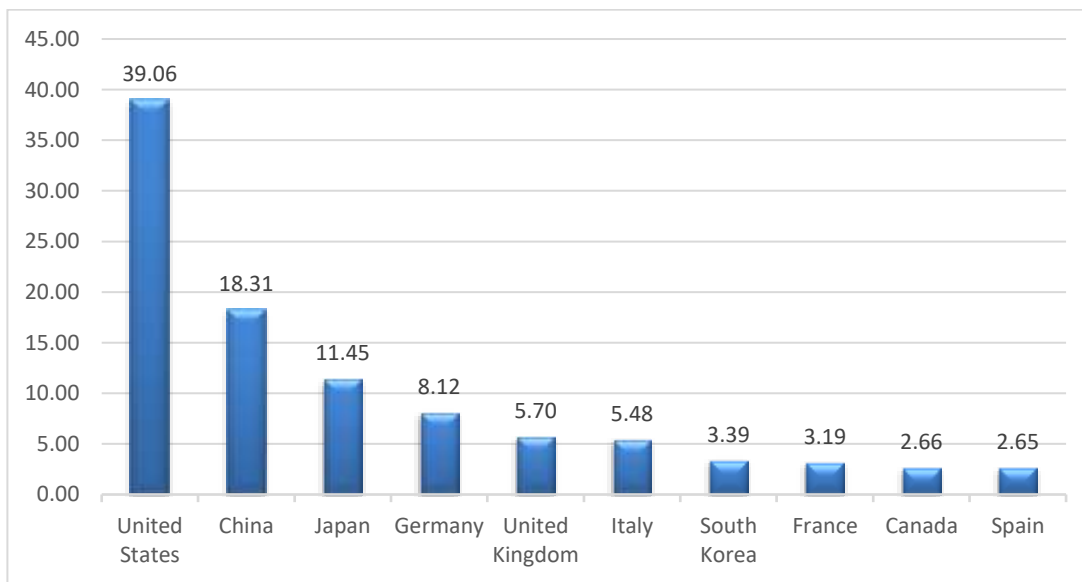
<b>Funding sponsor</b>	<b>No. of Publications</b>
National Institutes of Health	1618
National Natural Science Foundation of China	1276
National Cancer Institute	675
Japan Society for the Promotion of Science	273
Ministry of Education, Culture, Sports, Science and Technology	188
American Cancer Society	146
Foundation for the National Institutes of Health	143
Deutsche Forschungsgemeinschaft	137
Center for Outcomes Research and Evaluation, Yale School of Medicine	135
National Research Foundation of Korea	130

**6.9 COUNTRIES WITH THEIR PUBLICATIONS**

This table describes the top 10 countries contributed to the number of publications. It is better explained with the represented graph that shows the country with maximum contribution during the concerned period is United States followed by China and the country with minimum number of publications is Spain.

<b>Country</b>	<b>No. of publication</b>
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	(%)
United States	39.06%
China	18.31%
Japan	11.45%
Germany	8.12%
United Kingdom	5.70%
Italy	5.48%
South Korea	3.39%
France	3.19%
Canada	2.66%
Spain	2.65%
<b>Total</b>	<b>100%</b>



**Figure 6: Top 10 Countries with their Publications**

**7. CONCLUSION**

The study concluded that there is gradual increase in the number of publications during the period of study (2009-2018) and lies between (1294-2567). From the current trend of 10 years it can be said that the number of publications are yearly with a maximum increase of approx 100 publications and it is concluded that blood cancer researchers published 19662 publications in these 10 years which shows that blood cancer research is being done on worldwide basis where US is the country producing largest number of cancer related papers. The study is very useful to measure the productivity and growth pattern of literature. Authorship pattern reflects maximum contribution to work from single authors where 28.92% publications are from single authors, 14.19% publications from double authors and 20 most productive authors are identified with 2126 publications. The results have reflected the ongoing increase in the frequency of literature with the identification of top nations, sponsoring bodies, affiliations and journals involved in the production of literature during study.

The study presented that the bibliometric analysis of blood cancer research came out with the findings that number of publications concerning cancer is increasing worldwide but still there is little or no publications

concerning the treatment of cancer with the precautions, prevention and the quality of life of cancer survivors. Similarly, its diagnosis and prevention in early stages is a kind of under researched topics.

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