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Research Output Of Indian Scholars On Anemia: A Bibliometric Analysis

Kirti Singh[1,2] , Ashok Kumar Upadhyay[1] and Shiv Singh*[3]

[1]Department of Library& Information Science, Mangalayatan University, Aligarh, UP

[1,2]Dr. D. P. Rastogi Central Research Institute of Homeopathy, Noida, UP

[3]Bennett University (Times of India Group), Greater Noida, UP

Abstract

The study highlighted the research growth and characteristics of anemia by Indian Scholars. Over 2,748 articles for the period of 1991-2020wereretrievedfrom Pub Med database. Some important findings are that researchers preferred “Indian journal of Pediatrics” for their publication, but Annals of Hematology has highest impact factor= 2.904 as per JCR 2019 and contributed only 22 articles. Sharma, S has contributed throughout the period of study and produced 79 publications which were highest. Study revealed that maximum no. of papers 1,123 published during 2016 to 2020, it observed continuous growth in publication with the average citation of per documents is 9.499. The multi authors are dominated they were 10,413 while Single author only contributed 84 articles, which shows that the team research work is high. The Percentage of Author per document is 3.82 and the publication per year is 88.55. The distribution of citation counts per publication values are the max 1618, mean 9.5, standard error of the mean (SEM)0.67, and median (MED) 4.

Keywords: Bibliometrics, Anemia, PubMed, Scientific visualization, Indian Scholars, low hemoglobin

Introduction

The quantitative study of science fields based on published literature and communication is known as scientometrics. Vasily Nalimov introduced scientometrics in 1969 under the Russian name Naukometriya, which translates to "Scientometrics" in English. The work of Derek J. de Solla Price and Eugene Garfield is largely responsible for modern scientometrics. Haitun treats “Scientometrics‟, as a scientific discipline, which performs reproducible measurements of scientific activity and reveals its objective quantitative regularities. Institutional productivity, institutional research rankings, top journals, top

scholarly articles, and developing profiles of top authors and institutions in terms of research performance have been the main focus of scientometric study[1,2].

Anemia is described as a low red blood cell count. Anemia is diagnosed by a low hemoglobin or hematocrit level in a standard blood test. Hemoglobin is the primary protein found in red blood cells. It transports and distributes oxygen in the blood. Blood loss, reduced red blood cell synthesis, and increased red blood cell breakdown can all contribute to anemia. Trauma and gastrointestinal bleeding are two common causes of blood loss. Iron insufficiency, vitamin B12 insufficiency, thalassemia, and a variety of bone marrow neoplasms are also causes of reduced production. Increased breakdown can be caused by hereditary disorders such sickle cell anemia, infections like malaria, and autoimmune illnesses. Anemia is most common in women and persons who have chronic conditions such as cancer. According to the Ministry of Health and Family Welfare's 5th National Family Health Survey (NFHS-5) data, India has the highest total prevalence of anemia in the world, at 39.86%. According to NFHS-5 data, more than half of children and women in 13 of the country's 22 States/UTs are anemic. WHO estimated that Anemia affects 1.62 billion individuals worldwide and 24.8 percent of the population. Preschool-age children have the highest prevalence (47.3%), while men have the lowest (12.7%). Non-pregnant women (468.4 million) are the population category with the biggest number of people impacted [3-5].

Literature Review

There are many research conducted on disease, their reviews are done for further understanding of topic. Vellaichmy, A. and Jeyshankar, R. (2015) [11] studied that a total 14052 publications on Myeloma research for the papers were published during 2008-2012.It had found that India ranks at 13th position among the top 15 most productive countries. The multi authored had publication share of 87.03% and degree of collaboration had a mean value of 0.87. The majority of authors from around the world preferred to published their research papers in the journal of blood. Bhardwaj, Raj Kumar (2013) [12] analyzed 14356 papers published on celiac disease during 2001-12. Most productive year was 2011 in which 1604 articles were published and highest number of publication (19.68%) produced by USA. This study revealed that the most important field of celiac disease research remains medicine, which accounts for a significant portion of overall research output. A quantitative study done by Pathak, Manohar (2020) [13] examined that the covid research output in India. Study showed that India was in among top 10 countries in Covid-19 research. The most productive Institute was All India Institute of Medical Science, published 65 literatures. The research output on glaucoma research by quantitative method had been evaluated by Gupta, B.M. and Kaur Har (2013) [14]. They used Scopus citation database to retrieved the data for the period 2002-2011.The annual

average publication growth rate was 6.94% and its global share increased over the years from 2.58% in 2002 to 4.8% in 2011. India ranked 6th amongst the top 15 productive countries in world. Patra et al. (2005) [15] conducted a study on a bibliometric study on cancer research in India. The most productive organization was All India Institute of Medical Science, Delhi with 1037 papers. Bradford law of scattering was used to identify core journals and Lotka's law was used for author productivity. Vellaichmy, A. and Jeyshankar, R. (2014) [16] analyzed 5085 articles on anemia research in India which were indexed in Scopus database. The study was focused on publication growth, degree of collaboration and authorship pattern etc. The authorship pattern shows that most of the papers were published by multi authored (92.27%). A scientrometric study by Bansal, Jivesh and et.al., (2018) [17] analysed 717 publications on Iron deficiency anemia, indexed in Scopus database during 2006 – 2015, experiencing an annual average growth rate of 18.77% and average citation impact was 6.45%.

Objective of the Study

The objective of this study is as follow: -

1.To analyze the Growth of Literature in Anemia Research.

2. To identify the Top journals preferred by Indian Researchers.

3. To find out Country wise Author collaboration and to analyze the collaborative network of authors.

4. To examine the Keyword frequency.

Methodology

The one of the largest biomedical database Pub Med was selected as source of data and these data on Anemia research were identified, retrieved, and downloaded for the period of 20 years i.e.,1991 to 2020.The term 'Anemia' search as a keyword with Affiliation of India used to extract necessary data. These bibliographical data downloaded in CSV format and further analysed for predicting anemia research in terms of

- top journals,
- growth of publications,
- Keywords analysis,
- authors frequency.

The VOS viewer was used for showing network collaboration. The pictorial representation is presented in the Figure 1:

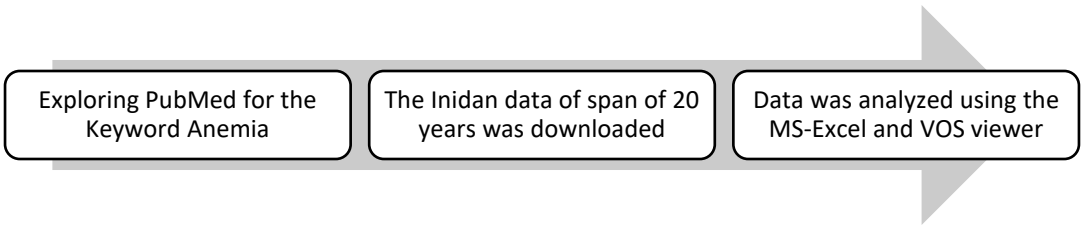

Figure 1 Pictorial representation of Methodology

Data Analysis

A total 2,748 records on Anemia are extracted from Pub Med for the period 1991 to 2020. These records included all type of documents like articles, proceedings, letter, review, clinical trial, books and documents, systematic review. In this bibliometric study, the total records covering article proceedings, articles, letters, and reviews are considered.

Growth of Literature

The increasing trend of publications has been the subject of numerous studies. Exponential growth, linear growth, logistic growth, relative growth rate, and doubling time are all examples of growth studies. Figure1.depicts the year wise growth of total publications (TP) with their percentage and are further analysed with six block periods which have five years in each block. The results showed the upward trend from the first block year to last block years. There was total 2748 publications were present. In first block year, 1991 to 1995 had 40 publications with 1.46% has increased in last block year with 1123 (40.87%) publications.

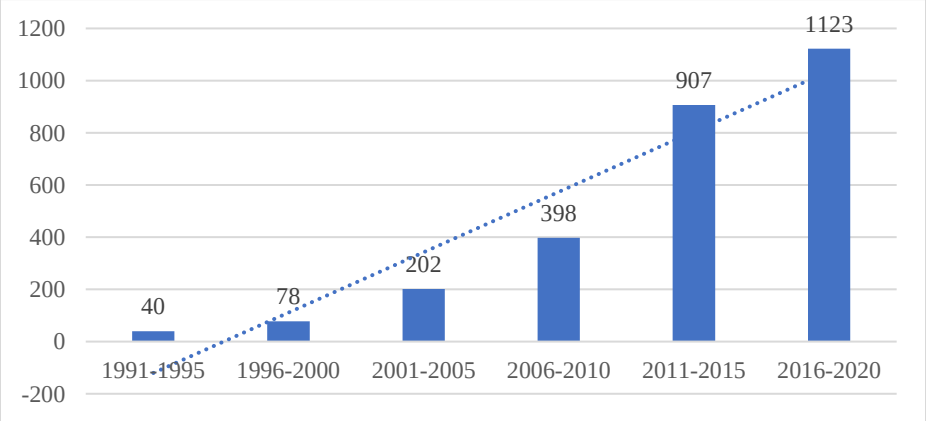

Figure 2 Growth of literature

Collaboration Pattern of Indian Scholars

Collaborative measures such as the collaborative index, degree of collaboration, collaborative coefficient, and modified collaborative coefficient are necessary for research activities in order to determine author productivity. It depicts the current state of a certain subject, including subjects, journal publications etc. Figure2. Shows collaboration pattern of Indian Scholars. The total 81 countries contributed on Anemia Research with Indian out of which Indian authors have highest frequency i.e.,7930 on Anemia research followed by USA with 321, Japan (93), Australia (84), Spain (81), Germany (64), Saudi Arabia (64), China (58) and UK (56).

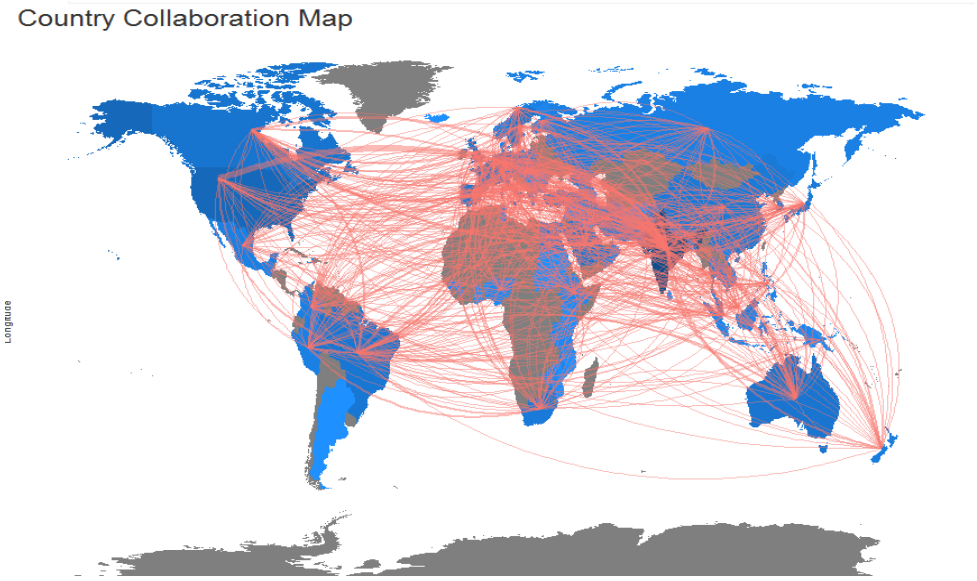

Figure 3 Country Collaboration Map

Top Journals preferred for Publications and their Impacts

Researchers preferred journals to publish their articles irrespective of other forms of documents. The journal published maximum number of articles in any area is counted as a core journal. Here, Table 1. Shows the list of Top 25 Journals contributed 991 articles on Anemia during the study. Indian Journal of Paediatrics has the highest number of publications (147) published on Anemia accounting with 1229 total citations and JIF 1.508 as per JCR 2019. This is followed by Indian Journal of Hematology & Blood Transfusion has second highest publications 113 with impact factor of 1.615, "Journal of Family Medicine and Primary Care" (75 articles) and "Indian Journal of Pathology and Microbiology" (44 articles).

H-index is author-level indicators that measure both the productivity and citation effectiveness of a publication.

G-index is calculated based on the distribution of citations obtained from the publications of a particular researcher.

M-index is another variant of H-index, showing the H-index per year since it was first published.

Impact Factor is a measure of the number of times an average journal article is cited in a particular year. It is used to measure the importance or rank of a journal by calculating the number of articles cited.

The h-index of articles is also presented which were published on anemia research. The next most preferred journal is "Indian Pediatrics" with 106 publications in top journals and it was found that h-index is highest for the articles published in "Journal of Pediatrics" followed by "Indian Pediatrics" (h - index=18) and JIF= 1.186, Indian Journal of Gastroenterology (h-index =12) and Annals of Hematology (h-index =11). g-index and m-index are also shown in the journals listed in this table. In terms of impact factors 'Annals of Hematology' has highest 2.904(JIF) with 22 publications. Articles of "Indian Pediatrics" has highest g-index (27) followed by Indian journal of pediatrics (g-index = 25) and Annals of Hematology (g-index = 17) respectively. In terms of m-index PLOS ONE has maximum m-index=0.91.

Name of Journals	h_index	g_index	m_index	TC	NP	PY_start	IF
Indian Journal of Pediatrics	19	25	0.61	1229	147	1991	1.508
Indian Journal of Hematology & Blood Transfusion: An Official Journal of Indian Society of Hematology and Blood Transfusion	10	14	0.67		113	2007	1.615
Indian Pediatrics	18	27	0.58	1178	106	1991	1.186
Journal of Family Medicine and Primary Care	7	10	0.70	188	75	2012	
Indian Journal of Pathology & Microbiology	8	10	0.42	209	44	2003	0.663
Indian Journal of Gastroenterology: Official Journal of the Indian Society of Gastroenterology	12	16	0.41	339	36	1993	
Indian Journal of Medical Sciences	9	12	0.47	193	33	2003	
Asian Journal of Transfusion Science	7	11	0.54	153	32	2009	
Indian Journal of Community Medicine:	10	14	0.71	233	32	2008	

Official Publication of Indian Association of Preventive & Social Medicine							
Indian Journal of Nephrology	7	9	0.54	131	31	2009	
Journal of Pediatric Hematology/Oncology	6	11	0.40	147	30	2007	1.016
Saudi Journal of Kidney Diseases and Transplantation: An Official Publication of the Saudi Center for Organ Transplantation, Saudi Arabia	6	9	0.32	115	29	2003	
Journal Of Obstetrics and Gynecology of India	7	8	0.70	97	27	2012	
Plos One	10	13	0.91	192	26	2011	2.740
Indian Journal of Cancer	9	13	0.30	200	24	1992	0.765
Annals of Hematology	11	17	0.37	298	22	1992	2.904
Hematology (Amsterdam, Netherlands)	9	13	0.45	197	22	2002	
Indian Journal of Endocrinology and Metabolism	8	11	0.80	147	22	2012	
The Journal of the Association of Physicians of India	7	15	0.26	267	22	1995	
Indian Journal of Clinical Biochemistry: IJCB	5	8	0.22	89	21	1999	
Hemoglobin	7	13	0.35	187	20	2002	0.526
Indian Journal of Public Health	6	9	0.26	96	20	1999	
Journal of Postgraduate Medicine	8	14	0.29	205	20	1994	1.167
Journal of Laboratory Physicians	4	6	0.31	57	19	2009	
Indian Journal of Critical Care Medicine: Peer-Reviewed, Official Publication of Indian Society of Critical Care Medicine	4	5	0.40	42	18	2012	

*TC=Total Citation, NP=Number of publications, PY_Start= Publication year start, IF=Impact Factor

Table 1: Top Rank journals along with their Impact

Top Authors Production over the Time period

Continuous research is important to understand the depth and nature of subject. Top authors of any field are always helpful for research scholars to know the subject. Mostly, top authors of any field continuously work on particular field with the period of time. Figure 3shows the Top Authors of Anemia Research in India. Top Twenty Authors have contributed 943 publications on Anemia. The highest no. of publications 79 given by Sharma, S and he is the longest author in terms of writing articles since 1991 to 2020. Kumar, R has contributed total 72 articles during the study; most productive years are 2012, 2018 and 2020 in every individual year, he has contributed 07 articles. Kumar, A ranked on third position with the contribution of 71 articles during 1996 to 2020, the most productive years are 2012, 2016 and 2018 followed by Gupta, S (68), Kumar, S (67), Gupta, A (56).

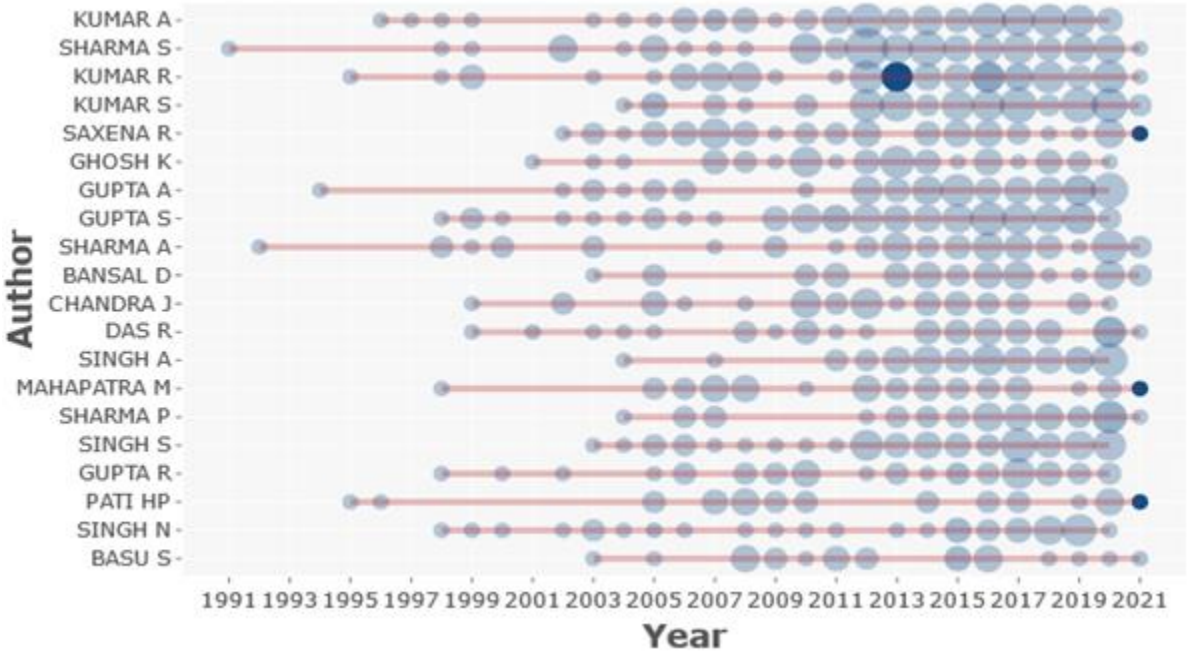

Figure 4 Top authors production over time space

Highly productive institutions

Top 20 most productive institutions for total publications are shown in Figure 4, AIIMS ranked first in the number of publications 607, followed by Postgraduate Institute of Medical Education and Research 236 and Christian Medical College, 236. The collaboration network of organization, journals and authors is presented in Figure 5.

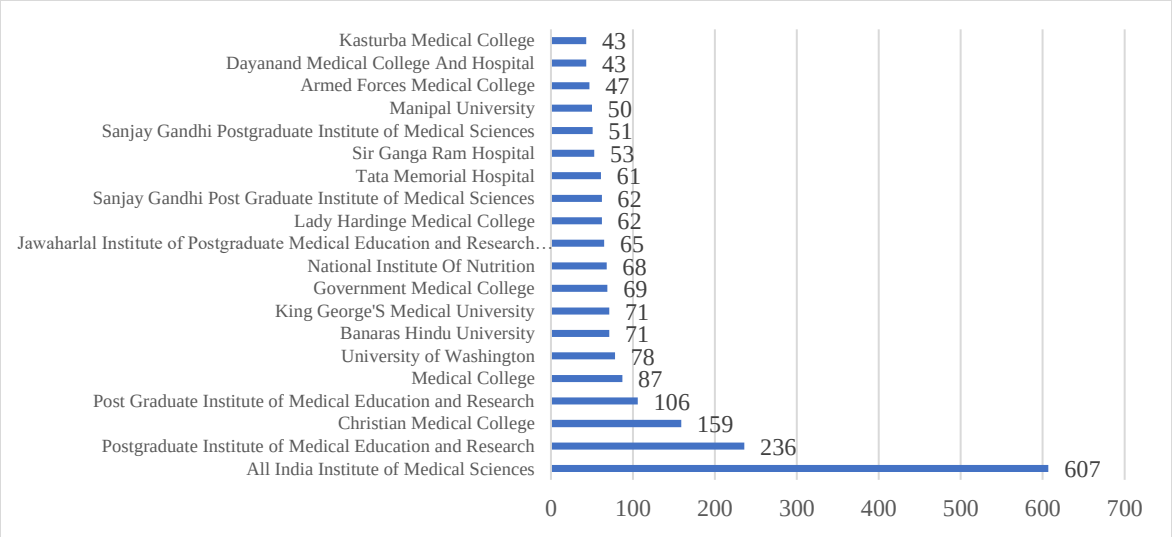

Figure 5 Top Rank highly productive Institutions

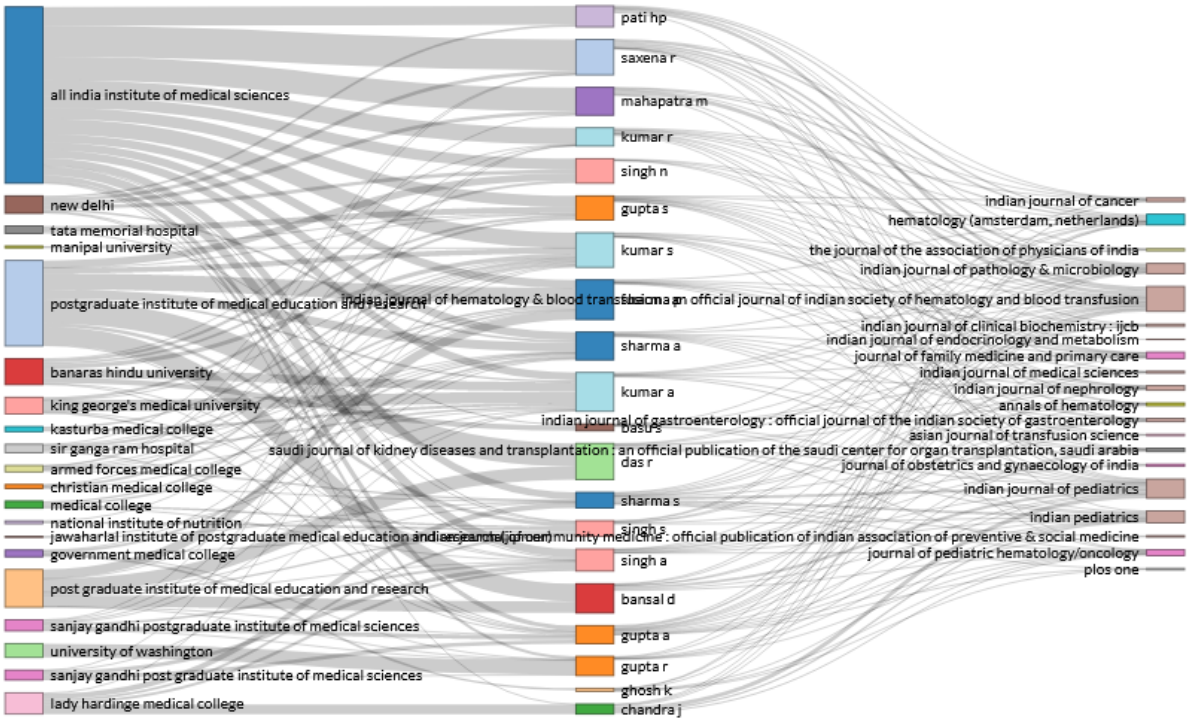

Figure 6 Three factor analysis of the relationship among authors affiliated (left), Authors (middle), and Journals (right**)**

Collaboration Network

The scientific collaboration is important for research. Now a days, Scientists prefer to build a collaborative network in order to find out the multidisciplinary approaches of subject.

Figure6 shows the collaborative network of authors. It is showed that there are 15 cluster doing collaboration with each other. The first cluster have 17 authors Aggarwal Anu, Ahluwalia jasmine, Bansal Deepak, Bharti Bhavneet etc. The second cluster include 16 authors. All these authors are related to one another and collaborate effectively in small groups.

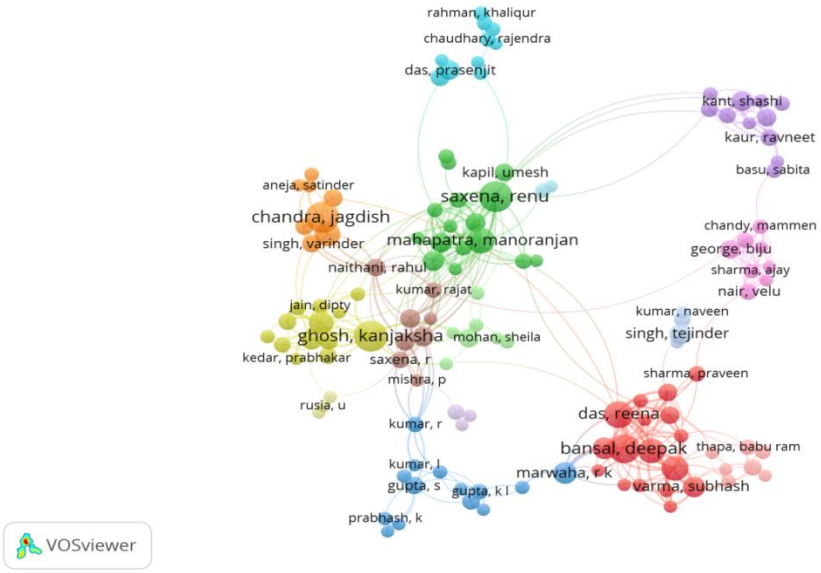

Figure 7 Collaboration network among top contributed authors

Content Analysis

Content analysis is one of the scientometric indicators for quickly understanding and grasping the intellectual content of publications and determining the topic field's growth. By evaluating the keywords found in the title or assigned by the indexer or the author himself, help to determine in which direction knowledge is growing. In this study, Author keywords, Title keywords and Abstract keywords are analyzed. The most frequently used keyword in Keyword Plus and Author keywords is Humans which occur 1582 times. In Author Keyword and Keyword Plus, all the keywords are same as well as their frequency too. The word Anemia used 836 times in Title Keywords and 4763 times in Abstract Keywords. The term India has been used 278 times in Keyword Plus and 400 times in Title Keywords. The highly used term in Abstract Keyword i.e. “Patient” has been used in 5063 times. In Abstract Keywords “Study” term used in 2656 times. The word deficiency used only 212 times in Title Keywords which has very less frequency in comparison to other keyword used in Keyword plus, Author Keywords, Title Keywords and Abstract Keywords.

Keyword Plus	Author Keywords	Title Keywords	Abstract Keywords

Words	Occurrences	Words	Occurrences	Words	Occurrences	Words	Occurrences
Humans	1582	Humans	1582	Anemia	836	Patients	5063
Female	1077	Female	1077	India	400	Anemia	4763
Male	970	Male	970	Iron	326	Study	2656
Adult	651	Adult	651	Study	312	Iron	2152
Child	461	Child	461	Patients	296	Blood	1516
Adolescent	435	Adolescent	435	Children	227	Children	1502
Middle Aged	372	Middle Aged	372	Cell	220	Disease	1421
Child Preschool	354	Child Preschool	354	Deficiency	212	Group	1376
India/Epidemiology	293	India/Epidemiology	293	Disease	210	Cases	1306
India	278	India	278	Case	183	Haemoglobin	1160
Infant	269	Infant	269	Indian	149	Levels	1150
Young Adult	235	Young Adult	235	Clinical	147	Clinical	1105
Treatment Outcome	185	Treatment Outcome	185	Report	146	Deficiency	1071
Aged	182	Aged	182	Syndrome	145	Cell	1053
Animals	176	Animals	176	Aplastic	118	Methods	1040
Pregnancy	174	Pregnancy	174	Blood	117	Treatment	1033
Prospective Studies	157	Prospective Studies	157	Care	112	Age	1013
Prevalence	147	Prevalence	147	Chronic	111	Years	992
Retrospective Studies	143	Retrospective Studies	143	Acute	104	Severe	954
Infant Newborn	132	Infant Newborn	132	Hemolytic	103	Associated	924

Table 2: Top Rank Keywords by Authors, Title, Abstract

Conclusion

Anemia is most common in women and persons who have chronic conditions such as cancer. According to WHO, anemia affects 1.62 billion individuals worldwide and 24.8 percent of the population. In the field of anemia research productive is low but continuously researchers working on it. 2748 documents were published in 857 sources by 10497 authors. The maximum no. of articles published in block year of 2016 to 2020.Indian Journal of Pediatrics is most preferred journal for anemia research publication. The Top author document is Fetal Iron Status in Maternal Anemia and Fetal Growth in Maternal Anemia are received 61 total citations respectively.The top cited paper with 1618 citations is Simonneau, G. et al. (2013). Updated clinical classification of pulmonary hypertension. Journal of the American College of Cardiology, 62(25 Suppl), D34–D41. https://doi.org/10.1016/j.jacc.2013.10.029. Henceforth, looking to the severity of the Anemia problem, the more research is required in this field.

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