



Rheumatoid Arthritis Research in India: A Scientometric Assessment of Publications during 2007-2016



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Abstract

The paper examines 1744 Indian publications on rheumatoid arthritis research, as covered in Scopus database during 2007-16, experiencing an annual average growth rate of 8.19% and qualitative citation impact averaged to 9.23 citations per paper. India's share in global output was 3.05% during 2007-16, which increased from 2.46% to 3.61% from 2007-11 to 2012-16. The international collaborative share of India's publications in rheumatoid arthritis research was 11.75% during 2007-16, which increased from 11.35% to 12.02% from 2007-11 to 2012-16. Medicine, among subjects contributed the highest publications share (58.89%) in India's output in rheumatoid arthritis, followed by pharmacology, toxicology & pharmaceuticals (30.91%), biochemistry, genetics & molecular biology (18.41%), immunology & microbiology (12.10%) and chemistry (3.44%) during 2007-16.

The top 15 most productive organizations and authors together contributed 29.87% and 18.23% respectively as their share of global publication output and 37.92% and 22.36% respectively as their share of global citation output during 2007-16. Among the total journal output of 1722 papers (98.74% of total output), the top 15 journals contributed 31.24% share to the global journal output in rheumatoid arthritis research in India during 2007-16, which increased from 30.41% to 31.79% from 2007-11 and 2012-16. Indian Journal of Radiology contributed the largest number of papers (169), followed by International Journal of Rheumatic Diseases (50 papers), Rheumatology International (36 papers), Clinical Rheumatology (30 papers), etc. during 2007-16. Of the total Indian rheumatoid arthritis research output, the top 12 highly cited publications registered citations from 101 to 1138 during 2007-16, which together received 3405 citations, which averaged to 283.78 citations per paper.

Keywords: Rheumatoid arthritis research; Indian publications; Scientometrics; Bibliometrics

Introduction

Rheumatoid arthritis (RA) is an autoimmune disease in which the body's immune system-which normally protects its health by attacking foreign substances like bacteria and viruses-mistakenly attacks the joints. This creates inflammation that causes the tissue that lines the inside of joints (the synovium) to thicken, resulting in swelling and pain in and around the joints. The synovium makes a fluid that lubricates joints and helps them move smoothly. Rheumatoid arthritis most commonly affects the joints of the hands, feet, wrists, elbows, knees and ankles. The joint effect is usually symmetrical. That means if one knee or hand is affected, usually the other one is, too. Because RA also can affect body systems, such as the cardiovascular or respiratory systems, it is called a systemic disease. Systemic means "entire body" [1]. RA affects about 24.5 million people as of 2015 [2]. This is between 0.5 and 1% of adults

in the developed world with 5 and 50 per 100,000 people newly developing the condition each year [3] Onset is most frequent during middle age and women are affected 2.5 times as frequently as men [4]. In 2013, it resulted in 38,000 deaths up from 28,000 deaths in 1990 [5].

Rheumatoid arthritis (RA) affects about 0.92% of adult population in India. Early diagnosis and aggressive therapy can usually prevent permanent disability. This, unfortunately, does not happen in many cases. There are about 20-40 new cases per Lac population each year and the disease occurs more frequently in females. The onset can be after delivery although the disease remains silent during pregnancy. Stress and environmental triggers can precipitate onset of the disease. About 5% of first degree relatives are at risk of developing RA. Cigarette smoking, coffee and

oral contraceptive pills appear to increase risk of development of RA [6].

Literature Review

Only one study has so far been conducted in the past on quantitative analysis of arthritis research. Lewison & Devey [7] used bibliometric methods to evaluate the magnitude and quality of publications in arthritis research in the UK and also compared this with that of other countries. Outputs from 13 countries between 1988 and 1995 were analyzed by number, research level (from clinical to basic) and potential impact on other researchers (from low to high). The UK has a strong presence in arthritis research and the highest relative commitment of all the countries studied. Papers with funding acknowledgements were of significantly higher impact and less clinical than those without. Only one literature review is available on rheumatoid arthritis research in India. Here Handa et al. [8] provided a literature review of observational studies published from 1985 to 2012 and this review identified twenty-eight studies. Of the 28 studies, seven described the descriptive epidemiology of RA, 14 described comorbidities and extra-articular manifestations, nine described the functioning abilities and quality of life among patients, and 10 provided information on treatments. Since no Indian bibliometric study was available in this area, as a result we decided to undertake the present study.

Objectives

The main objectives of this study are to study the performance of India's rheumatoid arthritis research during 2007-16, based on publications output covered in Scopus database. In particular, the study focuses on the following objectives:

- To study the growth India's research output in rheumatoid arthritis research and its citation impact ;
- To study the India's international collaboration share and

Analysis

Table 1: World and India's output in rheumatoid arthritis research, 2007-16.

Publication Period	World	India					
	TP	TP	TC	CPP	ICP	%ICP	%TP
2007	5243	92	1574	17.11	4	4.35	1.75
2008	5187	102	1444	14.16	15	14.71	1.97
2009	5664	119	2018	16.96	18	15.13	2.1
2010	5803	156	2976	19.08	20	12.82	2.69
2011	6043	218	2035	9.33	21	9.63	3.61
2012	6300	230	1904	8.28	23	10	3.65
2013	6466	246	1551	6.3	27	10.98	3.8
2014	6213	216	1086	5.03	29	13.43	3.48
2015	5840	200	1316	6.58	26	13	3.42
2016	4429	165	200	1.21	22	13.33	3.73
2007-11	27960	687	10047	14.62	78	11.35	2.46
2012-16	29248	1057	6057	5.73	127	12.02	3.61
2007-16	57208	1744	16104	9.23	205	11.75	3.05

TP: Total Papers; TC: Total Citations; CPP: Citations Per Paper; ICP: International Collaborative Papers

share of leading collaborating countries

- To study the Indian research output by broad subject areas
 - To study the publication productivity and citation impact of top 15 most productive organizations and authors
 - To study the modes of communication and identification of most productive journals and
- (v) to study the characteristics of top 12 highly cited papers.

Methodology

The study retrieved and downloaded 10-year publication data of the Indian output in rheumatoid arthritis research from the Scopus database (<http://www.scopus.com>) covering the period 2007-16. Keywords, such as "rheumatoid arthritis" were searched in "keyword tag" or "Article Title tag" for period 2007-16 within "date range tag". This became our main search string. When the main search string was restricted to "India tag", we were able to get publication data on India, which consisted of 1744 publications. Using analytical commands or tags available in Scopus database, such as "subject area tag", "country tag", "source title tag", "journal title name" and "affiliation tag", we were able to get data/information on the distribution of publications output by subject, collaborating countries, author-wise, organization-wise and journal-wise, etc. For citation data, citations to publications were also collected from date of publication till July 2017.

((KEY(rheumatoid arthritis) OR TITLE(rheumatoid arthritis)) AND PUBYEAR > 2006 AND PUBYEAR < 2017

(KEY(rheumatoid arthritis) OR TITLE(rheumatoid arthritis)) AND PUBYEAR > 2006 AND PUBYEAR < 2017 AND (LIMIT-TO (AFFILCOUNTRY,"India"))

The total research output of the world and India in field of rheumatoid arthritis cumulated is 57208 and 1744 publications in 10 years during 2007-16. The annual output of the world and India in rheumatoid arthritis research increased from 5243 and 92 in the year 2007 to 4429 and 165 publications in the year 2016, registering-1.39% and 8.19% growth per annum. The cumulative world and Indian output in rheumatoid arthritis research in 5 years 2007-11 increased from 27960 and 687 to 29248 and 1057 publications during succeeding 5-year period 2012-16, registering 4.61% and 53.86% quinquennial growth. India's share in global publication output in rheumatology arthritis was 3.05% during 2007-16, which increased from 2.46% to 3.61% from 2007-11 to 2012-16. Of the total Indian publications output on arthritis, 62.04% (1082) was published as articles, 23.74% (414) as reviews, 6.77% (118) as letters, 3.04% (53) as editorials, 1.83% (32) as conference papers, 1.43% (25) as notes and the rest as book chapters (5) and erratum (1). The citation impact of Indian publications on arthritis research averaged to 9.23 citations per publication (CPP) during

2007-16; five-yearly impact averaged to 14.62CPP for the period 2007-11 which declined to 5.73CPP in the succeeding five-year 2012-16 (Table 1).

India's international collaboration

The international collaborative share of India's publications in rheumatoid arthritis research was 11.75% during 2007-16, which increased from 11.35% to 12.02% from 2007-11 to 2012-16. Among foreign countries, USA contributed the largest share of 47.80% to India's international collaborative papers in arthritis research, followed by U.K. (22.44%), France (12.20%), Germany (10.24%), Japan (9.76%), Italy and Netherlands (7.80% each), Canada and Sweden (7.32% each) and Argentina (6.83%) during 2007-16. The share of international collaborative papers increased by 7.47% in Japan, followed by 6.19% in Germany, 3.11% in U.K., 2.25% each in Italy and Netherlands, 1.46% in Sweden and 0.68% in Argentina, as against decrease by 7.68% in USA, 3.08% in France and 0.61% in Canada from 2007-11 to 2012-16 (Table 2).

Table 2: The share of top 10 foreign countries in India's international collaborative papers in rheumatoid arthritis research during 2007-16.

S.No.	Collaborative Country	Number of International Collaborative Papers			Share of International Collaborative Papers		
		2007-11	2012-16	2007-16	2007-11	2012-16	2007-16
1	USA	41	57	98	52.56	44.88	47.8
2	U.K.	16	30	46	20.51	23.62	22.44
3	France	11	14	25	14.1	11.02	12.2
4	Germany	5	16	21	6.41	12.6	10.24
5	Japan	4	16	20	5.13	12.6	9.76
6	Italy	5	11	16	6.41	8.66	7.8
7	Netherlands	5	11	16	6.41	8.66	7.8
8	Canada	6	9	15	7.69	7.09	7.32
9	Sweden	5	10	15	6.41	7.87	7.32
10	Argentina	5	9	14	6.41	7.09	6.83
	Total	78	127	205	100	100	100

Subject-wise distribution of research output

The global rheumatoid arthritis research output published during 2007-16 is distributed across five sub-fields (as identified in Scopus database classification), with medicine science accounting for the highest publications share (58.89%), followed by pharmacology, toxicology & pharmaceuticals (30.91%), biochemistry, genetics & molecular biology (18.41%), immunology & microbiology (12.10%) and chemistry (3.44%) during 2007-16. The activity index, which computes change in research activity in a discipline over time 2007-11 to 2012-16 (world average activity index of a

given subject is taken as 100), witnessed increase in pharmacology, toxicology & pharmaceuticals (from 89.01 to 107.14), biochemistry, genetics & molecular biology (from 97.78 to 107.94), immunology & microbiology (from 96.25 to 102.44) and chemistry (from 80.39 to 112.75), as against decline of research activity in medicine (from 119.88 to 87.08), from 2007-11 to 2012-16. In terms of citation impact per paper, chemistry tops the list with CPP of 30.33, followed by immunology & microbiology (13.89), biochemistry, genetics & molecular biology (13.42), pharmacology, toxicology & pharmaceuticals (9.82) and medicine (9.27) during 2007-16 (Table 3).

Table 3: Subject-wise breakup of Indian publications in rheumatoid arthritis research during 2007-16.

S.No	Subject*	Number of Papers (TP)			Activity Index		TC	CPP	%TP
		2007-11	2012-16	2007-16	2007-11	2012-16	2007-16	2007-16	2007-16
1	Medicine	485	542	1027	119.88	87.08	9523	9.27	58.89
2	Pharmacology, toxicology & pharmaceuticals	189	350	539	89.01	107.14	5294	9.82	30.91

3	Biochemistry, genetics & molecular biology	111	210	321	87.78	107.94	4309	13.42	18.41
4	Immunology & microbiology	80	131	211	96.25	102.44	2931	13.89	12.1
5	Chemistry	19	41	60	80.39	112.75	1820	30.33	3.44
	World output	687	1057	1744	100	100			

*There is overlapping of literature covered under various subjects

TP: Total Papers; TC: Total Citations; CPP: Citations Per Paper

Profile of top 15 most productive Indian organizations

In Indian rheumatoid arthritis research, the productivity of 15 most productive Indian organizations varied from 18 to 87 publications and together they contributed 29.87% (521) publication share and 37.92% (6107) citation share to its cumulative publications output during 2007-16. The scientometric profile of these 15 organizations is presented in (Table 4). Four of these organizations registered publications output greater than the group average of 34.76: Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPGIMS), Lucknow (87 papers), All India Institute of Medical Sciences (AIIMS), New Delhi (80 papers), Postgraduate Institute of Medical Education & Research (PGIMER), Chandigarh (76 papers) and Christian Medical College (CMC), Vellore (38 papers) during 2007-16. Six organizations registered impact above the group average of 11.72 citations per publication during 2007-16: All India Institute of Medical Sciences, New Delhi (20.35), Center for Rheumatic Diseases, Pune (17.40), Postgraduate Institute of Medical Education & Research (PGIMER), Chandigarh (15.68), Aligarh Muslim University (15.41), Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow (13.51) and Banaras Hindu University, Varanasi (13.0) during 2007-16. Seven organizations registered h-index above the group

average of 7.93: Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow (19), All India Institute of Medical Sciences, New Delhi (17), Postgraduate Institute of Medical Education & Research, Chandigarh (11), Aligarh Muslim University and Punjabi University, Patiala (10 each), Center for Rheumatic Diseases, Pune and Banaras Hindu University, Varanasi (9 each) during 2007-16. Six organizations contributed international collaborative publications share above the group average of 13.05%: Nizam's Institute of Medical Sciences, Hyderabad (28.57%), Aligarh Muslim University (27.27%), Jawaharlal Institute of Postgraduate Medical Education & Research (JIPMER), Pondicherry (21.74%), Christian Medical College, Vellore (21.05%), Center for Rheumatic Diseases, Pune (20.0%) and Institute of Post Graduate Medical Education & Research, Kolkata (19.23%) during 2007-16. Six organizations registered the relative citation index above the group average (1.27) of all organizations: All India Institute of Medical Sciences, New Delhi (2.20), Center for Rheumatic Diseases, Pune (1.89), Postgraduate Institute of Medical Education & Research, Chandigarh (1.70), Aligarh Muslim University (1.67), Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow (1.46) and Banaras Hindu University, Varanasi (1.41) during 2007-16.

Table 4: Scientometric Profile of Top 15 most productive Indian organizations in rheumatoid arthritis research during 2007-16.

S.No	Name of the Organization	TP	TC	CPP	HI	ICP	%ICP	RCI
1	Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPGIMS), Lucknow	87	1175	13.51	19	11	12.64	1.46
2	All India Institute of Medical Sciences (AIIMS), New Delhi	80	1628	20.35	17	9	11.25	2.2
3	Postgraduate Institute of Medical Education & Research (PGIMER), Chandigarh	76	1192	15.68	11	8	10.53	1.7
4	Christian Medical College (CMC), Vellore	38	154	4.05	6	8	21.05	0.44
5	Punjabi University, Patiala	30	277	9.23	10	0	0	1
6	Institute of Post Graduate Medical Education & Research (IPGIMER), Kolkata	26	123	4.73	4	5	19.23	0.51
7	Banaras Hindu University, Varanasi	24	312	13	9	1	4.17	1.41
8	Jawaharlal Institute of Postgraduate Medical Education & Research (JIPMER), Pondicherry	23	123	5.35	4	5	21.74	0.58
9	Aligarh Muslim University	22	339	15.41	10	6	27.27	1.67
10	Nizam's Institute of Medical Sciences (NIMS), Hyderabad	21	123	5.86	6	6	28.57	0.63
11	Center for Rheumatic Diseases, Pune	20	348	17.4	9	4	20	1.89
12	Medical College & Hospital, Kolkata	19	83	4.37	5	1	5.26	0.47
13	Armed Forces Medical College, Pune	19	40	2.11	3	2	10.53	0.23
14	Chhatrapati Shahuji Maharaj Medical University (CSMMU), Lucknow	18	64	3.56	4	2	11.11	0.39
15	Jamia Hamdard University, Delhi	18	126	7	2	0	0	0.76

	Total of 15 organizations	521	6107	11.72	7.93	68	13.05	1.27
	Total of India	1744	16104	9.23				
	Share of top 15 organizations in Indian total output	29.87	37.92					
TP: Total Papers; TC: Total Citations; CPP: Citations Per Paper; HI: h-index; ICP: International Collaborative Papers; RCI: Relative Citation Index								

Profile of top 15 most productive authors

In the field of Indian rheumatoid arthritis research, the research productivity of top 15 most productive authors varied from 13 to 60 publications. Together they contributed 18.23% (318) Indian publication share and 22.36% (3601) citation share during 2007-16. The scientometric profile of these 15 authors is presented in (Table 5). Five authors registered publications output above the group average of 21.2: Aggarwal AA (60 papers), Misra R (33 papers), Chopra A (29 papers), Agarwal V and Danda D (22 papers each) during 2007-16. Five authors registered impact above the group average of 11.32 citations per publication: Misra R (17.94),

Aggarwal AA (17.65), Chopra A (14.86), Ghosh A (13.69) and Gupta R (11.75) during 2007-16. Five authors registered h-index above the group average of 7.53 of all authors: Aggarwal AA (19), Misra R (14), Chopra A (11), Gupta R (9) and Agarwal V (8) during 2007-16. Eight authors contributed international collaborative publications share above the group average of 15.72% of all authors: Handa R (42.86%), Ravindran V (29.41%), Dhir V (23.08%), Danda D (22.73%), Shankar S (21.43%), Aggarwal AA (18.33%), Chopra A (17.24%) and Kumar A (15.78%) during 2007-16. Five authors registered the relative citation index above the group average (1.23) of all authors: Misra R (1.94), Aggarwal AA (1.91), Chopra A (1.61), Ghosh A (1.48) and Gupta R (1.27) during 2007-16.

Table 5: Scientometric profile of top 15 most productive authors in rheumatoid arthritis research during 2007-16.

S.No	Name of the Author	Affiliation of the Author	TP	TC	CPP	HI	ICP	%ICP	RCI
1	Aggarwal AA	SGPGIMS, Lucknow	60	1059	17.65	19	11	18.33	1.91
2	Misra R	SGPGIMS, Lucknow	33	592	17.94	14	2	6.06	1.94
3	Chopra A	Centre for Rheumatic Diseases, Pune	29	431	14.86	11	5	17.24	1.61
4	Danda D	CMC, Vellore	22	72	3.27	5	5	22.73	0.35
5	Kumar A	Fortis Flt. Lt. Rajan Dhall Hospital, New Delhi	19	174	9.16	7	3	15.79	0.99
6	Ravindran V	Center for Rheumatology, Calicut	17	51	3	4	5	29.41	0.33
7	Gupta R	AIIMS, New Delhi	16	188	11.75	9	2	12.5	1.27
8	Silakari O	Punjabi University, Patiala	16	151	9.44	7	0	0	1.02
9	Singh S	PGIMER, Chandigarh	16	73	4.56	5	1	6.25	0.49
10	Handa R	AIIMS, New Delhi	14	120	8.57	5	3	21.43	0.93
11	Malaviya AN	Indian Spinal Injury Centre, Delhi	14	119	8.5	6	6	42.86	0.92
12	Shankar S	AIIMS, New Delhi	14	62	4.43	4	2	14.29	0.48
13	Dhir V	AIIMS, New Delhi	13	178	13.69	5	2	15.38	1.48
14	Ghosh A	IPMER, Kolkata	13	114	8.77	4	3	23.08	0.95
	Total of 15 authors		318	3601	11.32	7.53	50	15.72	1.23
	Total of India		1744	16104	9.23				
	Share of top 15 authors in Indian total output		18.23	22.36					
TP: Total Papers; TC: Total Citations; CPP: Citations Per Paper; HI: h-index; ICP: International Collaborative Papers; RCI: Relative Citation Index									

Medium of communication

Of the total Indian output in rheumatoid arthritis research, 98.74% (1722) appeared in journals. The top 15 most productive journals accounted for 15 to 169 papers each in arthritis research and together accounted for 31.24% share (538 papers) of total journal publication output during 2007-16. The publication share

of these top 15 most productive journals increased from 30.41% to 31.79% from 2007-11 and 2012-16. The top most productive journal (with 169 papers) was Indian Journal of Radiology, followed by International Journal of Rheumatic Diseases (50 papers), Rheumatology International (36 papers), Clinical Rheumatology (30 papers), etc. during 2007-16 (Table 6) [6-10].

Table 6: Top 15 most productive journals in indian rheumatoid arthritis research during 2007-2016.

S.No	Name of the Journal	Number of Papers		
		2007-11	2012-16	2007-16
1	Indian Journal of Radiology	87	82	169

2	International Journal of Rheumatological Diseases	13	37	50
3	Rheumatology International	13	23	36
4	Clinical Rheumatology	18	16	34
5	Indian Journal of Pediatrics	15	15	30
6	International Journal of Pharmacy & Pharmaceutical Sciences	4	25	29
7	International Journal of Pharmaceutical Sciences Review and Research	7	20	27
8	International Journal of Pharma & Bio Sciences	7	17	24
9	Journal of Clinical & Diagnostic Research	2	21	23
10	Research Journal of Pharmaceutical Biological & Chemical Sciences	7	16	23
11	Journal of Rheumatology	16	6	22
12	Asian Journal of Pharmaceutical & Chemical Research	2	18	20
13	Journal of Association of Physicians of India	7	12	19
14	BMJ Case Reports	0	17	17
15	Indian Journal of Dermatology, Venereology & Leprology	10	5	15
	Total of 15 journals	208	330	538
	Total global journal output	684	1038	1722
	Share of top 15 journals in Indian journal output	30.41	31.79	31.24

Highly cited papers

A total of 12 highly cited papers were identified which received citations from 101 to 1138 during 2007-16. These 12 papers together received 3405 citations, which averaged to 283.78 citations per paper. Of the 12 high cited papers, 7 were reviews and 5 articles. Seven out of 12 high cited papers involve collaboration (2 national collaborative and 5 international collaborative). These 12 high cited papers involve the participation of 263 authors and 228 organizations (26 Indian). The 26 Indian organizations include 2 papers in Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow and 1 paper each in All India Institute of Medical Sciences, New Delhi, Postgraduate Institute of Medical Education & Research, Chandigarh, Jamia Hamdard, Delhi, etc. These 12 highly cited papers were published in 12 journals such as Arthritis Research & Therapy, Colloid and Surface B, Current Problems in Cancer, Drug Discovery Today, European Journal of Pharmaceutical Sciences, Journal of American Medical Association, Journal of Clinical Pharmacology, Journal of Rheumatology, The Lancet, Medicinal Research Review, and Mini Reviews in Medicinal Chemistry and Seminars in Nuclear Medicine.

Conclusion

India has published 1744 publications in rheumatoid arthritis research during 2007-16, increasing from 92 in the year 2007 to 1658 publications in the year 2016, 8.19% growth per annum. The cumulative Indian output in rheumatoid arthritis research increased from 687 to 1057 publications from 2007-11 to 2012-16, registering 53.86% growth. India's share in global output was

3.54% during 2007-16, which increased from 2.96% to 4.09% from 2007-11 to 2012-16. India's share in global publication output in rheumatoid arthritis was 3.05% during 2007-16, which increased from 2.46% to 3.61% from 2007-11 to 2012-16. The average citation impact per paper of Indian publications on rheumatoid arthritis research was 9.23 citations, which decreased from 14.62 to 5.73 from 2007-11 to 2012-16. The international collaborative share of India's publications in rheumatoid arthritis research was 11.75% during 2007-16, which decreased from 12.02% to 11.75% from 2007-11 to 2012-16. USA contributed the largest share of 47.80% to India's international collaborative papers in rheumatoid arthritis research, followed by U.K. (22.44%), France (12.20%), Germany (10.24%), Japan (9.76%), Italy and Netherlands (7.80% each), Canada and Sweden (7.32% each) and Argentina (6.83%) during 2007-16.

Medicine, among subjects contributed the highest publications share (58.89%) in India's output in rheumatoid arthritis, followed by pharmacology, toxicology & pharmaceuticals (30.91%), biochemistry, genetics & molecular biology (18.41%), immunology & microbiology (12.10%) and chemistry (3.44%) during 2007-16. The research activities showed increase in pharmacology, toxicology & pharmaceuticals, biochemistry, genetics & molecular biology, immunology & microbiology and chemistry, as against decline in medicine from 2007-11 to 2012-16.

The top 15 most productive organizations and authors together contributed 29.87% and 18.23% respectively as their share of global publication output and 37.92% and 22.36% respectively as

their share of global citation output during 2007-16. The leading organizations in terms of publication productivity were: Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow (87 papers), All India Institute of Medical Sciences, New Delhi (80 papers), Postgraduate Institute of Medical Education & Research, Chandigarh (76 papers), Christian Medical College, Vellore (38 papers), etc. during 2007-16. The leading organizations in terms of research quality and impact (measured in terms of citations per paper) were All India Institute of Medical Sciences, New Delhi (20.35), Center for Rheumatic Diseases, Pune (17.40), Postgraduate Institute of Medical Education & Research, Chandigarh (15.68), Aligarh Muslim University (15.41), Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow (13.51) and Banaras Hindu University, Varanasi (13.0), etc. during 2007-16.

Among the total journal output of 1722 papers (98.74% of total output), the top 15 journals contributed 31.24% share to the global journal output during 2007-16 which increased from 30.41% to 31.79% from 2007-11 and 2012-16. Indian Journal of Radiology (with 169 papers) contributed the largest number of papers, followed by International Journal of Rheumatic Diseases (50 papers), Rheumatology International (36 papers), Clinical Rheumatology (30 papers), etc. during 2007-16. Only 12 highly cited publications registered citations from 101 to 1138 in rheumatoid arthritis research and they together received 3405 citations, with 283.78 citations per paper. These 12 high cited papers involve the participation of 263 authors and 228 organizations (26 Indian). These 12 highly cited papers were published in 12 journals, with 1 paper each in Arthritis research & therapy, colloid and surface b, current problems in cancer, drug discovery today, European journal of pharmaceutical sciences, journal of American medical association, journal of clinical pharmacology, journal of rheumatology, the lancet, medicinal research review, mini reviews in medicinal chemistry and seminars in nuclear medicine.

Concludes that rheumatology has been a neglected subspecialty in India. A staggering patient load, a severely inadequate number of trained rheumatology specialists, therapeutic nihilism and limited advocacy are some of the critical challenges that confront rheumatology care, and possibly explain the high rates of reliance on complementary and alternative medicines in India. To address the many problems with rheumatology care in India, curricular reforms, capacity building, patient education and political support are sorely needed.

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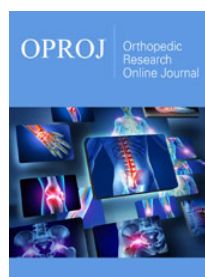
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