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Knee Osteoarthritis Research in India: A Scientometric Assessment of Publications Output During 2008-17

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Abstract

The paper examines 432 Indian publications on knee osteoarthritis research, as covered in Scopus database during 2007-16, registering an annual average growth rate of 6.86%, global publication share of 24.05% and qualitative citation impact averaged to 6.89 citations per paper and international collaborative publication share of 24.07%. Medicine, among subjects, accounted for the highest publications share (78.47%), followed by followed by pharmacology, toxicology & pharmaceutics (14.58%) biochemistry, genetics & molecular biology (14.12%) and immunology & microbiology (2.55%) during 2008-17. The top 15 most productive organizations and authors in knee osteoarthritis together contributed 40.51% and 33.10% respectively as their share of global publication output and 71.67% and 70.77% respectively as their share of global citation output during 2007-16. Among the total journal output of 420 papers, the top 15 journals contributed 36.90% share to the Indian journal output in knee osteoarthritis during 2007-16. Journal of Arthoplasty was the most productive journal with 35 papers.

Keywords: Allogenic bone graft; Fracture healing; Non union; Difficult fracture

Introduction

Knee is the largest joint in the body and it is located where your thigh bone (femur) and your shin bone (tibia) meet. It allows the bones to move freely but within limits and is enough to take our weight and it locks into position to help us stand upright. It has to act also as a hinge to help us in walking and it withstands extreme stresses, twists and turns, whenever we run or play sports. During knee osteoarthritis, knee surfaces become damaged and it doesn't move as well as it should do, resulting in following:

i. The cartilage becomes rough and thin–over the main surface of your knee joint and in the cartilage underneath your kneecap,

ii. The bone underneath the cartilage reacts by growing thicker and becoming broader,

iii. All the tissues in your joint become more active than normal, as if your body is trying to repair the damage,

iv. The bone at the edge of your joint grows outwards, forming bony spurs called osteophytes,

v. The synovium may swell and produce extra fluid, causing the joint to swell – this is called an effusion or sometimes water on the knee and

vi. The capsule and ligaments slowly thicken and contract. These changes in and around your joint are partly the result of the inflammatory process and partly an attempt by your body to repair the damage. In many cases your body's repairs are quite successful and the changes inside your joint won't cause much pain or, if there is pain, it'll be mild and may come and go. However, in other cases the repair doesn't work as well and your knee is damaged. This leads to instability and more weight being put onto other parts of the joint [1].

Almost everyone will eventually develop some degree of osteoarthritis. However, several factors increase the risk of developing significant arthritis at an earlier age: Weight, heredity, gender, repetitive stress injuries, athletics and other illnesses [2]. The most prevalent form of arthritis in India, osteoarthritis affects over 15 million adults every year. In the last few decades, Indians in the age-group of 30 to 50 years are falling prey to osteoarthritis and it continues to have serious impact on the lives of elderly people., Come 2025 and India is likely to notice an endemic of osteoarthritis with about 80 percent of the 65 and above population in the country suffering with wear and tear of joints. Forty percent of these people are likely to suffer from severe osteoarthritis, which will disable them from daily activities [3]. The reason behind the onset of this endemic is said

to be increasing longevity of Indians. By 2020, the number of 65 and above population in India is likely to be about 177 million, whereas India had 100 million people in this age group in 2010.

Literature Review

Few bibliometric studies related to knee osteoarthritis were published in the past. Among such studies, Ajuied, Back, Smith, Davies, Wong & Earnshaw [4] studied knee arthroplasty and soft tissue surgery publications (7500 from 1995 to 2010), with regard to their geographical authorship, institutional funding and number of authors. Eom, Bamne, Chowdhry, Chae & Kim [5] studied quantity and quality of research in total knee arthroplasty (TKA) from Asian countries, in terms of total number of publications and citations, with country-specific contribution. Kumar, Gupta & Goel [6] examined 792 Indian osteoarthritis research publications indexed in Scopus database during 2007-16. The study focused on growth rate, citation impact, international collaboration, broad subject-wise distribution, productivity of leading organizations, authors, journals and bibliographic characteristics of high cited papers.

Objectives

The objectives of the present study are to study the performance of Indian knee osteoarthritis research output during 2008-17, using on publications data covered in Scopus database. The study, in particular focuses on growth date of Indian research output in knee osteoporosis research, its global share and citation impact; its international collaboration share and significant foreign partner countries; its distribution by broad subject areas, its publication productivity and citation impact by top 15 Indian most productive organizations and authors and its principal medium of communication.

Methodology

The knee osteoarthritis research publications landscape from 2008 through 2017 was identified using the Scopus database (http://www.scopus.com). An keyword search was used to identify publications that contained the terms "knee osteoporosis" in the "Article title tag" or '' keyword tags" and restricting it to the period 2008-17 in "date range tag" was used for searching the global and Indian publication data and this become the main search string. The search has resulted into 21164 global and 432 Indian publications on knee osteoarthritis research during 2008-17. When the main search string for India publications, using various analytical provisions in Scopus database, was restricted to "subject area tag", "country tag", "source title tag", "journal title name" and "affiliation tag", we were able to get information on distribution of publications 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 23 February 2018. (KEY (knee osteoarthritis) OR TITLE (knee osteoarthritis)) AND PUBYEAR > 2007 AND PUBYEAR < 2018 (KEY (knee AND osteoarthritis) OR TITLE (knee AND osteoarthritis)) AND PUBYEAR > 2007 AND PUBYEAR < 2018 AND (LIMIT-TO (AFFILCOUNTRY , "India ")).

Analysis

Table 1: India Research Output in Knee Osteoarthritis Research during 2008-17.

Publication Year	World	India					
	TP	TP	TC	CPP	%TP	ICP	%ICP
2008	1481	13	371	28.54	0.88	5	38.46
2009	1534	20	222	11.10	1.30	1	5.00
2010	1627	19	279	14.68	1.17	5	26.32
2011	1754	33	469	14.21	1.88	4	12.12
2012	2051	33	389	11.79	1.61	5	15.15
2013	2278	62	619	9.98	2.72	13	20.97
2014	2500	59	359	6.08	2.36	13	22.03
2015	2582	58	113	1.95	2.25	16	27.59
2016	2692	71	132	1.86	2.64	23	32.39
2017	2665	64	23	0.36	2.40	19	29.69
2008-12	8447	118	1730	14.66	1.40	20	16.95
2013-17	12717	314	1246	3.97	2.47	84	26.75
2008-17	21164	432	2976	6.89	2.04	104	24.07

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

The total research output of India in knee osteoarthritis research consisted of cumulated to 432 publications in 10 years during 2008-17, using a Scopus database. The annual output of global and India in osteoarthritis research increased from 1481 and 13 in the year 2008 to 2665 and 64 publications in the year 2017, registering 6.86% and 24.05% growth per annum. The cumulative global and Indian output in knee osteoarthritis research computing in 5 years increased from 8447 and 118 during 2008-12 to 12717 and 314 during 2013-17, registering growth rate of 50.55% and 166.10%. India is ranked at 17th

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position in global output and its global publication share in knee osteoarthritis research was 2.04% during 2008-17, which increased from 1.40% to 2.47% from 2008-12 to 2013-17. Of the total global publications output, 78.70% (340) was published as articles, 7.41% (32) as reviews, 7.18% (31) as letters, 4.17% (18) as conference papers, 1.39% (6) as notes and 1.16 % (5) as editorials. The citation impact of Indian publications on knee osteoarthritis research averaged to 6.89 citations per publication (CPP) during 2007-16; five-yearly impact averaged to 14.66 CPP for the period 2008-12 which declined to 3.97 CPP in the succeeding five-year 2013-17 (Table 1).

International Collaboration

India's share of internationally collaborative papers (ICP) (104) in knee osteoarthritis research was 24.07% during 2008-17, which increased from 16.95% to 26.75% from 2008-12 to 2013-17. These 104 international collaborative papers together have received 938 citations, registering citation impact per paper of 9.02. Among the 37 countries contributing to internationally collaborative papers, USA topped the list with 25.96% share, followed by Saudi Arabia and South Korea (17.31% each), U.K. (13.46%), Canada and Germany (6.73% each), Italy (5.77%), Australia (4.81%), Malaysia and Netherland (3.85% each) during 2008-17. India's international collaborative publications share increased by 21.4% in Saudi Arabia, 16.7% in U.K., 8.3% in Canada, 7.1% in Italy, 6.0% in Australia, 2.9% in South Korea and 1.2% in USA, as against decrease by 4.1% in Germany and 1.4% each in Netherland and Malaysia from 2008-12 to 2013-17 (Table 2).

Table 2: Share of Leading Foreign Countries in India's Collaborative. Research Output in Knee Osteoarthritis Research during 2008-17.

S. No	Collaborative Country	Number of Papers			Share of Papers		
		2008-12	2013-17	2008-17	2008-12	2013-17	2008-17
1	USA	5	22	27	25.00	26.19	25.96
2	Saudi Arabia	0	18	18	0.00	21.43	17.31
3	South Korea	3	15	18	15.00	17.86	17.31
4	U.K.	0	14	14	0.00	16.67	13.46
5	Canada	0	7	7	0.00	8.33	6.73
6	Germany	2	5	7	10.00	5.95	6.73
7	Italy	0	6	6	0.00	7.14	5.77
8	Australia	0	5	5	0.00	5.95	4.81
9	Malaysia	1	3	4	5.00	3.57	3.85
10	Netherland	1	3	4	5.00	3.57	3.85
	Indian Total	20	84	104			

Top 10 Most Productive Countries in Knee Osteoarthritis Research

Table 3: Global Publication Share of Top 10 Most Productive Countries in Knee Osteoarthritis Research during 2008-17.

S.No	Name of the Country	Number of Papers			Share of Papers		
		2008-12	2013-17	2008-17	2008-12	2013-17	2008-17
1	USA	2404	3555	5959	28.46	27.95	28.16
2	U.K.	898	1153	2051	10.63	9.07	9.69
3	China	388	1207	1595	4.59	9.49	7.54
4	Germany	637	802	1439	7.54	6.31	6.80
5	Australia	482	845	1327	5.71	6.64	6.27
6	Canada	552	731	1283	6.53	5.75	6.06
7	Japan	463	742	1205	5.48	5.83	5.69
8	Netherland	350	562	912	4.14	4.42	4.31
9	France	382	506	888	4.52	3.98	4.20
10	South Korea	282	509	791	3.34	4.00	3.74
	Total of 10 countries	6838	10612	17450	80.95	83.45	82.45
	World	8447	12717	21164			
	Share of 10 Countries in World Total	80.95	83.45	82.45			

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116 countries participated in global knee osteoarthritis research during 2008-17. Amongst these 116 countries, 53 countries contributed 1-10 papers each, 24 countries 11-50 papers each, 10 countries 51-100 papers each, 15 countries 101-500 papers each, 7 countries 501-1000 papers each, 5 countries 1001-2000 papers each and 2 countries 2051-5959 papers each during 2008-17. Table 2 presents the knee osteoarthritis output of top 10 most productive countries during 2008-17. The publication share of the 10 most productive countries in knee osteoarthritis together contributed 82.45% global share during 2008-17, showing increase from 80.95% to 84.45% from 2008-12 to 2013-17. The global publication share of individual 10 countries varied from 3.74% to 28.16% during 2008-17, with highest publication share (28.16%) coming from USA, followed by U.K. (9.69%), China (7.54%), Germany, Australia and Canada (from 6.06% to 6.80%), Japan (5.69%), Netherlands and France (4.31% and 4.20%) and South Korea (3.74%) during 2008-17. The following countries showed increase in global share: 4.90% in China, 0.94% in Australia, 0.66% in South Korea, 0.35% in Japan and 0.28% in Netherlands, as against decrease in : 1.56% in U.K., 1.23% in Germany, 0.79% in Canada, 0.54% in France and 0.51% in USA from 2008-12 to 2013-16. Of the 10 countries, six have scored relative citation index more than the average of 1.23: Netherlands (1.64), Canada (1.49), U.K (1.47), USA (1.37), Australia (1.35), France (1.32) and Germany (1.27) during 2008-17 (Table 3).

Subject-Wise Distribution of Research Output

Table 4: Subject-Wise Breakup of Indian Publications in Knee Osteoarthritis Research during 2008-17.

S.No	Subject*	Number of Papers (TP)			Activity Index		TC	CPP	%TP
		2008-12	2013-17	2008-17	2008-12	2013-17	2008-17	2008-17	2008-17
1	Medicine	99	240	339	106.91	97.40	2668	7.87	78.47
2	Pharmacology, Toxicology & Pharmaceutics	20	43	63	116.22	93.90	250	3.97	14.58
3	Biochemistry, Genetics & Molecular Biology	9	52	61	54.02	117.28	229	3.75	14.12
4	Immunology & Microbiology	2	9	11	66.56	112.57	193	17.55	2.55
	Total Indian Output	118	314	432					

There is overlapping of literature covered under various subjects.
TP: Total Papers; TC: Total Citations; CPP: Citations Per Paper.

The Indian knee osteoarthritis research output published during 2008-17 is distributed across four sub-fields (as identified in Scopus database classification), with medicine accounting for the highest publications share (78.47%), followed by pharmacology, toxicology & pharmaceutics (14.58%) biochemistry, genetics & molecular biology (14.12%) and immunology & microbiology (2.55%) during 2008-17. The activity index, which computes change in research activity in a discipline over time 2008-12 to 2013-17 (world average activity index of a given subject is taken as 100), witnessed increase in biochemistry, genetics & molecular biology (from 54.02 to 117.28) and immunology & microbiology (from 66.56 to 112.57), as against decline of research activity in medicine (from 106.91 to 97.40) and pharmacology, toxicology & pharmaceutics (from 116.22 to 93.90), from 2008-12 to 2013-17. Immunology & microbiology among three subjects registered the highest citation impact per paper (17.55), followed by medicine (7.87), pharmacology, toxicology & pharmaceutics (3.97) and biochemistry, genetics & molecular biology (3.75) and during 2008-17 (Table 4).

Significant Keywords

A large number of significant keywords have been identified from the literature, which throw light on the research trends in knee osteoarthritis. These keywords are listed in Table 5 in the decreasing order of the frequency of occurrence during 2008-17.

Table 5: List of Significant Keywords Appearing in Indian Knee Osteoarthritis Literature during 2008-17

S.No	Name of Keyword	Frequency	S.No	Name of Keyword	Frequency
1	Knee Osteoarthritis	324	16	Knee Replacement	37
2	Osteoarthritis	201	17	Knee Prosthesis	30
3	Knee	105	18	Rheumatoid Arthritis	29
4	Knee Joint	89	19	NMR Imaging	26
5	Arthoplasty Replacement, Knee	81	20	Articular Cartilage	23
6	Knee Pain	79	21	Hyaluronic Acid	28
7	Total Knee Arthoplasty	62	22	Placebo	26

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8	Total Knee Replacement	62	23	Pathophysiology	22
9	Drug Efficacy	64	24	Histopathology	21
10	Knee Radiography	49	25	Osteotomy	19
11	Drug Safety	43	26	Weight Bearing	18
12	Scoring System	43	27	Cartilage	17
13	Knee Arthoplasty	42	28	Anti-inflammatory Activity	19
14	Pain	42	20	Obesity	16
15	Knee Function	39			

Profile of Top 10 Most Productive Indian Organizations

Table 6: Scientometric Profile of Top 15 Most Productive Organizations.

S.No	Name of the Organization	TP	TC	CPP	HI	ICP	%ICP	RCI
1	All India Institute of Medical Sciences, New Delhi	25	165	6.60	6	5	20.00	0.96
2	Postgraduate Institute of Medical Education & Research, Chandigarh	22	354	16.09	7	2	9.09	2.34
3	Breach Candy Hospital, Bombay	21	502	23.90	11	3	14.29	3.47
4	Bharati Vidyapeeth University, Pune	12	67	5.58	4	0	0.00	0.81
5	CSM Medical University, Lucknow	12	137	11.42	5	2	16.67	1.66
6	Dr D Y Patil College of Physiotherapy, Pune	12	56	4.67	4	11	91.67	0.68
7	Centre for Rheumatic Diseases, Pune	10	263	26.30	8	4	40.00	3.82
8	Indraprastha Apollo Hospital, Delhi	10	20	2.00	2	1	10.00	0.29
9	Lilavati Hospital & Research Centre, Bombay	10	187	18.70	4	0	0.00	2.71
10	Manipal Academy of Higher Education	10	187	18.70	3	0	0.00	2.71
11	Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow	7	86	12.29	5	0	0.00	1.78
12	University of Lucknow	6	40	6.67	2	0	0.00	0.97
13	Institute of Post Graduate Medical Education & Research, Kolkata	6	38	6.33	2	0	0.00	0.92
14	Seth G.S. Medical College & KEM Hospital, Bombay	6	4	0.67	1	0	0.00	0.10
15	Poona College of Pharmacy	6	27	4.50	3	0	0.00	0.65
	Total of 15 organizations	175	2133	12.19	4.47	28	16.00	1.77
	Total of India	432	2976	6.89				
	Share of top 15 organizations in India total output	40.51	71.67					

TP: Total Papers; TC: Total Citations; CPP: Citations Per Paper; HI: h-index; ICP: International Collaborative Papers; RCI: Relative Citation Index.

280 organizations participated in Indian knee osteoarthritis research, of which 271 organizations contributed 1-5 papers each, 11 organizations 6-10 papers each, 5 organizations 11-20 papers and 3 organizations 21-30 papers each. The productivity of 15 most productive organizations In Indian knee osteoarthritis research varied from 6 to 25 publications and together they contributed 40.51% (175) publication share and 71.67% (2133) citation share to its cumulative publications output during 2008-17. The scientometric profile of these 15 organizations is presented in Table 6.

i. Six of these organizations registered publications output greater than the group average of 11.67: All India Institute of Medical Sciences, New Delhi (25 papers), Postgraduate Institute of Medical Education & Research, Chandigarh (22 papers), Breach Candy Hospital, Bombay (21 papers), Bharati Vidyapeeth University, Pune, CSM Medical University, Lucknow and Dr D Y Patil College of Physiotherapy, Pune (12 papers each) during 2008-17;

ii. Six organizations registered impact above the group average of 12.19 citations per publication during 2007-16: Centre for Rheumatic Diseases, Pune (26.3), Breach Candy Hospital, Bombay (23.9), Lilavati Hospital & Research Centre, Bombay (18.7), Manipal Academy of Higher Education (18.7), Postgraduate Institute of Medical Education & Research, Chandigarh (16.09), and Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow (12.29) during 2008-17;

iii. Four organizations contributed international collaborative publications share above the group average of

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16.0%: Dr D Y Patil College of Physiotherapy, Pune(91.67%0, Centre for Rheumatic Diseases, Pune(40.0%), All India Institute of Medical Sciences, New Delhi (20.0%) and CSM Medical University, Lucknow (16.67%) during 2008-17;

iv. Six organizations registered the relative citation index above the group average (1.77) of all organizations: Centre for Rheumatic Diseases, Pune (3.82), Breach Candy Hospital, Bombay (3.47), Lilavati Hospital & Research Centre, Bombay (2.71), Manipal Academy of Higher Education (2.71), Postgraduate Institute of Medical Education & Research, Chandigarh (2.34) and Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow (1.78) during 2008-17.

Profile of Top 15 Most Productive authors

Table 7: Scientometric Profile of Top 15 Most Productive Authors in Knee Osteoarthritis Research in India during 2008-17.

S.No	Name of the Author	Affiliation of the Author	TP	TC	CPP	HI	ICP	%ICP	RCI
1	G.M. Shetty	Breach Candy Hospital, Bombay	19	320	16.84	10	5	26.32	2.44
2	A.Chopra	Centre for Rheumatic Diseases, Pune	17	295	17.35	8	5	29.41	2.52
3	A.Mullaji	Breach Candy Hospital, Bombay	17	287	16.88	10	1	5.88	2.45
4	R.N.Maniar	Lilavati Hospital & Research Centre, Bombay	10	187	18.70	4	0	0.00	2.71
5	M.S.Dhillon	Postgraduate Institute of Medical Education & Research, Chandigarh	10	242	24.20	3	2	20.00	3.51
6	P. Sancheti	Sancheti Institute of Orthopaedic Rehabilitation, Pune	10	27	2.70	2	9	90.00	0.39
7	V. Kumar	All India Institute of Medical Sciences, New Delhi	7	29	4.14	4	3	42.86	0.60
8	A. Singh	King George's Medical University, Lucknow	7	70	10.00	4	0	0.00	1.45
9	T. Singhi	Breach Candy Hospital, Bombay	7	186	26.57	4	0	0.00	3.86
10	R.N.Srivastava	King George's Medical University, Lucknow	7	76	10.86	5	1	14.29	1.58
11	R. Vaishya	Indraprastha Apollo Hospital, Delhi	7	5	0.71	1	0	0.00	0.10
12	V.Vijay	Indraprastha Apollo Hospital, Delhi	7	5	0.71	1	0	0.00	0.10
13	A. Mishra	King George's Medical University, Lucknow	6	75	12.50	5	1	16.67	1.81
14	S.Patel	Postgraduate Institute of Medical Education & Research, Chandigarh	6	227	37.83	2	0	0.00	5.49
15	D.Sanghi	King George's Medical University, Lucknow	6	75	12.50	5	1	16.67	1.81
	Total of 15 authors								
	143	2106	14.73	4.53	28	19.58	2.14		
	Total of India		432	2976	6.89				
	Share of top 15 authors in Indian total output		33.10	70.77					

TP: Total Papers; TC: Total Citations; CPP: Citations per Paper; HI: h-index; ICP: International Collaborative Papers; RCI: Relative Citation Index.

371 authors participated in Indian knee osteoarthritis research, of which 351 authors contributed 1-5 papers each, 17 authors 6-10 papers each and 3 authors 11-20 papers each. The productivity of 15 most productive authors in Indian knee osteoarthritis research varied from 6 to 19 publications. Together they contributed 33.1% (143) global publication share and 70.77% (2106) citation share during 2008-17. The scientometric profile of these 15 authors is presented in Table 7.

a. Six authors registered publications output above the group average of 9.53: G.M. Shetty (19 papers), A. Chopra and A. Mullaji (17 papers each), R.N. Maniar, M.S. Dhillon and P.Sancheti (10 papers each) during 2008-17;

b. Seven authors registered impact above the group average of 14.73 citations per publication: S. Patel (37.83), T Singhi (26.57), MS Dhillon (24.2), RN Maniar (18.7), A Chopra(17.35), A Mullaji (16.88) and GM Shetty (16.84) during 2008-17;

c. Five authors contributed international collaborative publications share above the group average of 19.58% of all authors: P Sancheti (90.0%), V Kumar (42.86%), A Chopra (29.41%), G.M. Shetty (26.32%) and MS Dhillon (20.0%) during 2008-17;

d. Seven authors registered the relative citation index above the group average (2.14) of all authors: S Patel (5.49),

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T. Singhi(3.86), MS Dhillon (3.51), RN Maniar (2.71), A Chopra (2.52), A Mullaji (2.45) and G.M. Shetty (2.44) during 2008-17.

Medium of Communication

210 journals participated in Indian knee osteoarthritis research, of which 195 journals contributed 1-5 papers each, 12 journals 6-10 papers each and 3 journals 21-35 papers each. Of the total Indian publications output in knee osteoarthritis research, 97.22% (420) appeared in journals. The top 15 most productive journals accounted for 5 to 35 papers each in knee osteoarthritis research and together accounted for 36.90% share (155 papers) of total journal publication output during 2008-17. The publication share of these top 15 most productive journals decreased from 41.03% to 35.31% between 2008-12 and 2013-17. The top most productive journal (with 35 papers) was Journal of Arthoplasty, followed by Osteoporosis International (26 papers), Indian Journal of Orthopaedics (10 papers), Indian Journal of Rheumatology, International Journal of Rheumatic Diseases and International Orthopaedics (9 papers each), etc. during 2008-17 (Table 8).

Table 8: Top 15 Most Productive Journals in Knee Osteoarthritis Research in India during 2008-17.

S.No	Name of the Journal	Number of Papers		
		2008-12	2013-17	2008-17
1	Journal of Arthoplasty	13	22	35
2	Journal of Clinical & Diagnostic Research	1	20	21
3	Indian Journal of Orthopaedics	2	8	10
4	Indian Journal of Rheumatology	5	4	9
5	International Journal of Rheumatic Diseases	5	4	9
6	International Orthopaedics	3	6	9
7	Knee Surgery Sports Traumatology Arthroscopy	2	7	9
8	International Journal of Pharma & Bio Sciences	3	5	8
9	Knee	2	6	8
10	Clinical Orthopaedics & Related Research	2	5	7
11	Journal of Clinical Orthopaedics & Trauma	0	7	7
12	Asian Journal of Pharmaceutical & Clinical Research	0	6	6
13	Journal of Ayurveda & Integrated Medicine	2	4	6
14	Journal of Indian Medical Association	5	1	6
15	Archives of Orthpaedic & Trauma Surgery	3	2	5
	Total of 15 Journals	48	107	155
	Total India Journal output	117	303	420
	Share of top 15 journals in Indian Journal output	41.03	35.31	36.90

Summary & Conclusion

India had produced 432 publications on knee osteoarthritis research as indexed in Scopus database in 10 years during 2007-16 These publications increased from 13 to 64 from the year 2008 to year 2017, registering 24.05% annual growth. India's global publications share on knee osteoarthritis research was 2.04% during 2008-17, which increased from 1.40% to 2.47% from 2008-12 to 2013-17. India's citation impact on knee osteoarthritis research averaged to 6.89 citations per publication during 2007-16, which dropped from 14.66 to 3.97 from 2008-12 to 2013-16. The share of international collaborative papers of India in its research output on knee osteoarthritis research was 24.07% during 2008-17, which increased from 16.95% to 26.75% from 2008-12 to 2013-17. USA contributed the largest share of 25.96% in international collaborative papers among foreign countries, followed by Saudi Arabia and South Korea (17.31% each), U.K. (13.46%), Canada and Germany (6.73% each), Italy (5.77%), Australia (4.81%), Malaysia and Netherland (3.85% each) during 2008-17. India's international collaborative publications share increased in Saudi Arabia, UK, Canada, Italy, Australia, South Korea and USA, as against decrease in Germany, Netherland and Malaysia from 2008-12 to 2013-17.

Medicine, among subjects, accounted for the highest publications share (78.47%) in knee osteoarthritis research, followed by pharmacology, toxicology & pharmaceutics (14.58%) biochemistry, genetics & molecular biology (14.12%) and immunology & microbiology (2.55%) during 2008-17. The research activities showed increase in biochemistry, genetics & molecular biology and immunology & microbiology, as against decline in medicine and pharmacology, toxicology & pharmaceutics from 2008-12 to 2013-17. Immunology & microbiology, among three subjects, registered the highest citation impact per paper (17.55), followed by medicine (7.87), pharmacology, toxicology & pharmaceutics (3.97) and biochemistry, genetics & molecular biology (3.75) and during 2008-17.

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The top 15 most productive organizations and authors in knee osteoarthritis together contributed 40.51% and 33.10% respectively as their share of global publication output and 71.67% and 70.77% respectively as their share of global citation output during 2007-16. The leading most productive Indian organizations contributing to knee osteoarthritis research were All India Institute of Medical Sciences, New Delhi (25 papers), Postgraduate Institute of Medical Education & Research, Chandigarh (22 papers), Breach Candy Hospital, Bombay (21 papers), Bharati Vidyapeeth University, Pune, CSM Medical University, Lucknow and Dr D Y Patil College of Physiotherapy, Pune (12papers each) during 2008-17.

The leading Indian organizations with comparatively higher citation impact per paper were Centre for Rheumatic Diseases, Pune (26.3), Breach Candy Hospital, Bombay (23.9), Lilavati Hospital & Research Centre, Bombay (18.7), Manipal Academy of Higher Education (18.7), Postgraduate Institute of Medical Education & Research, Chandigarh (16.09), and Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow (12.29) during 2008-17. The leading most productive authors contributing to Indian knee osteoarthritis research were GM Shetty (19 papers), A Chopra and A Mullaji (17 papers each), RN Maniar, MS Dhillon and P Sancheti (10 papers each) during 2008-17. The leading Indian authors with comparatively higher citation impact per paper were S Patel (37.83), T Singhi (26.57), MS Dhillon (24.2), RN Maniar (18.7), A. Chopra (17.35), A Mullaji (16.88) and GM Shetty (16.84) during 2008-17.

Of the 420 journal publications from India on knee osteoarthritis, the top 15 most productive journals accounted for 36.90% share of total Indian journal publication output during 2008-16, which decreased from 41.03% to 35.31% between 2008-12 and 2013-17. Journal of Arthoplasty was the most productive journal with 35 papers, followed by Osteoporosis International (26 papers), Indian Journal of Orthopaedics (10 papers), Indian Journal of Rheumatology, International Journal of Rheumatic Diseases and International Orthopaedics (9 papers each), etc. during 2008-17.

Osteoarthritis is a chronic disease; its management should be patient centred and coordinated, with attention to modifiable risk factors and co morbidities. Its focus should be on conservative non-drug treatment, particularly exercise; for overweight or obese patients weight loss is recommended. Management should be evidence based; do not use interventions with high cost and risk that outweigh their benefits. Conclude that clinical practice guidelines needs to be developed in India which should summarize evidence related to the management of knee osteoarthritis and to facilitate uptake of evidence-based knowledge by clinicians.

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