A Scientometric Analysis of the most Highly Cited Publications on Fracture Research from India: 1989–2022

Raju Vaishya[1] Brij Mohan Gupta[2] Mallikarjun Kappi[3] Abhishek Vaish[1]

[1] Department of Orthopaedics and Joint Replacement Surgery, Indraprastha Apollo Hospital, Sarita Vihar, New Delhi, India
[2] Formerly with CSIR-NISTADS, New Delhi, India
[3] Government First Grade College, Library and Information Centre, Davanagere (Dist), Karnataka, India

Address for correspondence Abhishek Vaish, MS(Orth), MCh, DNB, MNAMS, Consultant Orthopaedic Surgeon, Department of Orthopaedics and Joint Replacement Surgery, Indraprastha Apollo Hospital, Sarita Vihar, New Delhi 110076, India (e-mail: drabhishekvaish@gmail.com).

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Abstract

Background India bears a huge burden of accidents and fractures. This study aimed to study the bibliometric characteristics of India's fracture research output during last three decades. The most highly cited publications (HCPs; with 20 or more citations) on orthopaedic fracture research from India were analyzed on various parameters.

Methodology The Scopus database was used to identify publications on fractures that originated from India, between 1989 to 2022. The top HCPs were retrieved. A bibliometric and network analysis was used to identify the key players, such as organizations, authors and journals, and important keywords besides identifying their collaborative interactions and visual co-occurrences of significant keywords using VOSviewer and Biblioshiny software.

Results Of the total 1,048 Indian publications, 126 (10.02%) were HCPs (cited 4,695 times). External funding was received in 1.59%, and international collaboration in 15.08%. The most productive organizations were All India Institute of Medical Sciences (AIIMS), New Delhi, followed by Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh, and Pandit Bhagwat Dayal Sharma Post Graduate Institute of Medical Sciences (PGIMS), Rohtak. The most impactful organizations were Maulana Azad Medical College (MAMC), Delhi, followed by the Jawaharlal Institute of Postgraduate Medical Education & Research (JIPMER), Pondicherry, and Sancheti Institute of Orthopaedic Research & Rehabilitation, Pune. The most productive authors were R. Malhotra, M.S. Dhillon, and N.K. Magu, and the most impactful authors were U. K. Meena, A.P. Singh, and P. Sancheti. Delhi was the epic of research, followed by Karnataka, Tamil Nadu, and Chandigarh.

Conclusion This study provides an insight into the research trends, the most influential contributions, and the performance of Indian organizations and authors. It gives some ideas about the past, present, and future hotspots in research.

Keywords
- bone
- fracture
- orthopaedics
- high-cited publications
- India
- scientometrics
- bibliometrics
- journals
- institution
- author

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Introduction

India bears a heavy burden of accidents and fractures, due to rising road traffic accidents (RTAs),[1,2] causing increased morbidity and disability, and impacting the quality of life, besides imposing a significant economic burden on the health system.[3] Osteoporotic fractures are also on the rise.[4–7]

There has been an increased interest in fractures as is evidenced by numerous published research, research grants, and the development of fracture-related activities. As the body of literature regarding fractures continues to grow, an analysis of the most impactful literature is justified to direct future research and pay tribute to the highest contributing work within the field.

Several publications have investigated the most influential articles on various bone fractures like calcaneus,[8] hip,[9–11] proximal humerus,[12] scaphoid,[13] and spine.[14–16] However, fracture research at the global and national levels has been rarely studied from a bibliometric perspective. Among global studies, Baldwin et al[17] studied the 100 most cited articles in fracture surgery and identified their characteristics to determine the qualities that make an article highly cited in this field. At the national level, Dong et al[18] studied the characteristics of the most-cited articles on fracture surgery by Chinese authors.

No bibliometric study has investigated, so far, the most influential articles relating to Indian fracture research. We believe that the most highly cited publications (HCPs) of fracture research will have the most historically influential impact and will also play a significant role as the basis for recent studies to build on. Therefore, we decided to undertake a comprehensive review of the most influential articles related to fracture research from India. The study aims to identify India's HCPs, examine their trends, and identify the various characteristics of fracture research between 1989 and 2022, using bibliometric methods.

Methods

The terms related to fractures were searched in the Scopus database for articles published between 1989 and 2022 for retrieving relevant output on fracture research from Indian on December 2, 2022 using the retrieval search strategy highlighted in ►**Fig. 1**. In all, 1,408 records on India's fracture research were retrieved, of which 126 HCPs with a total

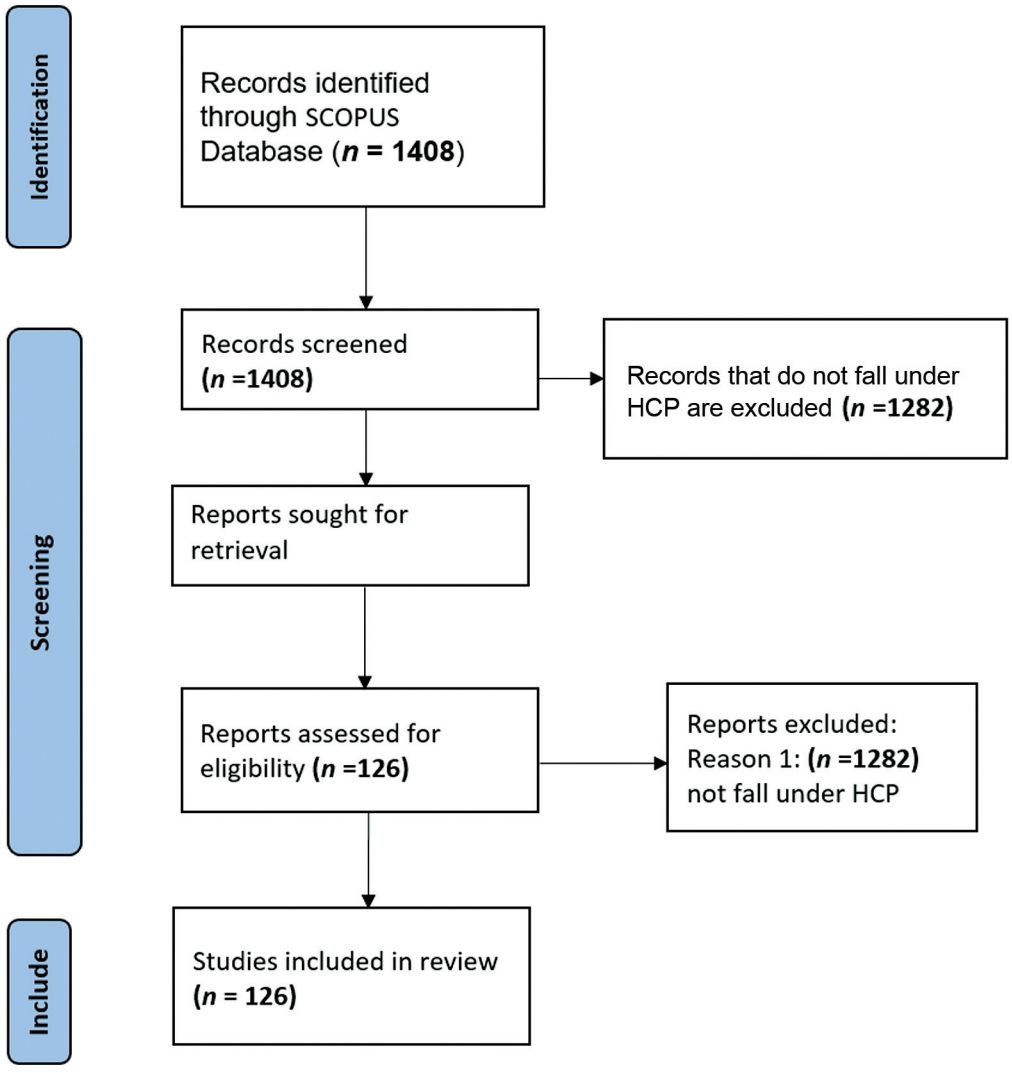

Fig. 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) chart showing the inclusion and exclusion details of the study.

citation [TC] of ≥20 were isolated, after excluding 1,282 articles that were not HCPs.

Detailed ranking and analysis of these HCPs are useful for identifying the most influential articles in guiding our decision-making. Bibliometric tools were used for this study. The main analyses include publication and citation counts, the contribution of countries, institutions, authors, funding agencies and journals, and the clustering of keywords. This study used VOSviewer for visualizing the co-occurrence analysis of keywords. (N.B.: Co-occurrence is a method to analyze text that includes a graphic visualization of potential relationships between people, organizations, countries, or other entities represented within written material.)

The most productive authors were defined as those who have contributed more than the average productivity of all the authors. The most impactful organizations were defined as organizations that have registered a higher citation per paper (CPP) than the average CPP of all the organizations. India's authors and institutions were included in this study when one of the authors or institutions in the publication were from India.

((TITLE(fracture) AND TITLE(orthoped* or orthopaed*)) AND PUBYEAR > 1988 AND PUBYEAR < 2023) OR ((TITLE (fracture) AND SRCTITLE(orthoped* or orthopaed*)) AND PUBYEAR > 1988 AND PUBYEAR < 2023) AND (LIMIT-TO (AFFILCOUNTRY,"India"))

Bibliometrics is a method of statistical analysis used to assess a particular subject's characteristics and major developmental trends based on published research publications. It is a validated method for collecting and identifying impactful studies across scientific and medical fields. Because TC count is thought to be predictive of an article's overall impact, focusing on TC count through careful analysis allows scholars to present both empirical and subjective findings related to the most influential works within a field.[19]

Results

Overall Picture

The search on India's fracture research in the Scopus database for articles published between 1989 and 2022 yielded 1,408 records. Of these, 126 (10.02%) were HCPs, having received ≥20 TCs. These HCPs received 4,695 citations, averaging 37.26 citations per paper (CPP). The HCPs increased from 1 in 1989 to 17 in 2012 and then decreased to 0 in 2022. The highest number of HCPs were published in 2012 ($n = 17$), followed by 2011 and 2014 at 12 each. Of all of the years examined, 2011 had the highest number of citations ($n = 695$). Of the 126 HCPs, 110 articles were in the citation range of 20 to 50, 12 in the citation range of 51 to 98, and 4 in the citation range of 105 to 347.

Top 10 High-Cited Publications

The top 10 HCPs in India's fracture research are listed in ►**Table 1**.[20–29] These 10 HCPs have received a combined 1,141 citations, averaging 114.1 CPP. Of these top 10 HCPs, 6 and 4 were in the citation range of 65 to 98 and 105 to 347, respectively. The 10 HCPs comprise eight articles and two reviews, and involve the participation of a single organization (zero collaboratives) in four articles and the participation of ≥2 organizations (international collaborative) in six articles. Four foreign countries were involved in the publication of seven international collaborative HCPs included in the study, three from the United Kingdom, two from the United States, and one each from Australia and Switzerland. The 10 HCPs involve the participation of 23 organizations and 39 authors, of which 10 organizations and 22 authors are Indians. The 10 Indian organizations involved in the publication of one article each include Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh; All India Institute of Medical Sciences (AIIMS), New Delhi; Maulana Azad Medical College (MAMC), New Delhi; Jawaharlal Institute of Postgraduate Medical Education & Research (JIPMER), Pondicherry; and Indian Institute of Science (IISc), Bangalore. Articles from eight journals were in the 10 HCPs: 3 articles from *International Orthopaedics* (IF = 3.479) and one article each from *Acta Orthopaedics* (IF = 3.717), *Indian Journal of Orthopaedics* (IF = 1.0303), *Journal of Orthopaedic Trauma* (IF = 2.512), *Hong Kong Journal of Orthopaedic Surgery* (IF = 1.482), *Journal of Pediatric Orthopaedics: Part B* (IF = 1.306), *Orthopaedics & Traumatology: Surgery & Research* (IF = 2.256), and *Proceeding of the Nation Academy of Sciences of United States* (IF = 12.799).

Citation Life Cycle Pattern of Top 10 HCPs

In the initial years after publication, articles generally receive a small but growing number of citations until, eventually, they reach a peak from where they tend to decline (►**Fig. 2**). Among the top 10 HCPs, the article authored by Dhanwal et al in 2011[20] received the highest number of 347 citations during the study period. However, the article by Garg et al in 1993[21] is cited 135 times.

Funding and Collaboration

Only two (1.59%) HCPs received external funding and they registered 452 citations, averaging 226.0 CPP. Nineteen (15.08%) publications were international collaborations, and these received 1,249 citations, averaging 65.74 CPP. Authors from 11 foreign countries collaborated with Indian authors on fracture research. The United Kingdom ($n = 7$) and United States ($n = 6$) contributed the maximum number of articles, followed by Canada and Netherlands ($n = 2$ each), and Australia, Denmark, Germany, Ireland, Nepal, Switzerland, and U.A.E. ($n = 1$ each).

Publication Pattern

Of the 126 HCPs, original research articles accounted for the highest number of publications (110/126 [97.30%]), followed by reviews (11/126 [8.73%]) and conference papers (5/126 [3.97%]). Age or osteoporosis (10 articles) and vitamin D deficiency (5 articles) were the risk factors for the majority of fracture cases in most HCPs. The main causes of fracture were reported to be injury in 18 HCPs, RTAs in 6 HCPs, and falls in 6 HCPs.

Table 1 Details of the top 10 high-cited publications

Sl. no.	Study	Title	Source	Total citations
1	Dhanwal et al[20]	Epidemiology of hip fracture: worldwide geographic variation	Indian J Orthop 2011;45(1):15–22	347
2	Garg et al[21]	Percutaneous autogenous bone marrow grafting in 20 cases of ununited fracture	Acta Orthop 1993;64(6):671–672	135
3	Changulani et al[22]	Comparison of the use of the humerus intramedullary nail and dynamic compression plate for the management of diaphyseal fractures of the humerus. A randomised controlled study	Int Orthop 2007;31(3):391–395	120
4	Johnson et al[23]	Hydrogel delivery of lysostaphin eliminates orthopedic implant infection by *Staphylococcus aureus* and supports fracture healing	Proc Natl Acad Sci U S A 2018;115(22): E4960–E4969	105
5	Kulshrestha et al[24]	Operative versus nonoperative management of displaced midshaft clavicle fractures: a prospective cohort study	J Orthop Trauma 2011;25(1):31–38	98
6	Meena et al[25]	Predictors of postoperative outcome for acetabular fractures	Orthop Traumatol Surg Res 2013;99(8):929–935	69
7	Putti et al[26]	Locked intramedullary nailing versus dynamic compression plating for humeral shaft fractures	J Orthop Surg (Hong Kong) 2009;17(2):139–141	68
8	Kannan et al[27]	Arthroplasty options in femoral-neck fracture: answers from the national registries	Int Orthop 2012;36(1):1–8	67
9	Singisetti and Ambedkar[28]	Nailing versus plating in humerus shaft fractures: a prospective comparative study	Int Orthop 2010;34(4):571–576	66
10	Johari and Sinha[29]	Remodeling of forearm fractures in children	J Ped Orthop B 1999;8(2):84-87	65

Geographical Distribution by Indian States

Delhi had the largest share of publication (30.95% and 39 articles) in Indian HCPs, followed by Karnataka and Tamil Nadu (at 11.90% and 15 articles each) and Chandigarh (10.32% and 13 articles).

Type and Subtype of Fractures

By anatomical location, the major publication focus was on the femur ($n = 42$ and 33.33% share), followed by the tibia ($n = 18$ and 14.29% share), humerus/humeral and hip ($n = 16$ and 12.7% share each), acetabulum and spine ($n = 7$ and 5.56% share each), radius ($n = 6$ and 4.76% share), clavicle ($n = 4$ and 3.17% share), etc.

Ulnar and clavicular fractures registered comparatively higher CPPs (81.33 and 66.0, respectively) than all the fractures identified in this study, followed by forearm fractures ($n = 65.0$ CPP) and hip fractures ($n = 48.69$ CPPs).

By sex distribution: These HCPs were focused on males in 84 articles and on females in 81 articles. (N.B.: There is overlapping of articles among these two population categories, as each article may report more than one category.)

By population age groups: Among the 126 HCPs, 62 focused on the adult population, 48 on the middle-aged, 36 on the aged, and 43 on children and adolescents. (N.B.: There is an overlapping of articles among these population age groups, as more than one fracture can be reported in each article.) The major focus in fracture type in the 126 HCPs by population age groups was as follows:

- *Adults:* Femur/femoral, tibia/tibial, and humeral/humerus fractures (10 articles and 16.13% share each); femur/femoral neck fractures (8 articles and 12.9% share); hip and acetabulum fractures (6 articles and 9.68% share each); femur shaft fracture (3 articles and 4.84% share); clavicle, femur/femoral intertrochanteric, pelvis, and radius/radial fractures (2 articles and 3.23% share each), etc.
- *Middle aged:* Tibia/tibial fractures (9 articles and 18.75% share), femur/femoral fractures (8 articles and 16.67% share), humerus/humeral fractures (7 articles and 14.58% share), hip fractures (6 articles and 12.5% share), femoral neck fractures (5 articles and 10.42% share), spine, acetabulum, and radial/radius fractures (4 articles and 8.33% share each), etc.
- *Elderly:* Hip fractures (9 articles and 25.0% share); humerus/humeral fractures (7 articles and 19.44% share); femur/femoral fractures (6 articles and 16.67% share); femur intertrochanteric, tibia/tibial, and femur/femoral neck fractures (4 articles, and 11.11% share each); acetabulum and femur trochanteric fractures (2 articles and 5.56% share each), etc.
- *Children and adolescents:* Humeral/humerus fractures (13 articles and 30.23% share); femur/femoral fractures

(12 articles and 27.91% share); femur/femoral neck fractures (9 articles and 20.93% share); acetabulum, spine, femur shaft, ulna, and tibia/tibial fractures (2 articles and 4.65% share each); radius/radial and hip fractures (1 article and 2.33% share each), etc.

Significant Keywords

A total of 587 author keywords that appeared in 128 HCPs on India's fracture research were identified. Some of the important keywords with the comparatively largest frequency of occurrence were "osteosynthesis" and "fracture healing" ($n = 40$ each), "fracture fixation, internal" ($n = 37$), "fracture fixation" ($n = 24$), etc. (►**Fig. 2**). A total of 47 keywords with a frequency of more than two were chosen for the co-occurrence network. The co-occurrence network map was constructed with the help of VOSviewer, which revealed that these 47 keywords were spread over four clusters. The 48 keywords have 636 links with total link strength of 1,777.

Most Productive and Most Impactful Organizations

In all, 151 organizations participated in 126 HCPs, of which 122 organizations published 1 article each, 69 organizations 2 to 5 articles each, and 2 organizations 8 to 12 articles each. The top 26 organizations contributed 2 to 16 articles each and together contributed 104 articles and 3,796 citations, accounting for 82.54 and 81.48% share in total publications and total citations. It was also observed that the top 10 organizations contributed more than the average group publication productivity (4.0) of 26 organizations, and 7 organizations registered CPP and relative citation index (RCI) more than the group average (36.5 and 0.99, respectively) of the top 26 organizations. ►**Table 2** presents the profile of the top 8 most productive and top 8 most impactful organizations. The collaboration links among the top 26 organizations were observed to be weak, as there only were 38 institutional pairs having 1 collaboration link and 2 institutional pairs having 2 collaboration links (PGIMER, Chandigarh–Dr Ram Manohar Lohia Hospital, New Delhi and Indraprastha Apollo Hospital, Delhi–Vardhman Mahavir Medical College [VMMC] & Safdarjung Hospital, New Delhi).

Most Productive and Most Impactful Authors

In all, 470 Indian authors participated in 126 HCPs, of which 411 authors published 1 article each, 43 authors published 2 articles each, 7 authors published 3 articles each, 5 authors published 4 articles each, 3 authors published 5 articles each, and 1 author published 6 articles. The top 46 authors contributed 2 to 6 articles each and together contributed 122 articles and 3,527 citations, accounting for a share of 96.83 and 75.70% in total publications and total citations, respectively. It was also observed that the top 16 authors contributed more than the average group publication productivity (2.65) of 46 authors, and 19 authors registered CPP and RCI of more than the group average (28.91 and 0.78, respectively) of the top 46 organizations. ►**Table 3** presents the profile of the top 8 most productive and 8 most impactful authors. The details of the HCPs of the most productive authors (with references) are presented in ►**Supplementary Table S1** (available in the online version only).

The collaboration links among the top 46 authors were considered to be stronger compared to institutional collaboration. Among author collaboration pairs, 206 pairs have 1 collaboration link, 20 pairs have 2 collaboration links, 4 author pairs have 3 collaboration links, and 2 author pairs

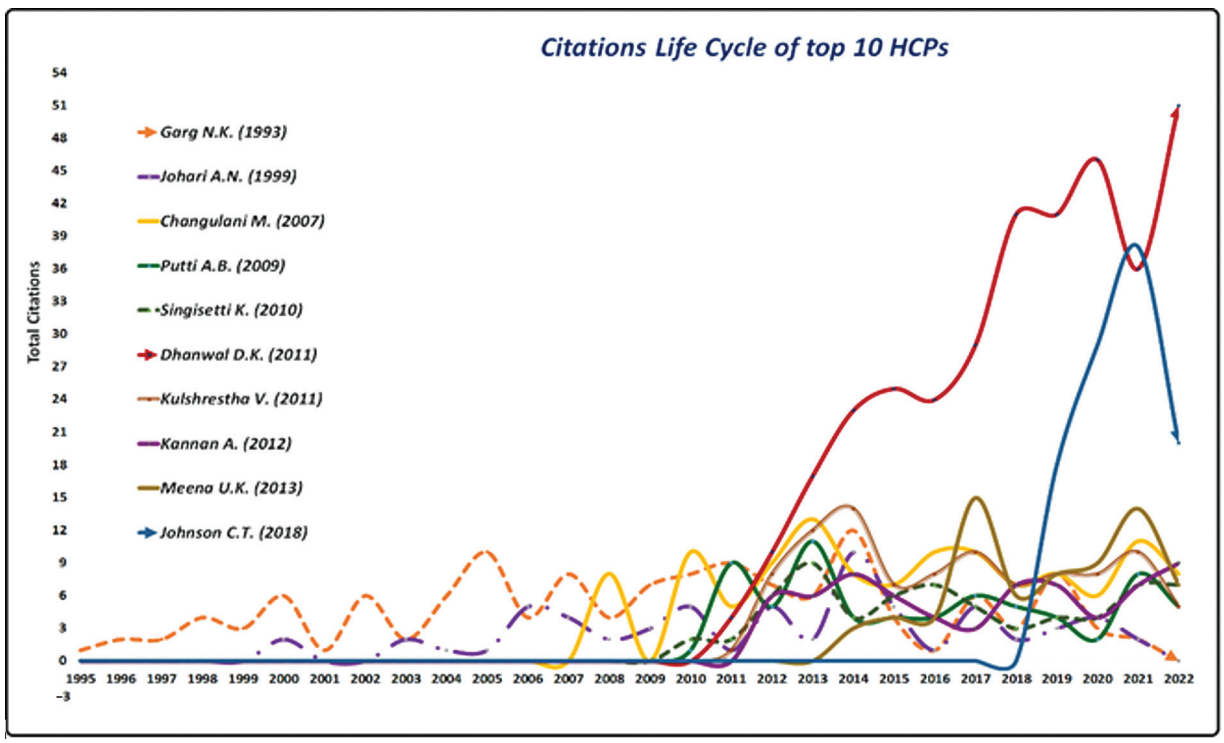

Fig. 2 Citation life cycle of top 10 high-cited publications.

Table 2 Profile of top 8 most productive and 8 most impactful organizations

Sl. no.	Organizations	Total papers	Total citations	Citations per paper	Relative citation index	Total link strength
Top 8 most productive organizations						
1	AIIMS, New Delhi	16	568	35.50	0.96	11
2	PGIMER, Chandigarh	13	428	32.92	0.89	13
3	Pt. BD Sharma PGIMS, Rohtak	9	279	31.00	0.84	0
4	UCMS, New Delhi	5	173	34.60	0.94	4
5	MAMC, Delhi	5	505	101.00	2.73	6
6	Indraprastha Apollo Hospital, Delhi	5	189	37.80	1.02	7
7	VMMC and Safdarjung Hospital, New Delhi	4	116	29.00	0.78	1
8	Dr. Ram Manohar Lohia Hospital, Delhi	4	121	30.25	0.82	4
Top 8 most impactful organizations						
1	MAMC, Delhi	5	505	101.00	2.73	6
2	JIPMER, Pondicherry	2	165	82.50	2.23	0
3	Sancheti Institute of Orthopaedic Research & Rehabilitation, Pune	2	94	47.00	1.27	13
4	Lok Nayak Hospital, Delhi	2	89	44.50	1.20	1
5	Parvathy Hospital, Chennai	2	78	39.00	1.05	4
6	Guru Teg Bahadur Hospital, Delhi	4	153	38.25	1.03	2
7	Indraprastha Apollo Hospital, New Delhi	5	189	37.80	1.02	7
8	Mayo Institute of Medical Sciences, Barabanki, Uttar Pradesh	3	107	35.67	0.96	4

Abbreviations: AIIMS, All India Institute of Medical Sciences; MAMC, Maulana Azad Medical College; PGIMER, Postgraduate Institute of Medical Education and Research; Pt. BD Sharma PGIMS, Pandit Bhagwat Dayal Sharma Post Graduate Institute of Medical Sciences; UCMS, University College of Medical Sciences; VMMC, Vardhaman Mahavir Medical College."

Table 3 Profile of top 8 most productive and 8 most impactful authors

Sl. no.	Name of the author	Affiliation of the author	Total papers	Total citations	Citations per paper	Relative citation index	Total link strength
Top 8 most productive authors							
1	R. Malhotra	AIIMS, New Delhi	6	216	36.00	0.97	21
2	M.S. Dhillon	PGIMER, Chandigarh	5	181	36.20	0.98	17
3	N.K. Magu	Pt. BDS PGIMS, Rohtak	5	134	26.80	0.72	19
4	R. Singh	Pt. BDS PGIMS, Rohtak	5	139	27.80	0.75	16
5	S. Aggarwal	PGIMER, Chandigarh	4	141	35.25	0.95	12
6	S.K. Tripathi	PGIMER, Chandigarh	4	136	34.00	0.92	14
7	R.K. Sen	PGIMER, Chandigarh	4	136	34.00	0.92	14
8	R. Vaishya	Indraprastha Apollo Hospital, Delhi	4	78	19.50	0.53	12
Top 8 most impactful authors							
1	U.K. Meena	SMS Medical College, Jaipur	2	102	51.00	1.38	5
2	A.P. Singh	UCMS, Delhi	2	96	48.00	1.30	6
3	P. Sancheti	Sancheti Institute of Orthopaedic Research & Rehabilitation, Pune	2	94	47.00	1.27	76
4	L. Maini	MAMC, Delhi	3	129	43.00	1.16	7
5	D. Gulati	UCMS, Delhi	2	73	36.50	0.99	6
6	M.S. Dhillon	PGIMER, Chandigarh	5	181	36.20	0.98	17
7	R. Malhotra	AIIMS, New Delhi	6	216	36.00	0.97	21
8	A.K. Singh	Mayo Institute of Medical Sciences	3	107	35.67	0.96	3

Abbreviations: AIIMS, All India Institute of Medical Sciences; BDS PGIMS, Pandit Bhagwat Dayal Sharma Post Graduate Institute of Medical Sciences; MAMC, Maulana Azad Medical College; PGIMER, Postgraduate Institute of Medical Education and Research; SMS, Sawai Madho Singh; UCMS, University College of Medical Sciences.

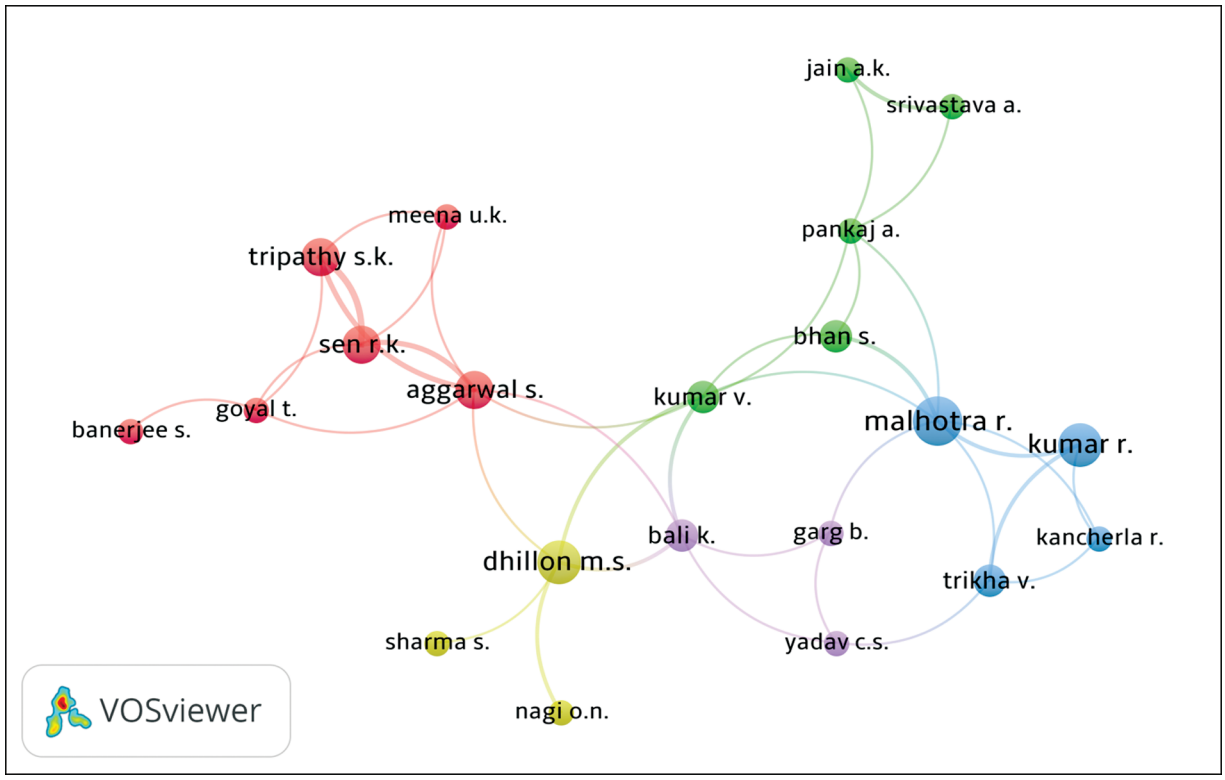

Fig. 3 Authors' co-authorship network.

have 4 collaboration links. The author network collaborative map among top authors is shown in ►**Fig. 3**.

Most Productive and Impactful Journals

The 126 HCPs were published in 27 journals: 21 journals published 1 to 5 articles, 2 journals 6 to 10 articles, and 4 journals 11 to 122 articles. The details of the top 8 most productive journals in publication output are presented in ►**Supplementary Table S2** (available in the online version only). The *Indian Journal of Orthopaedics* and *International Orthopaedics* ($n = 22$ each) were the most productive journals, whereas the *Proceedings of the National Academy of Sciences of USA* and *The Lancet* were the most impactful journals.

Discussion

Despite a large burden of fractures in the Indian population, due to road accidents[1,2] and other causes, not much research has been done so far, especially on the prevalence of these fractures and the published literature from Indian authors on this topic. However, the research output of the Indian authors in other fields like orthopaedics[30–32] and arthroplasty[33] have been studied. Rupp et al[34] found an increase in the incidence of fractures by 14% in Germany between 2009 and 2019. They observed that the most common fractures were femoral neck fractures (120 per 100,000 persons per year), pertrochanteric femoral fractures (109 per 100,000 persons/y), and distal radius fractures (106 per 100,000 persons/y). We also noted a significantly higher incidence of fractures in the lower limb, accounting for two-thirds of fractures (65.98%), compared to the upper limb fractures. However, the publications on upper limb fractures were more impactful and received a higher CPP, as compared to the publications on lower limb fractures. In our study, the HCPs related to fractures in adults and older people were substantially more (83/126) as compared to those of adolescents and children (43/126). In a systematic analysis of global, regional, and national burden of bone fractures in 204 countries and territories between 1990 and 2019, it was suggested that strategies should be focused on decreasing the incidence and burden of fractures by screening for osteoporosis in older people, promoting diet to improve bone health, reducing the risks of falls, providing a safe environment at work, and reducing the RTA by enforcing policy reforms and road safety measures.[35]

Using a bibliometric approach, the present study has identified and retrieved the most relevant and comparative HCPs in India's fracture research. We studied mainly the present trends and characteristics of India's fracture research by identifying the main types and subtypes of fractures and their distribution by anatomical location, sex, and population age groups. We identified the prominent collaborating countries, organizations, authors, and journals, besides significant keywords.

Vaishya et al reported that India's publications in orthopaedics grew at a rate of 20.8% annually in the last two decades, and 10.4% of Indian studies received external funding and 16.3% were international collaborations.[30] Karlapudi et al[31] found New Delhi to be the epicenter of publications related to orthopaedics, similar to our findings related to fractures. Vaish et al[32] found that in Indian HCPs related to

orthopaedics 24.58% publications received external funding and 36.87% publications were an international collaboration. This is higher than our findings according to which there was external funding in 1.59% publications and international collaboration in 15.08% publications, signifying a lower interest in the fracture research from India. We concur with the views that national and international collaboration in research helps in exchanging ideas, provides better-quality results, and may provide access to external funding for research.[36,37]

The leading teaching government institutions of India were the most productive and impactful organizations in fracture research, with AIIMS, New Delhi, PGIMER, Chandigarh, and Pandit Bhagwat Dayal Sharma Post Graduate Institute of Medical Sciences (Pt. BD Sharma PGIMS), Rohtak, being the most productive organizations. The MAMC, Delhi, JIPMER, Pondicherry, and Sancheti Institute of Orthopaedic Research & Rehabilitation, Pune, were the most impactful organizations, receiving the highest CPP. The top three organizations reporting the highest collaboration linkages and intensity with other Indian and foreign organizations were the following: PGIMER, Chandigarh, and Sancheti Institute of Orthopaedic Research & Rehabilitation, Pune ($n = 13$ linkages each) and AIIMS, New Delhi ($n = 11$ linkages).

Among the authors, R. Malhotra, M.S. Dhillon, and N.K. Magu were the most productive authors with 6, 5, and 5 articles, respectively, and U.K. Meena, A.P. Singh, and P. Sancheti registered the highest CPP (►**Supplementary Table S1**, available in the online version only). The authors reporting the highest collaborative linkages were P. Sancheti (76 linkages), R. Malhotra (21 linkages), M.S. Dhillon (17 linkages), and R. Singh (17 linkages). Among journals, the *Indian Journal of Orthopaedics*, *International Orthopaedics*, *Hong Kong Journal of Orthopaedic Surgery*, and *Journal of Orthopaedics & Traumatology* were the most productive journals (with 11–22 articles). The *Proceedings of the National Academy of Sciences of USA*, *The Lancet*, *Acta Orthopaedica*, and *Journal of Pediatric Orthopaedics: Part B* registered a comparatively higher CPP, and all these journals have a higher impact factor.

There are a few limitations to the present study. Only a single database of Scopus was searched, and other databases and sources (e.g., Web of Science) were not included in this bibliometric analysis. Therefore, some potential information may have been missed due to the noninclusion of some of the publications in the Scopus database. However, the use of multiple databases may lead to other difficulties in merging existing data in different databases available in different formats. In addition, there are chances that funding-related information may not be complete, an author's name may be similar to some other author's name, etc. We acknowledge that bibliometric studies do not involve clinical data of the patients; however, this is a well-established research method of evaluation of scientific contents. These studies are also valuable and useful as supporting tools for decision-making in setting research priorities, tracking the evolution of science and technology, funding allocation, and rewarding scientific excellence, among others.[38] We believe that bibliometrics is an objective and quantitative way of measuring research impact. The methodology is reproducible, transparent, and scalable, and one can assess the bibliometrics on an individual, institutional, national, or international level. On the negative side, the metrics can be exploited by researchers and journals to artificially boost bibliometric scores.

Conclusion

In this bibliometric study, we identified from the Scopus database 126 HCPs ($\geq$20 citations) on Indian fracture research published during 1989 to 2022. Delhi was the epicenter of research and publication activities on the topic. The most productive organization were AIIMS, New Delhi, and PGIMER, Chandigarh, whereas the most impactful organizations were MAMC, New Delhi, and JIPMER, Pondicherry. The most productive authors were R. Malhotra and M.S. Dhillon, and the most impactful authors were U.K. Meena and A.P. Singh. *Indian Journal of Orthopaedics* and *International Orthopaedics* published the maximum number of HCPs, but the most impactful publications were from *Proceedings of the National Academy of Sciences of USA* and *The Lancet*, with an impact factor of 12.799 and 202.7, respectively.

To diversify India's research on fractures, there is an urgent need to develop a national registry and expand international collaboration, which will help improve both research output and research impact and quality. These research topics are expected to continue to be the hotspots and focus of research. Citation number–based identification of important articles will help current practitioners gain insight into the past and current trends in their respective fields and provide the foundation for further investigations.

Authors' Contribution
R.V. was responsible for conception of the study, literature search, manuscript writing, editing, and final reading of the manuscript. B.M.G. contributed to conception of the study, literature search, data collection and analysis, manuscript writing, and final reading of the manuscript. M.K. contributed to literature search, data collection and analysis, manuscript writing, and final reading of the manuscript. A.V. contributed to literature search, manuscript writing, editing, final reading, and submission of the manuscript.

Conflict of Interest
None declared.

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