Scientific Output of Immunology Research in India: A Scientometric Analysis

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Abstract

The present study analyses the Indian research output of Immunology literature as reflected in the Web of Science database from 1995 to 2024. The parameters used in the present study include Indian research publications and citations, authorship patterns, the most prolific authors, rankings of institutions and journals, and highly cited papers in the field of Immunology. A total of 25,555 records and 4,54,329 citations were examined. The study's findings revealed slight increases and decreases in Immunology research. Fluctuations in Relative Growth Rate (RGR) and Doubling Time (DT) have been observed over the study period. All India Institute of Medical Sciences, New Delhi, has contributed the most publications, and the Indian Journal of Medical Research ranks first with 5,163 research articles. "Pathogen Recognition by the Innate Immune System" has received the highest citations.

Keywords
Immunology, Immunotherapy, Immune System, Immune Genetics, Immune Pathology

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INTRODUCTION

In India, the burden of both infectious and non-infectious diseases remains significant, placing demands on healthcare infrastructure and research preferences. According to the National Health Reports (NHR), Government of India, diseases such as tuberculosis, HIV/AIDS, malaria, SARS-CoV-2 and COVID-19 persist in public health, requiring strong immunological studies for infection control and prevention (Prakash, 2012). India is presently facing a challenge of communicable and non-communicable diseases along with the emergence of new infections. The spread of a disease depends on a person's immune system health (Gupta & Bala, 2011). In this context, Immunology plays a crucial role in medicine. Immunology is an important basic subdivision of the biomedical sciences that examines the immune system, its functions, components, foreign substances, abnormal cells, and disorders, with an emphasis on how the body defends itself against pathogenic organisms (Zhoa et al., 2021). The immune system is crucial in keeping good health and preventing diseases. In recent years, immunology has become one of the most active and rapidly evolving fields of research, owing to its significant role in understanding human health and disease. Many researchers have conducted studies in immunology and its allied areas, including autoimmune diseases, immunotherapy, immunogenetics, immunopathology, viral immunology, bacterial immunology, and vaccine development and evaluation. The rising incidence of viral diseases in India has spurred a robust nationwide response, driving improved scientific research and a remarkable increase in Immunology-related publications. Therefore, an explosive increase in scholarly literature has made it necessary to scientifically analyze the growth, structure and influence of Immunology research at the international level.

Scientometric studies are useful for quantitative analysis of a particular topic. Scientometric studies examine the growth of the literature, international collaborations, citation analysis, institutional research output, journal rankings, and scholarly influence in a particular field (Ivancheva, 2008). The sceintometric technique also helps researchers to explore the authorship network, h-index, authorship pattern, highly productive authors, etc. There have been many quantitative studies on subtopics and allied areas of medicine. Therefore, this paper aims to understand the growth of the literature in the field of Immunology, a branch of medicine. The study aims

to analyze the research productivity of Indian researchers, average citation per paper, total citations, H-index, highly cited papers, authors' collaboration, and highly contributing institutions in the field of Immunology.

REVIEW OF LITERATURE

Ji et al. (2021) have explored publication trends in research on Aristolochic acid nephropathy during 1971-2019. The necessary data was retrieved from the Web of Science database. The study found that 923 research articles were published during the study period. The highest number of articles were published in the English language. China accounted for the largest share, contributing 20% of the publications, followed by the USA in second position. *Kidney International* was the most active journal in the field of Aristolochic acid nephropathy. The outcomes of the study show that research on Aristolochic Acid Nephropathy (AAN) is globally active and highly cited, with a strong emphasis on mechanistic pathways, including apoptosis, oxidative stress, and inflammation. Agrawal et al. (2021) identified the top-cited research articles in the field of pallidotomy as indexed in the Web of Science database. In their study, the authors accessed the Web of Science database and arranged the top 100 cited papers in descending order to analyze the data. The study revealed that the 100 top-cited research articles were published between 1961 and 2017 across 24 journals.

Ghazbani et al. (2022) studied brachytherapy research output using Bibliometrix and CiteSpace software. The study found that 31,632 records were published in the brachytherapy field. The USA was the most active country in brachytherapy research. The study highlights that contemporary brachytherapy research emphasizes advanced computational methods alongside its clinical focus on cervical and prostate cancers. Pantea et al. (2022) mapped the acceptance of injectable treatments for diabetes patients using the Web of Science database and VOSviewer software. A total of 1,502 keywords were identified from the total of 232 research articles. The study highlights that system-level interventions and technology-enabled monitoring play a crucial role in overcoming adherence barriers in injectable diabetes management. Mahendra (2023) undertook a scientometric study on Norovirus and Dental Health from 2012 to 2021. The study revealed that a total of 4,711 articles were accessed from the Web of Science database and analyzed using HistCite software, R Studio, and the VOS viewer tool. The study also shows that the largest number of research was published by the USA, followed by China and the United Kingdom. In terms of the most contributing institution, the University of California ranked first and received 5,549 citations.

Wang et al. (2023) conducted a worldwide bibliometric analysis exploring research trends, hotspots, and emerging themes in bacterial biofilm eradication from 2012 to 2022 using the Web of Science database. CiteSpace and VOSviewer software were employed to analyze the publication output, authorship patterns, institutional and country-wise contributions, and keyword clustering. The findings revealed the United States of America as the primary contributor, the Chinese Academy of Sciences as the most productive institution, and Frontiers in Microbiology as the most influential journal. The study highlights that research on bacterial biofilm eradication is rapidly evolving, with future progress dependent on enhanced collaboration and a focus on translating fundamental findings into practical applications. Karabulut & Kaya (2023) analyzed global research trends in Crohn's disease based on 16,216 research articles published between 1980 and 2022. The findings showed that the United States of America, the UK, and Germany were the most productive countries, while the French Research Universities and the Assistance Publique-Hôpitaux de Paris were the most active institutions. Khaledi et al. (2024) examined the publication patterns of anemia research indexed in the PubMed database. The study revealed a total of 8,484 research articles published between 2011 and 2020.

Rodrigues et al. (2024) conducted a scientometric review to examine research trends on bacterial infections in poultry systems and the application of bacteriophages as an alternative control strategy. The findings revealed Escherichia coli as the most frequently studied pathogen and demonstrated a positive correlation between research output, poultry productivity, and antimicrobial resistance concerns. The study identified the United States of America and China as the leading contributors and emphasized existing research gaps, highlighting the need for expanded investigations and practical implementation of bacteriophage-based interventions in poultry systems. Akbari et al. (2025) carried out a scientometric analysis on Stigma Research in Medicine from 1992 to 2022 as indexed in the Scopus database. VOS Viewer was used for network and keyword analysis.

Hafiz et al. (2025) have reviewed research trends in lumpy skin disease related to veterinary medicine. The necessary data were retrieved from the Scopus database. The author evaluated the total number of publications, citation analysis, h-index, institution-wise publication, most prolific authors and journals. The study found a significant increase in publications on lumpy skin disease. The University of Pretoria was the leading contributing institution, and the *Journal of Virology* was the most contributed journal over the study period. Li et al. (2025) have explored the growth of cancer immunotherapy literature by using the Web of Science database. The study shows that 4,856 research articles were published in the field of cancer immunotherapy.

Based on the literature review, previous studies on scientometric analysis have primarily focused on areas such as Aristolochic acid nephropathy, pallidotomy, brachytherapy, injectable treatments for diabetes patients, norovirus and dental health, bacterial biofilm eradication, Crohn's disease, anemia, bacterial infections in poultry systems, stigma research, lumpy skin disease, and cancer immunotherapy. This study addresses this gap by presenting a scientometric analysis of immunology research in India.

OBJECTIVES OF THE STUDY

The primary objective of this paper is to analyze the research output in the field of Immunology research in India for the period from 1995 to 2024 using the Web of Science citation database. The other objectives are to:

1. Examine the year-wise growth of Immunology research publications in India.
2. Study the Relative Growth Rate (RGR) and Doubling Time (Dt.);
3. Study the authorship pattern and to calculate the Degree of Collaboration (DC), CC, CI;
4. Identify the top highly productive authors in the field of Immunology.
5. Examine the top highly productive institutions in the field of Immunology; and
6. Identify the top journals preferred by the Authors in Immunology research.

MATERIALS AND METHODS

The necessary data were retrieved from one of the premier and widely cited databases, the Web of Science, covering Immunology research over 30 years (1995–2024). The Search string formulated to extract the bibliographic records: Key=(Immunology) AND PUBYEAR= (1995-2024) COUNTRY=INDIA. The search string was formulated to extract bibliographic records containing the term "Immunology" as a keyword. The citation data for the extracted publications were collected during the third week of May 2025. A total of 25,555 records were identified for Indian publications on Immunology.

ANALYSIS AND DISCUSSIONS

Table 1: Year-wise productivity in the field of Immunology Research in India

Sl. No.	Publication Year	TP	TC	ACPP	Cited	%	Uncited	%
1	1995	231	4601	19.92	215	1.05	16	0.31
2	1996	232	3693	15.88	194	0.95	38	0.74
3	1997	245	5356	21.86	234	1.15	11	0.21
4	1998	252	5166	20.5	232	1.14	20	0.39
5	1999	238	6260	26.3	219	1.07	19	0.37
6	2000	249	6021	24.18	219	1.07	30	0.58
7	2001	235	5665	24.11	210	1.03	25	0.49
8	2002	278	7066	25.42	248	1.22	30	0.58
9	2003	306	9033	29.52	294	1.44	12	0.23
10	2004	360	11360	31.56	341	1.67	19	0.37
11	2005	453	13282	29.32	405	1.98	48	0.93
12	2006	490	15657	31.95	444	2.18	46	0.89
13	2007	602	16985	28.21	530	2.60	72	1.40

14	2008	906	20645	22.79	701	3.44	205	3.98
15	2009	766	20146	26.3	692	3.39	74	1.44
16	2010	703	18467	26.27	617	3.02	86	1.67
17	2011	773	20649	26.71	669	3.28	104	2.02
18	2012	987	20434	20.7	775	3.80	212	4.12
19	2013	972	22274	22.92	835	4.09	137	2.66
20	2014	1120	22737	20.3	921	4.51	199	3.87
21	2015	1172	19477	16.62	967	4.74	205	3.98
22	2016	1375	23829	17.33	1052	5.16	323	6.27
23	2017	1283	24724	19.27	1067	5.23	216	4.20
24	2018	1354	29411	21.72	1107	5.42	247	4.80
25	2019	1395	23757	17.03	1097	5.38	298	5.79
26	2020	1632	27740	17	1267	6.21	365	7.09
27	2021	1748	24687	14.12	1520	7.45	228	4.43
28	2022	1777	14634	8.24	1371	6.72	406	7.89
29	2023	1660	8307	5	1174	5.75	486	9.44
30	2024	1761	2266	1.29	790	3.87	971	18.86
Total		**25555**	**454329**		20407	100	5148	100.00

TP-Total Publications, TC-Total Citations, ACPP-Average Citation per Paper

Table 1 shows the year-wise growth of Immunology research publications in India over thirty years (1995–2024), encompassing 25,555 publications and 454,329 citations. It is identified that a maximum of 1,777 research publications were contributed in the year 2022, followed by 1,761 publications in the year 2024 and 1,748 in the year 2021. During the thirty-year study, it was identified that a total of 25,555 publications received 4,54,329 citations. Of these, 29,411 citations were received for 1,354 publications in 2018, followed by 27,740 citations for 1,632 publications in 2020.

Table 2: Relative Growth Rate (RGR) and Doubling (Dt.) Time in the field of Immunology Research in India

Sl. No	Publication Year	Total Publications	Cumulative TC	W1	W2	RGR=(W2-W1)	Dt=(0.693/RGR)
1	1995	231	231		5.44		
2	1996	232	463	5.44	6.14	0.69	0.99
3	1997	245	477	6.13	6.17	0.03	23.26
4	1998	252	497	6.16	6.21	0.04	16.87
5	1999	238	490	6.21	6.19	-0.01	-48.86
6	2000	249	487	6.19	6.19	-0.01	-112.84
7	2001	235	484	6.19	6.18	-0.01	-112.15
8	2002	278	513	6.18	6.24	0.06	11.90
9	2003	306	584	6.24	6.37	0.13	5.34
10	2004	360	666	6.37	6.50	0.13	5.27
11	2005	453	813	6.50	6.70	0.20	3.48
12	2006	490	943	6.70	6.85	0.15	4.67
13	2007	602	1092	6.85	7.00	0.15	4.72
14	2008	906	1508	7.00	7.32	0.32	2.14
15	2009	766	1672	7.32	7.42	0.10	6.71
16	2010	703	1469	7.42	7.29	-0.13	-5.35
17	2011	773	1476	7.29	7.30	0.00	145.77
18	2012	987	1760	7.30	7.47	0.18	3.93
19	2013	972	1959	7.47	7.58	0.11	6.46
20	2014	1120	2092	7.58	7.65	0.07	10.55

21	2015	1172	2292	7.65	7.74	0.09	7.59
22	2016	1375	2547	7.74	7.84	0.11	6.56
23	2017	1283	2658	7.84	7.89	0.04	16.24
24	2018	1354	2637	7.89	7.88	-0.01	-87.36
25	2019	1395	2749	7.88	7.92	0.04	16.66
26	2020	1632	3027	7.92	8.02	0.10	7.19
27	2021	1748	3380	8.02	8.13	0.11	6.28
28	2022	1777	3525	8.13	8.17	0.04	16.49
29	2023	1660	3437	8.17	8.14	-0.03	-27.41
30	2024	1761	3421	8.14	8.14	0.00	-148.51
Total		**25555**		**7.1**	**7.14**	**0.09**	**-7.36**

Table 2 shows the relative growth rate and doubling time of the Indian Immunology literature from 1995 to 2024. The data indicate that the relative growth rate (RGR) fluctuated throughout the study period. 0.69 RGR was recorded in the year 1996, and it decreased to -0.01 in the year 2001. Again, it was increased to 0.06 in the year 2002 and increased to 0.32 in the year 2008. Furthermore, fluctuations were observed during the period from 2009 to 2024. The data shows the fluctuation trend from 1995 to 2024. In terms of doubling time, a fluctuating trend was also observed throughout the study period. 0.99 Value doubling time was recorded in the year 1996, and it was decreased to -112.15 in the year 2001. The fluctuation trend was recorded from 2002 to 2024. Overall, the data show a fluctuating trend in both the relative growth rate (RGR) and doubling time (DT) in the field of Immunology.

Table 3 Authorship Pattern in the field of Immunology Research in India

Authorship Pattern							
Year	**Single Author**	**Two Authors**	**Three Authors**	**Four Authors**	**Five Authors**	**> 5 Authors**	**Total Publications**
1995	11	36	51	54	25	54	231
1996	15	41	47	51	35	43	232
1997	27	47	53	41	28	49	245
1998	17	35	57	43	38	62	252
1999	14	35	46	50	36	57	238
2000	10	42	51	40	35	71	249
2001	14	38	48	35	38	62	235
2002	15	44	50	46	46	77	278
2003	11	29	70	49	51	96	306
2004	38	57	61	69	48	87	360
2005	36	58	89	69	58	143	453
2006	48	69	66	68	58	181	490
2007	70	92	93	86	78	183	602
2008	59	190	159	153	108	237	906
2009	40	111	119	135	106	255	766
2010	57	99	98	119	77	253	703
2011	44	112	104	107	96	310	773
2012	70	114	161	129	121	392	987
2013	61	123	138	168	127	355	972
2014	60	133	137	176	150	464	1120
2015	48	145	160	151	169	499	1172
2016	52	160	154	190	176	643	1375
2017	39	151	162	157	167	607	1283
2018	44	157	134	143	201	675	1354
2019	52	167	143	170	194	669	1395

2020	59	326	161	167	173	746	1632
2021	71	169	217	170	218	903	1748
2022	36	183	181	223	199	955	1777
2023	44	158	164	201	167	926	1660
2024	62	146	171	205	213	964	1761
Total	**1224**	**3267**	**3345**	**3465**	**3236**	**11018**	**25555**
%	**4.79**	**12.78**	**13.09**	**13.56**	**12.66**	**43.11**	**100**

Authorship is a vital measure in bibliometrics, scientometrics, and all metric studies that reflect current communication patterns, efficiency, and the association between researchers. Table 3 exhibits that out of 25,555 publications, the highest number i.e. 11,018 (43.11%) publications were published by more than five authors, followed by 3,465 (13.56%) publications were published by four authors, 3,345 (13.09%) publications were published by three authors, 3,267 (12.78%) publications were contributed by two authors and 3,236 (12.66%) publications were published by five authors. Only 1,224 (4.79%) of the publications were single-authored publications. Collaborative authorship was the most acceptable authorship pattern, particularly for more than five, four and three authors. The analysis reveals that the collaboration network was high in Immunology literature from 1995 to 2024.

Table 4: Degree of Collaboration in the Field of Immunology Research in India

Year	Single Author Publications	Multi-author Publications	Total Author publications	Degree of Collaboration DC=Nm / Ns + Nm	Collaboration Index	Collaboration Coefficient
1995	11	220	231	0.95	4.30	0.90
1996	15	217	232	0.93	4.25	0.87
1997	27	218	245	0.89	3.89	0.78
1998	17	235	252	0.93	4.28	0.87
1999	14	224	238	0.94	4.44	0.88
2000	10	239	249	0.96	4.53	0.92
2001	14	221	235	0.94	4.57	0.88
2002	15	263	278	0.94	4.62	0.89
2003	11	295	306	0.96	4.86	0.93
2004	38	322	360	0.89	4.20	0.79
2005	36	417	453	0.92	4.77	0.84
2006	48	442	490	0.90	4.80	0.80
2007	70	532	602	0.88	4.84	0.77
2008	59	847	906	0.93	4.56	0.87
2009	40	726	766	0.94	5.12	0.90
2010	57	646	703	0.91	5.28	0.84
2011	44	729	773	0.94	5.60	0.89
2012	70	917	987	0.92	5.67	0.86
2013	61	911	972	0.93	5.82	0.87
2014	60	1060	1120	0.94	5.94	0.89
2015	48	1124	1172	0.95	6.06	0.92
2016	52	1323	1375	0.96	6.64	0.92
2017	39	1244	1283	0.97	6.34	0.94
2018	44	1310	1354	0.96	6.84	0.94
2019	52	1343	1395	0.96	8.25	0.93
2020	59	1573	1632	0.96	6.98	0.93
2021	71	1677	1748	0.95	8.05	0.92
2022	36	1741	1777	0.98	7.52	0.96
2023	44	1616	1660	0.97	7.69	0.95

2024	62	1699	1761	0.96	8.00	0.93
	1224	**24331**	**25555**	**0.93**	**5.62**	**0.89**

Table 4 indicates the Degree of Collaboration, Collaborative Index (CI) and Collaboration Coefficient (CC) in Immunology literature during the study period. A fluctuating trend was observed in the degree of collaboration in the field of Immunology over the study period. The Collaborative Index was used to measure the mean number of authors. The lowest collaborative index (CI) of 4.30 was recorded in 1995, which increased to 8.00 in 2024, with slight fluctuations observed over the intervening years. The Collaborative Coefficient (CC) was used to assess the level of collaboration between authors in the field of research. The lowest collaboration Coefficient (CC) of 0.90 was recorded in 1995, increasing to 0.93 in 2024. From 1995 to 2024, both the collaborative index (CI) and collaboration coefficient (CC) exhibited an overall increasing trend, with slight year-to-year fluctuations

Table 5: Top ten highly productive authors in the field of Immunology Research in India

Sl. No.	Name of Author	Affiliation	State / UT	TP	TC	ACPP	H-Index
1	A. S. Soin	Medanta Inst. Liver Transplantat & Regenerat Med, Gurgaon	Haryana	168	201	1.2	7
2	Nagalingeswaran Kumarasasmy	Voluntary Health Services (VHS) Hospital in Chennai	Tamil Nadu	157	3743	23.84	37
3	Narendra K Mehra	All India Institute of Medical Sciences, New Delhi, India	New Delhi	146	2102	14.4	28
4	Bhaskar Saha	National Centre for Cell Science, Pune, Maharashtra	Maharashtra	130	3023	23.25	30
5	Amit Rawat	Post Graduate Institute of Medical Education & Research, Chandigarh	Chandigarh	117	1029	8.79	18
6	Soumya Swaminathan	M S Swaminathan Res Fdn, Chennai	Tamil Nadu	116	3657	31.53	32
7	Vivek B. Kute	Institute of Kidney Disease and Research Centre, Ahmedabad	Gujarat	116	569	4.91	14
8	Gagandeep Kang	Christian Medical College & Hospital, Vellore	Tamil Nadu	114	3680	32.28	33
9	Subash Babu	International Centre for Excellence in Research, Chennai	Tamil Nadu	110	2766	25.15	28
10	Balaji Veeraraghavan	Christian Medical College & Hospital, Vellore	Tamil Nadu	109	1685	15.46	25

Table 5 presents the top ten most productive authors in Indian Immunology research, along with their average citations per paper and H-index. It is evident from the table that among the top ten highly productive authors, A. S. Soin, affiliated to Medanta Inst. of Liver Transplantat & Regenerat Med, Gurgaon, Haryana, ranked first in terms of productivity with 168 publications, 201 citations and an h-index of 7, followed by Nagalingeswaran Kumarasasmy affiliated to the Voluntary Health Services (VHS) Hospital in Chennai, Tamil Nadu, secured second position with 157 publications, 3,743 citations, ACPP of 23.84 and also secured second rank with an H-index of 37. Narendra K. Mehra, affiliated to the All India Institute of Medical Sciences, New Delhi, was in third rank with 146 total publications, 2,102 citations, 14.4 ACCP and an H-Index of 28. In terms of ACPP, Gagandeep Kang, affiliated to Christian Medical College & Hospital, Vellore, Tamil Nadu, was in first position with 32.28 ACPP, followed by Soumya Swaminathan, affiliated to M. S. Swaminathan Res. Fodn, Chennai, Tamil

Nadu, with 31.53 ACCP, was in second position. Of the top ten most productive authors, five were affiliated with institutions in Tamil Nadu.

Table 6: Top Ten Highly Productive Institutions in the field of Immunology Research in India

Sl. No.	Name of Institution	TP	TC	ACPP
1	All India Institute of Medical Sciences, New Delhi	1806	32820	18.17
2	Post Graduate Institute of Medical Education Research, Chandigarh	1473	21960	14.91
3	Christian Medical College Hospital, Vellore, Tamil Nadu	926	18493	19.97
4	University of Delhi, New Delhi	588	14024	23.85
5	Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, Uttar Pradesh	521	9369	17.98
6	Banaras Hindu University, Varanasi, Uttar Pradesh	497	13971	28.11
7	National Institute for Research In Tuberculosis, Chennai, Tamil Nadu	489	11798	13
8	National Institute of Cholera Enteric Diseases, Kolkata, West Bengal	398	9772	24.55
9	National Institute of Virology, Pune, Maharashtra	390	8012	20.54
10	National Institute of Immunology, New Delhi	385	7644	19.85

The data in Table 6 indicate that among the top ten most productive institutions, All India Institute of Medical Sciences, New Delhi, has published the highest number of articles, i.e. 1,806 with 32,820 citations and 18.17 ACPP, followed by the Post Graduate Institute of Medical Education Research, Chandigarh, which holds second position with 1,473 publications, 21,960 citations and 14.91 ACPP. Christian Medical College Hospital, Vellore, Tamil Nadu was in third rank with 926 publications, 18,493 citations and 19.97 ACPP. Of the top ten most productive institutions, three are in New Delhi and two in Tamil Nadu.

Table 7: Journals preferred by the authors in the field of Immunology Research in India

Sl. No.	Publication Titles	TP	TC	ACPP	H-Index	Publisher	Country
1	Indian Journal of Medical Research	5163	78219	15.15	91	Indian Council of Medical Research	India
2	Indian Journal of Medical Microbiology	1871	14305	7.65	7.65	Indian Association of Medical Microbiologists	India
3	Transplantation	1334	4227	3.17	33	Wolters Kluwer Health	USA
4	Microbial Pathogenesis	974	19791	20.32	62	Elsevier	Netherlands
5	Vaccine	966	21256	22	63	Elsevier	Netherlands
6	Frontiers In Immunology	743	20373	27.42	66	Frontiers Media SA	Switzerland
7	International Immunopharmacology	543	13559	24.97	53	Elsevier	Netherlands
8	Fish Shellfish Immunology	455	17422	38.29	67	Elsevier	Netherlands
9	Clinical Infectious Diseases	405	17845	44.06	68	Oxford University Press	UK
10	Journal of Immunology	402	10601	26.37	55	American Association of Immunologists (AAI)	USA

Table 7 indicates the quantum of research productivity on Immunology literature in terms of articles published in the most productive international and national journals from 1995 to 2024The *Indian*

Journal of Medical Research, published by the Indian Council of Medical Research, ranked first with 5,163 publications, 78,219 citations, an average citation per paper (ACPP) of 15.15, and an H-index of 91, followed by *Indian Journal of Medical Microbiology* published by the Indian Association of Medical Microbiologists, India, with 1871 total publications, 14305 citations and h-index of 7.65. *Transplantation* was in third rank with 1,334 total publications, 4,227 citations, 3.17 ACPP and h-index of 33.The articles that were published in the top journals have significant reference value for doctors, scientists, researchers, academicians, policy-makers, and librarians.

Table 8: Top five highly cited papers in the field of Immunology Research in India

Sl. N0.	No. of Citations Received	Title	Authors	Source	Volume No.	Issue No.	Page No.
1	1640	Pathogen Recognition by the Innate Immune System	Kumar, Himanshu; Kawai, Taro; Akira, Shizuo	International Reviews of Immunology	30	1	16-34
2	1090	Simultaneous Emergence of Multidrug-Resistant Candida auris on 3 Continents Confirmed by Whole-Genome Sequencing and Epidemiological Analyses	Lockhart, Shawn R.; Etienne, Kizee A.; Vallabhaneni, Snigdha; Farooqi, Joveria; Chowdhary, Anuradha; Govender, Nelesh P.; et al.	Clinical Infectious diseases	64	2	134-140
3	1075	A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID-19 outbreak	Chew, Nicholas W. S.; Lee, Grace K. H.; Tan, Benjamin Y. Q.; Jing, Mingxue; Goh, Yihui; Ngiam, Nicholas J. H.; et al.	Brain Behavior and Immunity	88	-	559-565
4	1026	Intratumoral Tcf1+PD-1+CD8+ T Cells with Stem-like Properties Promote Tumor Control in Response to Vaccination and Checkpoint Blockade Immunotherapy	Siddiqui, Imran; Schaeuble, Karin; Chennupati, Vijaykumar; Marraco, Silvia A. Fuertes; Calderon-Copete, Sandra; Ferreira, Daniela Pais; et al.	Immunity	50	1	195
5	962	Strategies for combating bacterial biofilms: A focus on anti-biofilm agents and their mechanisms of action	Roy, Ranita; Tiwari, Monalisa; Donelli, Gianfranco; Tiwari, Vishvanath	Virulence	9	1	522-554

Table 8 presents the top 5 most-cited papers in the field of Immunology research in India. The data indicate that the paper titled "Pathogen Recognition by the Innate Immune System," authored by Kumar, Himanshu; Kawai, Taro; and Akira, Shizuo, was published in the *International Reviews of Immunology* journal, ranks first with the highest number of citations (1,640), followed by "Simultaneous Emergence of Multidrug-Resistant Candida Auris on 3 Continents Confirmed by Whole-Genome Sequencing and Epidemiological Analyses" authored by Lockhart, Shawn R.; Etienne, Kizee A.; Vallabhaneni, Snigdha; Farooqi, Joveria; Chowdhary, Anuradha; Govender, Nelesh P. et al. ranks second with 1090 citations, and the article "A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID-19 outbreak" ranks third with 1,075 citations.

CONCLUSION

This research presents a detailed quantitative analysis of Indian Immunology research productivity using the Web of Science database. The study shows increasing and decreasing trends in publications, citation count, and average citations per paper from 1995 to 2024. The Relative Growth Rate (RGR) and

Doubling Time (Dt.) also showed fluctuation during the study period. The authorship pattern revealed that more than 5 authors published the most publications, whereas only 4.79% were single-authored, indicating higher collaborative authorship in the field of Immunology. The top ten highly productive authors also contributed a significant number of research publications, and the top five highly cited papers in the field of Immunology. Highly contributed institutions, viz. All India Institute of Medical Sciences, New Delhi, Post Graduate Institute of Medical Education Research, Chandigarh, Christian Medical College Hospital, Vellore, Tamil Nadu have contributed a significant number of publications. Journals such as the Indian Journal of Medical Research, the Indian Journal of Medical Microbiology, and Transplantation ranked among the top three by publishing the highest number of papers in the field of Immunology. The article "Pathogen Recognition by the Innate Immune System" has received the most citations among the top five highly cited papers. This research guides future research directions for scholars, policymakers, librarians, and other stakeholders.

- Conflict of Interest: The authors affirm that there is no Conflicts of Interest.
- Statement of Data Consent: The article contains the data produced during the study.

REFERENCES

1) Agrawal, M., Garg, K., Samala, R., Rajan, R., & Singh, M. (2021). A scientometric analysis of the 100 most cited articles on Pallidotomy. *Stereotactic and Functional Neurosurgery*, *99*(6), 463-473.
2) Akbari, H., Mohammadi, M., & Hosseini, A. (2025). A Scientometric perspective on stigma research in medicine: a bibliometric review. *Iranian Journal of Public Health*, *54*(2), 346.
3) Ghazbani, A., Abdolahi, M., Mansourzadeh, M. J., BasirianJahromi, R., Behzadipour, S., Mohseni Azad, A., & Hamidi, A. (2022). Knowledge domain and emerging trends in brachytherapy: A scientometric analysis. *Precision Radiation Oncology*, *6*(3), 243-256.
4) Gupta, B. M., & Bala, A. (2011). A scientometric analysis of Indian research output in medicine during 1999–2008. *Journal of natural science, biology, and medicine*, *2*(1), 87.
5) Hafiz, M. Z., Heyat, M. B. B., Hayat, M. A. B., Parveen, S., Sultana, A., Akhtar, F., & Abdelgeliel, A. S. (2025). Progress and research trends in lumpy skin disease based on the scientometric assessment–a review. *Annals of Animal Science*, *25*(3), 829-843.
6) Ivancheva, L. (2008). Scientometrics today: A methodological overview. *COLLNET Journal of Scientometrics and Information Management*, *2*(2), 47-56.
7) Ji, H., Hu, J., Zhang, G., Song, J., Zhou, X., & Guo, D. (2021). Aristolochic acid nephropathy: A scientometric analysis of literature published from 1971 to 2019. *Medicine*, *100*(27), e26510.
8) Khaledi, H., Makkizadeh, F., & Hazeri, A. (2024). Scientometrics analysis of global researches on anemia. *International Journal of Hematology-Oncology and Stem Cell Research*, *18*(4), 390.
9) Li, Z., Qi, H., Huang, Z., Zhang, S., Guo, H., Hongliang, L., & Zhang, C. (2025). Exploring research trends in cancer immunotherapy via single-cell technologies: a scientometric perspective. *Frontiers in Immunology*, *16*, 1640224.
10) Mahendra, D. G. (2023). Global research trends in norovirus and dental health: a scientometric analysis (2012-2021). *Educational Administration: Theory and Practice*, *29*(4), 6043-6049.
11) Pantea, I., Roman, N., Repanovici, A., & Drugus, D. (2022). Diabetes patients' acceptance of injectable treatment, a scientometric analysis. *Life*, *12*(12), 2055.
12) Prakash, R. U. (2012). Overview of the burden of non-communicable diseases in India. *Iranian Journal of Public Health*, *41*(3), 1-8.s
13) Rodrigues, H. C., Sampaio, G. V., Bolsan, A. C., De Prá, M. C., Ghisi, N. D. C., & Gabiatti, N. C. (2024). Bacteriophages against bacterial infections in poultry systems: a scientometric review. *PHAGE*, *5*(3), 130-142.
14) Wang, T., Zhang, R., Chen, Z., Cao, P., Zhou, Q., & Wu, Q. (2023). A global bibliometric and visualized analysis of bacterial biofilm eradication from 2012 to 2022. *Frontiers in Microbiology*, *14*, 1287964.
15) Zhao, M., Jiang, J., Zhao, M., Chang, C., Wu, H., & Lu, Q. (2021). The application of single-cell RNA sequencing in studies of autoimmune diseases: a comprehensive review. *Clinical Reviews in Allergy & Immunology*, *60*(1), 68-86.