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Indian contribution status of the cataract research: a bibliometric analysis

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Abstract

Based on cataract research data obtained from the Scopus database, it is comprehended that 3673 (3.93 % global share) researched articles from India on cataract had been published till 2017, which place India on 6th position in the world in terms of research paper output. About 62.13 % of the Indian publications appeared during the period 2008-2017. L.V. Prasad Eye Institute India and All India Institute of Medical Sciences (AIIMS), New Delhi was the most productive as they had been publishing the highest number of papers, i.e., 424 and 385, respectively. About 38.71% Indian publications are a result of international collaboration with 116 countries.

Keywords: Cataract; blindness; India; Bibliometrics

Introduction

The International Agency for the Prevention of Blindness has defined cataract as “It is clouding of the lens of the eye which impedes the passage of light”. As per World Health Organisation (WHO), approximately 18 million people are bilaterally blind by cataract, which is almost half the total blindness cases in this world. Cataract is one of the leading causes of visual impairment in the world. Increasing age is one of the main irreversible risk factors for cataract. Inborn cataract in children are mainly due to genetic disorders. Also, women have an increased risk of cataract than men. The proportion of blindness by cataract ranges from 5% in developed countries to 50% or more in poor and remote countries. Thanks to Medical Science for offering cataract surgery or immediate visual rehabilitation, by which cataract can be removed and an intraocular lens (IOL) replaced. However, an ophthalmologist should be able to undertake as many as 2,000 or more cataract surgeries a year, if there are adequate support staff, infrastructure and patients who are able and willing to access the facilities [1].

In both developed and developing countries, cataract has been one of the main problems of blindness and low vision and even though Medical Science offers restoration of vision surgically, barriers still prevent patients to access the surgery properly. In such a scenario, WHO plays a significant role by providing them with the requisite guidance and appropriate technical support [2].

Research on cataract is catching momentum as evident from the increasing research publication output for the period under study. The different facets of publication productivity in different research zones can be analysed through Bibliometric techniques [3,4].

Several bibliometric studies have reported analysis of cataract literature [5-8] while some studies on ophthalmology and visual sciences in specific countries [5-9] including a study on global perspectives [10-11] also exists. There are few bibliometric studies on ophthalmology have been published so far [12-14]. Out of which, cataract has been explored very less [15-18]. From the review of literature, it has been observed that the studies conducted so far have not explored the literature on cataract research in India from the beginning. As such, this paper

attempts at filling the gap by presenting a bibliometric report on cataract research in India till 2017.

Objective of the paper

The prime objectives are as follows

- To analyse the role of India in cataract research.
- To study the research performance of Indian institutions in the field of cataract.
- To identify the top Indian scholars contributing on cataract research publication.
- To find preferred journals in which Indian scholars are publishing.
- To examine collaboration for cataract research publication.
- To analyse the activity index.

Methodology

A comprehensive search on the world-renowned database, i.e., Scopus was conducted for collecting data on ‘cataract’ till 2017 on June 2018. The word ‘cataract’ was examined in title and keywords with the fixed geographical location as India. The records were analysed for tabulating the productive countries, and then further analysed for India’s contribution in context of institutions, journals, authors and their citation impact and Hirsch Index.

Results and Discussion

The total worldwide contribution on cataract stood at 93,418 in Scopus databases. Table 1 presents the publication productivity of top six countries on contract. It was found that top four contributors on cataract were from developed nations and 5th and 6th rank were from developing countries, i.e., China followed by India. Total contribution on cataract research publication of top 6 countries is 55.79%. The US scored the top ranking with a total contribution of 26.52% followed by the UK. However, a decade-wise analysis shows that there has been a continuous growth in the number of researched articles. Nevertheless, the total share of the developed countries has gradually decreased during the recent decades. On the contrary, developing countries has shown an increasing trend. China has shown an extreme leap from 1998-2007 to 2008-2017, with a total percentage of 3.43% to 12.58%. India obtained 6th position in terms of worldwide publication with a contribution of 3673 researched papers, which is 3.93% of the total worldwide literature. Publication during 1963-1967, stood at 0.54% (only 33 articles of 6110 universally) that increased further to 1.05% during 1968-1977. The same percent share 1.05 % was seen during the next decade, i.e., 1978-1987. Since then, there had been a gradual increase in publication rate by the Indian authors

COUNTRY	Contribution	%	Number of Publications						Share of Publications %					
			<1967	1968 - 1977	1978 - 1987	1988 - 1997	1998 - 2007	2008 - 2017	<1967	1968 - 1977	1978 - 1987	1988 - 1997	1998 - 2007	2008 - 2017
United States	24777	26.52	1345	1533	3291	4529	5901	8178	22.01	22.71	33.81	29.33	26.40	24.76
United Kingdom	7273	7.79	229	311	477	1244	2344	2668	3.75	4.61	4.90	8.06	10.49	8.08
Japan	6279	6.72	18	316	586	1696	1767	1896	0.29	4.68	6.02	10.98	7.90	5.74
Germany	5125	5.49	62	228	568	979	1504	1784	1.01	3.38	5.84	6.34	6.73	5.40

China	4988	5.34	2	0	15	49	767	4155		0.03	-	0.15	0.32	3.43	12.58
India	3673	3.93	33	71	102	281	904	2282		0.54	1.05	1.05	1.82	4.04	6.91
Others	41303	44.21	4421	4291	4695	6665	9167	12064		72.36	63.57	48.23	43.16	41.01	36.53
World	93418	100.00	6110	6750	9734	15443	22354	33027		100.00	100.00	100.00	100.00	100.00	100.00

Table 1. Most productive countries and their publication share on cataract research

The Indian contribution of 3673 archives were further examined. It was observed that the first article was contributed by an Indian Scholar in 1909 and since then, there had been a continuous growth with the maximum contribution during the last decade, i.e., 2008-2017 at a grand maximum rate of 6.91%. These 3673 papers received 45,467 citations with an average citation rate of 12.38 per paper. However, papers published during the period 1998-2007 have the maximum citation average citation per paper (ACPP) (22.60).

Figure 1 presents the progress of Indian publication output and citations of Indian publication on cataract research during the period of 1909-2017. It has been recorded that till 1980, the publications were quite low, but in 1973 and 1974 there was a sudden jump and then the progress of scientific contribution was observed after 1987.

Out of 3673 papers, there were 2842 articles (77.40%), 320 reviews (8.71%), 282 letters (7.68%) and 82 conference papers (2.23%) and remaining were notes, i.e., 44 (1.20 %). There were contributions in the form of editorials, book chapters, short survey, erratum and books also, but the number were extremely low, i.e., lower than one percent each.

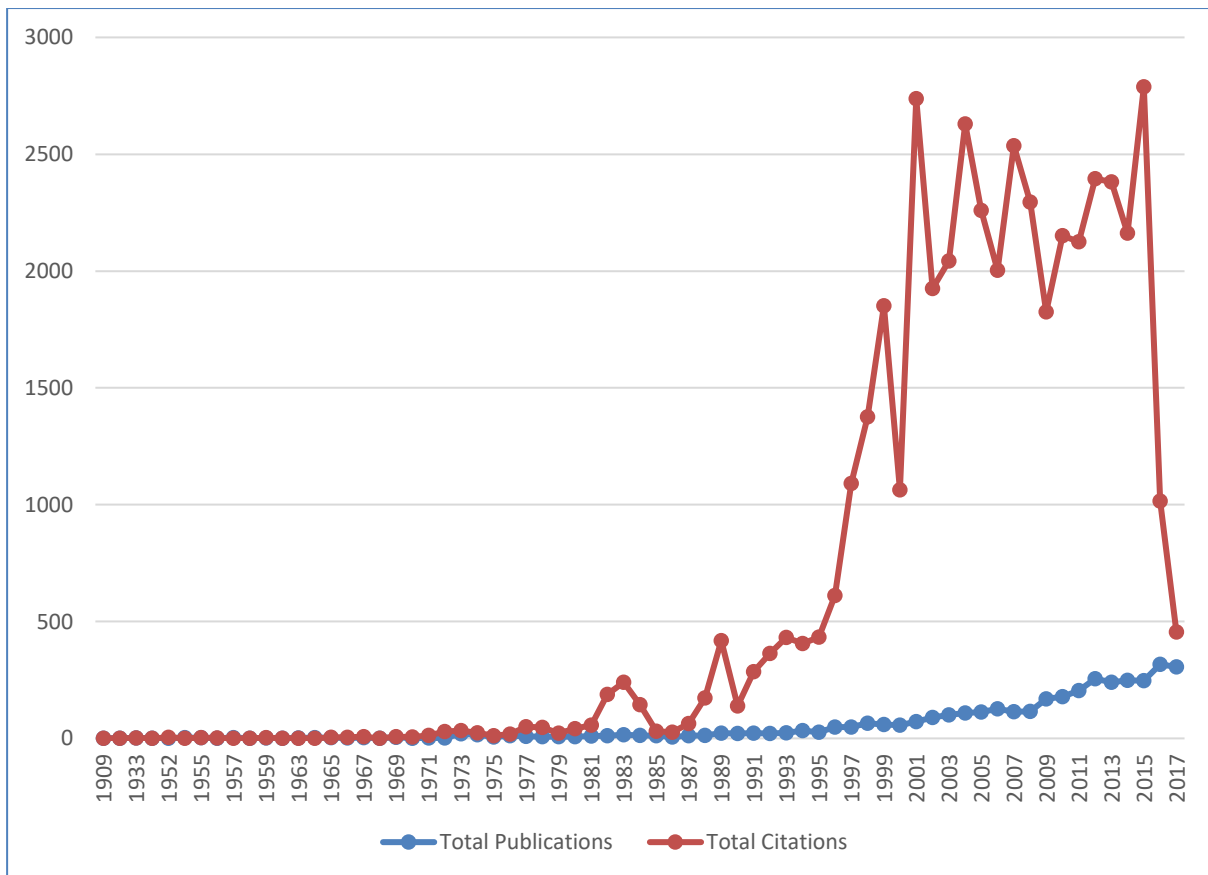


Figure 1: Publication growth and citedness of Indian publication on cataract

Research performance of Indian institutions on Cataract

It was found that 10 institutes published 77 or more papers on cataract during 1909-2017. Table 2 provides publication output of top 10 Indian institutions and their citation impact along with h-index values. These top 10 institutes have contributed 53.96% of the total Indian publications. The highest contribution was from L.V. Prasad Eye Institute India (424 papers), followed by All India Institute of Medical Sciences, New Delhi (385 papers) and Dr. Rajendra Prasad Centre for Ophthalmic Sciences (300 papers). In the context of citation count, All India Institute of Medical Sciences, New Delhi is at the top in the list with 4443 citations with an ACPP of 11.54 followed by Aravind Eye Hospital with 4213 citations and with a maximum ACPP of 22.06. The All India Institute of Medical Sciences, New Delhi and Postgraduate Institute of Medical Education and Research have H-index greater than 100, i.e., 137 and 110, respectively.

Rank	Institutions	Total Publications	Total Citations	Average Citation per publication	h-Index
1	L.V. Prasad Eye Institute India	424	2324	5.48	72
2	All India Institute of Medical Sciences, New Delhi	385	4443	11.54	137
3	Dr. Rajendra Prasad Centre for Ophthalmic Sciences	300	880	2.93	53
4	Postgraduate Institute of Medical Education and Research	213	2345	11.01	110
5	Aravind Eye Hospital	191	4213	22.06	49
6	Iladevi Cataract and Intraocular Lens Research	138	2448	17.74	27
7	Vision Research Foundation India	90	1331	14.79	52
8	Sankara Nethralaya	85	1427	16.79	52
10	Medical Research Foundation, Chennai Other institutes	77	1459	18.95	54

Table 2. Most productive institutions in India working on cataract

Research output of Indian authors on Cataract

Figure 2 elucidates output and impact of India's most productive authors in the field of cataract research. There are 16 Indian authors who have published more than 35 papers during 1909-2017. It was found that these 16 authors belong to 7 institutions in India. These authors contributed 902 papers, which accounts for 24.56% of the total Indian publications' output. The most productive author was A.R. Vasavada from Iladevi Cataract and Intraocular Lens Research with 131 publications followed by J. Ram from Postgraduate Institute of Medical Education and Research with 110 publications. N. Sharma from Dr. Rajendra Prasad Centre for Ophthalmic Sciences with 69 publications, R.B. Vajpayee from All India Institute of Medical Sciences, New Delhi with 68 publications and A. Gupta from Postgraduate Institute of Medical Education and Research with 58 publications.

Looking towards the citation count, the highest number of citations, i.e., 1993 was received by A.R. Vasavada's papers who had ACPP of 15.21 followed by G.N. Rao with 1941 citations and highest ACPP of 37.33. H-index is an important parameter of qualitative measure. It was found that A. Gupta has the highest h-index with a value of 191, followed by S. Sharma with

h-index 164 (rank 13) and A. Agarwal with h-index 142 (rank 15). There were 6 authors having the h-index greater than average h-index (67.62%).

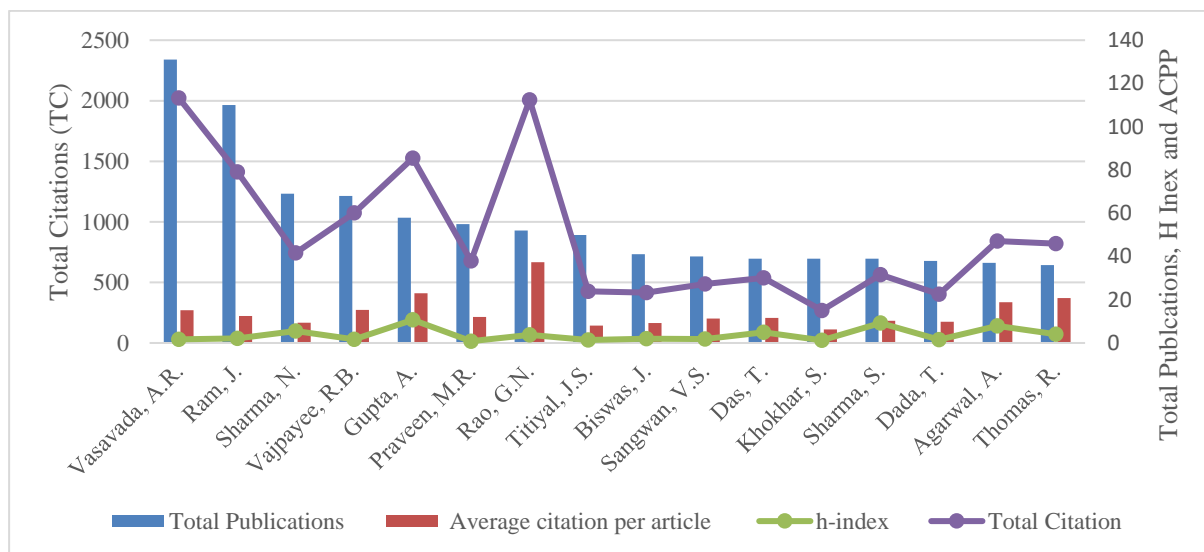


Figure 2: Prolific Indian authors engaged in cataract research

Journal productivity in terms of Indian contribution

The Indian papers on cataract were published in 737 national and international sources. Table 3 shows the list of top 13 journals in which 35 or more papers on cataract were published. The publication shares of these 13 journals was 35.37% of total Indian research output. Many Indian authors preferred Indian Journal of Ophthalmology. It had an impact factor (IF) of 0.961 for the year 2017. Other journals include Journal of Cataract and Refractive Surgery (246 papers; IF = 2.68), and British Journal of Ophthalmology (125 articles; IF = 3.384). As far as the IF is concerned, the Indian authors publishing in Ophthalmology include 73 papers and American Journal of Ophthalmology (71 papers) with IF 7.479 and 4.795, respectively.

Rank	Journal	Contributions	%	Impact Factor
1	Indian Journal of Ophthalmology	391	10.65	0.961
2	Journal of Cataract and Refractive Surgery	246	6.70	2.68
3	British Journal of Ophthalmology	125	3.40	3.384
4	Ophthalmology	73	1.99	7.479
5	American Journal of Ophthalmology	71	1.93	4.795
6	International Ophthalmology	56	1.52	1.335
6	Molecular Vision	56	1.52	2.219
7	BMJ Case Reports	53	1.44	-
7	Eye	53	1.44	2.478
8	Investigative Ophthalmology and Visual Science	47	1.28	3.388
8	Journal of Clinical and Diagnostic Research	47	1.28	
9	Clinical and Experimental Ophthalmology	46	1.25	2.249
10	Experimental Eye Research	35	0.95	3.152

Table 3. Top ranking journals with their contributions and impact factor

Indian cataract research collaboration

Of these 3673 papers published from India, 1422 were collaborative papers (38.71%) with authors from as many as 116 countries. Most of the collaborative research was with USA (392; 10.67%) followed by Australia (137; 3.73%), UK (137; 3.73%), Germany (80; 2.18%) and Singapore (58; 1.58%). Other countries have lower than one percent share of collaborative research with India. The research collaboration trend with top 5 countries since 1963 has been depicted in Figure 3.

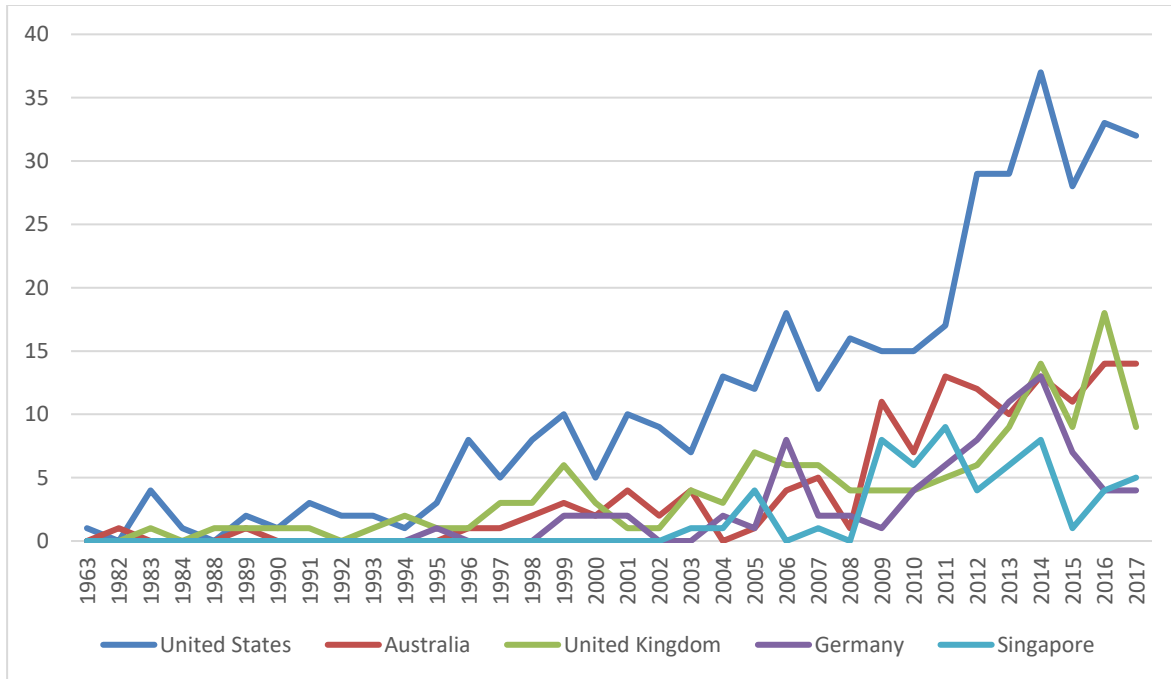


Figure 3: Indian cataract research collaboration trend with top five counties

Years	World Output	Indian Output	Activity Index
< 1967	6110	33	13.74
1968 – 1977	6750	71	26.75
1978 – 1987	9734	102	26.65
1988 – 1997	15443	281	46.28
1998 – 2007	22354	904	102.85
2008 – 2017	33027	2282	175.73
Total	93418	3673	392.01

Table 4. World’s Output vs. India’s Output

Activity Index characterizes the relative research effort of a country to a given field. Table 4 presents the Activity Index for India to analyse India’s research performance over different years. It is evident that Indian efforts in cataract research were highest in the decade 2008-2017, i.e., 175.73 followed by the previous decade 1998-2007, i.e., 102.85. Since the Activity Index is higher than 100 for the last two decades under consideration, it reflects higher activity of cataract research than the World’s average.

Conclusion

Cataract is not only the most common cause of vision loss in people over age 40 but also, it is the principal cause of blindness in the world. In fact, there are more cases of cataracts

worldwide compared to glaucoma, macular degeneration and diabetic retinopathy combined, according to Prevent Blindness America (PBA). The present study presents a 108 years perspective of Indian research on cataract. The study discloses that the Indian cataract research is regularly growing. Initially the research trend was very low, but there had been an abrupt jump during the last two decades of the study. L.V. Prasad Eye Institute, India has a very active research programme compared to the other institutes, hospitals and universities. Activity Index for India has continuously increased during the last four decades under consideration. Overall, there had been a higher activity of cataract research in India than the World's average.

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