Original Article

A scientometric analysis of literature published in Indian Journal of Ophthalmology from 2005 to 2017

Govindarajan Ramadoss, Dayakar Yadalla[1]

Purpose: To perform an analysis of ophthalmic literature published by the Indian journal of ophthalmology (IJO) between 2005 and 2017 using scientometric techniques. **Methods:** The bibliographic records of all the literature published in the study period were collected from PubMed and exported as XML into Microsoft access for scientometric analysis. Subspecialty wise distribution across time, type of articles published (original articles, case reports, review articles, editorials, and letter to editor), reference analysis, author productivity analysis and citation analysis were performed as per well-established scientometric methodology. **Results:** A total of 2,633 papers were published in the IJO during the study period. Articles related to vitreoretinal diseases contributed 23% of all the articles published (n = 598) followed by corneal diseases (n = 313, 12%), and cataract (n = 293, 11%). There were equal numbers of case reports (n = 894, 34%) and original articles (n = 862, 33%) though case reports reduced over time. A total of 5490 unique authors from 64 countries published in the IJO with majority authors (63%) from India. Less than 80% of articles published in the IJO were cited (n = 2051, 78%) by 24,592 articles with retina-related papers contributing 20% of all citations. Original articles had three times more likelihood of being cited compared to case reports. **Conclusion:** The IJO showed a steady increase in the number of publications from year to year. Papers from the vitreoretinal domain were the commonest and were cited most often. Original articles and case reports contributed equally to the published content though the former were cited much more frequently than the latter.

Key words: IJO, Indian Journal of Ophthalmology, Indian Ophthalmic Research, ophthalmology, scientometric

Access this article online

Website: www.ijo.in

DOI: 10.4103/ijo.IJO_1213_19

Quick Response Code:

The scientific performance of a journal is usually evaluated by the journal impact factor published every two years by Clarivate Analytics. Other bibliometric parameters described to understand a journal's impact are the Eigenfactor, article influence score, SCImago journal rank, and source-normalized impact per paper.[1] However, there are many aspects of literature published by a journal which are not captured by these metrics. A more detailed analysis of such literature published in the journal over a period of time helps to identify types of manuscripts published, subspecialty wise distribution of publications and their time trends, and the impact of these publications on global literature. The specific methodology used to measure the quantity and quality of the literature and its impact is termed "scientometrics." Though most publishers and journal editors indulge in scientometric analysis, these are seldom published for consumption of the readers.

The Indian journal of ophthalmology (IJO) is a peer-reviewed open access monthly publication by the All India Ophthalmic Society (AIOS). It publishes technical and clinical articles in the field of ophthalmology under the terms of Creative Commons Attribution-Non Commercial-Share Alike 4.0 licenses. The journal started publishing articles from the year 1953 and has published around 66 volumes and 6456 articles till date. The Journal's impact factor for 2018 as reported in the 2019 Journal Citation Reports® (Clarivate Analytics, 2018) was 0.977. Its SCIRank (2018) available from the 2017 SCImago Journal Rank of the journal was 0.498 and it was ranked in the third position in the field of ophthalmology in the Asiatic region.

Scientometric analysis has been employed previously to analyze the impact of published literature in many different faculties of medicine.[2,3] Ophthalmic literature has also been subjected to scientometrics in the past including for specific journals[4] as well as specific disease pathologies such as age-related macular degeneration, glaucoma, and diabetic retinopathy.[5-8] A previous paper showed a bibliometric analysis of Indian ophthalmic papers published from 2001 to 2006 in the peer-reviewed journals, and assessed the productivity, trends in journal choice, publication types, research funding, and collaborative research from Indian ophthalmology.[9] However, no study has performed a scientometric analysis of papers published in the IJO till date. In this study, we apply

Librarian, Aravind Eye Hospital and Postgraduate Institute of Ophthalmology, Madurai, Tamil Nadu, [1]Medical Consultant, Aravind Eye Hospital and Postgraduate Institute of Ophthalmology, Puducherry, India

Correspondence to: Dr. Dayakar Yadalla, Medical Consultant, Aravind Eye Hospital and Postgraduate Institute of Ophthalmology, Puducherry, India. E-mail: drdayakaryadalla@gmail.com

Received: 27-Jun-2019 Revision: 30-Oct-2019
Accepted: 18-Nov-2019 Published: 20-Apr-2020

Cite this article as: Ramadoss G, Yadalla D. A scientometric analysis of literature published in Indian Journal of Ophthalmology from 2005 to 2017. Indian J Ophthalmol 2020;68:738-44.

the scientometric methodology to the literature published in the IJO during the period between 2005 and 2017.

Methods

Since the study did not involve human subjects directly, it was exempt from review by the local institutional ethics committee. All papers published in the IJO were obtained from PubMed using the advanced search builder option. In the builder, the field "Journal" was selected and "Indian Journal of Ophthalmology" was chosen to retrieve the results. The retrieved results were filtered by the publication date ranging from 01/01/2005 to 31/12/2017. Through the "Send to" file option, a total of 2,633 bibliographic records were downloaded in XML format. The reference records for the 2,633 bibliographic records were also extracted in XML format using E-Utilities, a free tool available on PubMed. The XML files were then converted to excel using the tool PubMed2Xls. The data in the excel files was imported to Microsoft-Access for further data cleaning and analysis. Using these tools, we generated a database consisting of the title of publications, type of article (original articles, case reports, review articles, editorials, and letter to editor), authors list in the order that appears on PubMed, institutional affiliations of all authors including country-wise distribution, the date of publication and indexing including the year of publication, volume, and page numbers, the number of references in each article, and any particular substance (chemical) being described in the paper. For ranking the institution, country and state, the affiliation of the first authors was used. A missing affiliation was updated by referring to the original articles available on the IJO website (www.ijo.in). Citation data for each published article, including the number of citations and the articles that had cited the papers as well as the journals in which these articles were published, was extracted from Google Scholar as available on 4th October 2018.

Once data was tabulated, we performed a subspecialty wise distribution of the published literature and analyzed year-wise trends. The miscellaneous category included articles under history, low vision aids, microbiology, pathology, refraction, statistics, and teaching. The papers were then classified into original articles, review articles, editorials, case reports, letter to editor, and other type of manuscripts. All manuscripts with a tag of clinical study, clinical trial, comparative study, brief communication, controlled clinical trial, journal article, and randomized controlled trial were categorized as original articles. The "others" category included all other types of manuscripts including addresses, biography, comments, evaluation of other studies, historical articles, erratum, research support, retraction of publication, technical report, and video-audio media. Year-wise trends in types of articles published were also tabulated. Similarly, subspecialty wise articles were matched against the types of articles to see changing trends over time. The mean page length of articles was compared across years and tabulated. Authorship distribution was analyzed across the 12 years including the number of unique authors, authorship pattern, degree of collaboration, top institutions (Indian and foreign separately) contributing most to IJO, the top 10 countries published in IJO, and Indian state-wise distribution. Any paper with more than one author was perceived as collaborative research, in sync with scientometric techniques. To find out the degree of collaboration, the K. Subramanyam formula was used (Degree of collaboration = No. of papers with multiple authors/(No. of papers with multiple authors + No. of papers with single author)).

All data was entered in Microsoft Access and proportions were analyzed using Microsoft Excel. All proportions were presented as percentages (*n*, %). Comparison of variables across the years was done using the Chi square or the Fischer's exact test using STATA I/c version 12.1 I/C (Fort Worth, Texas, USA) and any *P* value less than 0.05 was considered statistically significant.

Results

A total of 2633 articles were published in the IJO during the 12-year study period. Table 1 shows exact year-wise distribution of the number of articles published along with the growth rate and percentage contributed by each year to the overall number. The number of articles increased steadily [Fig. 1] from 2005 with the highest growth rate seen in 2013 followed by 2017. Almost 100 more articles were published in these two years compared to the immediate previous year. The papers published in 2017 (*n* = 355) contributed almost 14% of the entire literature published over the study period.

The page length varied between 1 and 5 pages in majority papers (*n* = 2214, 84%) while 15% had page length between 5 and 10 pages (*n* = 394), and only 25 articles (*n* = 0.9%) had page length of 11 pages or more and all of these were review articles. The availability of substances used in the IJO literature for the period 2005–2017 was available only for 823 articles with about 608 unique substances enlisted. Angiogenesis inhibitors were the commonest substance (*n* = 175 articles, 21%) followed by glucocorticoids (*n* = 85, 10%).

Subspecialty wise analysis

Table 2 shows the subspecialty wise distribution of articles published in IJO across the study period. Articles related to vitreoretinal diseases contributed nearly one-fourth of all the articles published (*n* = 598, 23%) followed by articles related to corneal diseases (12%), cataract (11%), and orbit and

Table 1: Published literature in IJO during the period 2005-2017

Year	No. of literature (C)	Percentage (C/N)	Growth rate
2005	74	2.8%	
2006	92	3.5%	24.3%
2007	164	6.2%	78.3%
2008	152	5.8%	-7.3%
2009	132	5.0%	-13.2%
2010	165	6.3%	25.0%
2011	192	7.3%	16.4%
2012	160	6.1%	-16.7%
2013	257	9.8%	60.6%
2014	334	12.7%	30.0%
2015	290	11.0%	-13.2%
2016	266	10.1%	-8.3%
2017	355	13.5%	33.5%
Total	2,633 (N)	100%	

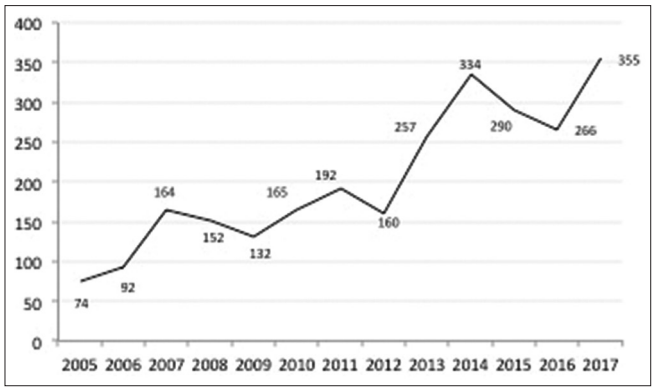

Figure 1: Time trends in the number of articles published in the IJO from 2005 to 2017

oculoplasty (9%). The miscellaneous section contributed 17% of all articles published. Time trends show that retina-related articles contributed a maximum of 31% in 2005 and a minimum of 18% in 2014. There was a sudden dip in the number of retina articles between 2014 and 2016 but since then more than 20% of all articles are related to diseases of the retina ($P = 0.03$).

Types of articles published

Table 3 shows a distribution of types of articles published in IJO between 2005 and 2017. Case reports and original articles contributed approximately two-third of all articles published. Year-wise trends showed that case reports contributed a higher number of publications between 2005 and 2010 after which there was a significant reduction from 2011 to 2015 ($P = 0.02$). Since 2016, the numbers of case reports have gradually increased again. Similar trends were not found for original articles with only 2007 showing much smaller numbers compared to the rest of the years. Subspecialty wise analysis of article types showed that maximum number of original articles (21%) and case reports (29%) were contributed by articles related to vitreoretinal diseases [Table 4]. The maximum number of review articles were under the miscellaneous section (20%) followed by cornea-related articles (16%). Out of the total of 598 retina-related articles, 30% ($n = 182$) were original articles and 44% ($n = 262$) were case reports. Similar trends were seen in cornea-related articles where original articles ($n = 117$) and case reports ($n = 117$) contributed to 37% each of the literature. In cataract-related papers, again 37% were original articles ($n = 111$) and 25% ($n = 75$) were case reports. In Oculoplasty, only 19% ($n = 47$) were original articles, while majority (60%, $n = 142$) were case reports.

Analysis of references used in published articles

A total of 34,956 references were cited in all papers published by the IJO during the study period. Papers under the vitreoretina domain used the most number of references [Table 5] with each paper citing about 12 references. Cornea and cataract related diseases used the second and third highest number of references. The journal "Ophthalmology" was cited most often ($n = 3379$, 10%) followed by the American Journal of Ophthalmology ($n = 2488$, 7%) and the IJO ($n = 2268$, 6.6%).

Author productivity and Institutional analysis

Author productivity analysis showed that there were 5490 unique authors over the study period. The highest number of unique authors was seen in the year 2014 ($n = 790$). Fig. 2

Table 2: Subspecialty wise distribution of articles over the study period

Subject	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Cataract and IOL	6 (8.1%)	10 (10.9%)	19 (11.6%)	11 (7.2%)	18 (13.6%)	24 (14.5%)	16 (8.3%)	17 (10.6%)	24 (9.3%)	43 (12.9%)	24 (8.3%)	21 (7.9%)	60 (16.9%)	293 (11.1%)
Community ophthalmology	1 (1.4%)	1 (1.1%)	0 (0%)	1 (0.7%)	2 (1.5%)	5 (3%)	2 (1%)	9 (5.6%)	4 (1.6%)	6 (1.8%)	5 (1.7%)	9 (3.4%)	5 (1.4%)	50 (1.9%)
Cornea	11 (14.9%)	14 (15.2%)	34 (20.7%)	22 (14.5%)	12 (9.1%)	19 (11.5%)	27 (14.1%)	19 (11.9%)	39 (15.2%)	29 (8.7%)	13 (4.5%)	21 (7.9%)	53 (14.9%)	313 (11.9%)
General Ophthalmology	0 (0%)	0 (0%)	1 (0.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	5 (1.4%)	6 (0.2%)
Glaucoma	6 (8.1%)	6 (6.5%)	3 (1.8%)	6 (3.9%)	11 (8.3%)	10 (6.1%)	39 (20.3%)	5 (3.1%)	16 (6.2%)	31 (9.3%)	21 (7.2%)	23 (8.6%)	18 (5.1%)	195 (7.4%)
Miscellaneous	9 (12.2%)	10 (10.9%)	14 (8.5%)	19 (12.5%)	18 (13.6%)	17 (10.3%)	13 (6.8%)	50 (31.3%)	39 (15.2%)	73 (21.9%)	87 (30%)	62 (23.3%)	34 (9.6%)	445 (16.9%)
Neurophthalmology	3 (4.1%)	5 (5.4%)	6 (3.7%)	6 (3.9%)	9 (6.8%)	6 (3.6%)	13 (6.8%)	5 (3.1%)	12 (4.7%)	29 (8.7%)	7 (2.4%)	11 (4.1%)	19 (5.4%)	131 (5%)
Oncology	0 (0%)	1 (1.1%)	2 (1.2%)	0 (0%)	0 (0%)	1 (0.6%)	0 (0%)	1 (0.6%)	2 (0.8%)	9 (2.7%)	27 (9.3%)	12 (4.5%)	13 (3.7%)	68 (2.6%)
Optics and Refraction	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (1%)	2 (1.3%)	3 (1.2%)	4 (1.2%)	1 (0.3%)	0 (0%)	0 (0%)	12 (0.5%)
Orbit and Oculoplasty	11 (14.9%)	11 (12%)	14 (8.5%)	28 (18.4%)	17 (12.9%)	10 (6.1%)	18 (9.4%)	9 (5.6%)	19 (7.4%)	29 (8.7%)	24 (8.3%)	32 (12%)	18 (5.1%)	240 (9.1%)
Pediatric ophthalmology	1 (1.4%)	6 (6.5%)	4 (2.4%)	3 (2%)	6 (4.5%)	5 (3%)	5 (2.6%)	4 (2.5%)	2 (0.8%)	4 (1.2%)	2 (0.7%)	2 (0.8%)	18 (5.1%)	62 (2.4%)
Refractive Surgery	0 (0%)	0 (0%)	1 (0.6%)	0 (0%)	0 (0%)	1 (0.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)	0 (0%)	0 (0%)	3 (0.1%)
Retina	23 (31.1%)	21 (22.8%)	50 (30.5%)	33 (21.7%)	25 (18.9%)	43 (26.1%)	52 (27.1%)	33 (20.6%)	69 (26.8%)	61 (18.3%)	56 (19.3%)	51 (19.2%)	81 (22.8%)	598 (22.7%)
Squint	0 (0%)	1 (1.1%)	6 (3.7%)	12 (7.9%)	8 (6.1%)	9 (5.5%)	4 (2.1%)	3 (1.9%)	7 (2.7%)	11 (3.3%)	12 (4.1%)	5 (1.9%)	11 (3.1%)	89 (3.4%)
Trauma	0 (0%)	1 (1.1%)	2 (1.2%)	2 (1.3%)	0 (0%)	2 (1.2%)	0 (0%)	0 (0%)	6 (2.3%)	3 (0.9%)	2 (0.7%)	5 (1.9%)	4 (1.1%)	27 (1%)
Uvea	3 (4.1%)	5 (5.4%)	8 (4.9%)	9 (5.9%)	6 (4.5%)	13 (7.9%)	1 (0.5%)	3 (1.9%)	15 (5.8%)	2 (0.6%)	8 (2.8%)	12 (4.5%)	16 (4.5%)	101 (3.8%)
Total	74 (100%)	92 (100%)	164 (100%)	152 (100%)	132 (100%)	165 (100%)	192 (100%)	160 (100%)	257 (100%)	334 (100%)	290 (100%)	266 (100%)	355 (100%)	2633 (100%)

Table 3: Type of article and distribution over the study period

Publication type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Case report	28 (37.8%)	38 (41.3%)	78 (47.6%)	65 (42.8%)	51 (38.6%)	61 (37%)	61 (31.8%)	52 (32.5%)	77 (30%)	92 (27.5%)	82 (28.3%)	98 (36.8%)	28 (37.8%)	894 (34%)
Editorial	4 (5.4%)	4 (4.3%)	8 (4.9%)	7 (4.6%)	6 (4.5%)	5 (3%)	8 (4.2%)	7 (4.4%)	16 (6.2%)	12 (3.6%)	16 (5.5%)	14 (5.3%)	4 (5.4%)	138 (5.2%)
Letter to editor	10 (13.5%)	13 (14.1%)	22 (13.4%)	20 (13.2%)	18 (13.6%)	42 (25.5%)	40 (20.8%)	25 (15.6%)	55 (21.4%)	55 (16.5%)	75 (25.9%)	41 (15.4%)	10 (13.5%)	437 (16.6%)
Original article	28 (37.8%)	25 (27.2%)	36 (22%)	46 (30.3%)	46 (34.8%)	48 (29.1%)	68 (35.4%)	48 (30%)	74 (28.8%)	144 (43.1%)	77 (26.6%)	92 (34.6%)	28 (37.8%)	862 (32.7%)
Others	3 (4.1%)	6 (6.5%)	10 (6.1%)	5 (3.3%)	6 (4.5%)	4 (2.4%)	7 (3.6%)	3 (1.9%)	8 (3.1%)	11 (3.3%)	12 (4.1%)	6 (2.3%)	3 (4.1%)	100 (3.8%)
Review article	1 (1.4%)	6 (6.5%)	10 (6.1%)	9 (5.9%)	5 (3.8%)	5 (3%)	8 (4.2%)	25 (15.6%)	27 (10.5%)	20 (6%)	28 (9.7%)	15 (5.6%)	1 (1.4%)	202 (7.7%)
Total	74 (100%)	92 (100%)	164 (100%)	152 (100%)	132 (100%)	165 (100%)	192 (100%)	160 (100%)	257 (100%)	334 (100%)	290 (100%)	266 (100%)	74 (100%)	2633 (100%)

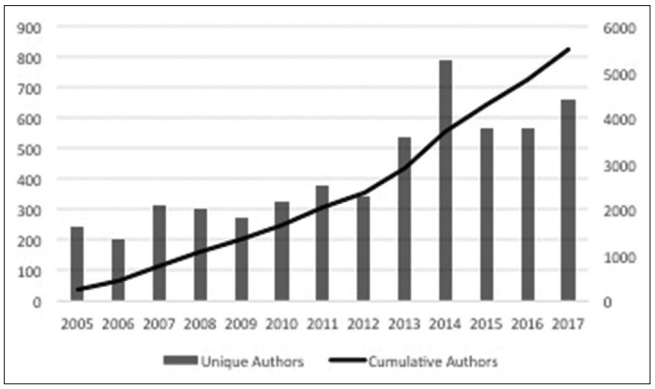

Figure 2: Distribution of unique authors per year and cumulative authors over the study period

shows the unique authors and cumulative authors over the study period. The commonest number of coauthors per paper was four (n = 608, 23%) followed by three (n = 532, 20%) and two (n = 434, 17%). The degree of collaboration was 0.86 across the study period. The top 10 first authors published a total of 215 papers over the period and all the top 10 authors were from India. Authors from a total of 64 countries published 2,271 articles in IJO. Majority of papers were published from India (n = 1,666, 63%) followed by Turkey (n = 125, 4.7%), USA (n = 86, 3.3%), UK (n = 45, 1.7%), and China (n = 41, 1.6%). In India, maximum papers originated in institutions from the state of Tamil Nadu (n = 378, 23%), followed by Maharashtra (n = 262, 16%) and New Delhi (n = 243, 15%). The Dr. Rajendra Prasad Centre for Ophthalmic Sciences, AIIMS published the maximum papers in the IJO (n = 147, 9%) followed by LV Prasad eye institute (n = 138, 8%), Sankara Nethralaya (n = 82, 5%), and Aravind eye hospital, Madurai (n = 74, 4.5%).

Citation analysis

A total of 2,051 (77.9%) articles were cited by 24,952 articles during the 12-year study period while the remaining 582 (22.1%) were not cited at all. Most papers were cited between 1 and 10 times (n = 1382, 67%) followed by 11–20 times (n = 342, 17%), 21–30 times (n = 145, 7%), 31–40 times (n = 65, 3%), 40–100 times (n = 101, 5%), and more than 100 times (n = 16, 1%). Fig. 3 shows the citation pattern over time. Subspecialty wise citation analysis showed that articles related to retinal diseases were cited most often and these contribute almost 20% of all citations from the IJO followed by cornea-related articles (17%) [Table 6]. Original articles were cited much more frequently and constituted 50% of all citations (n = 13,008), followed by case reports (n = 5135, 20%) and review articles (n = 4278, 17%). Similarly, original articles had a much higher likelihood of getting cited (15.1 times per article) compared to case reports (5.7 times per article) (P < 0.001), while review articles had the highest likelihood of getting cited (21 times per article). The top three highly cited articles were "Understanding and using sensitivity, specificity and predictive values" by Parikh, R., Mathai, A., Parikh, S., Sekhar, G. C., and Thomas, R., 2008 (418 citations), "Global variation and pattern changes in epidemiology of uveitis" by Rathinam, S. R. and Namperumalsamy, P. 2007 (244 citations), and "Review of epidemiological features, microbiological diagnosis and treatment outcome of microbial keratitis: experience of over a decade" by Gopinathan, U., Sharma, S., Garg, P., and Rao, G. N., 2009 (236 citations)."

Table 4: Subject-wise distribution of article type over the study period

Subject	Review Article	Original Article	Editorial	Letter to Editor	Case Report	Others	Total
Cataract & IOL	20 (9.9%)	111 (12.9%)	4 (2.9%)	65 (14.9%)	75 (8.4%)	18 (18%)	293 (11.1%)
Community ophthalmology	6 (3%)	32 (3.7%)	3 (2.2%)	5 (1.1%)	2 (0.2%)	2 (2%)	501 (1.9%)
Cornea	33 (16.3%)	117 (13.6%)	8 (5.8%)	26 (5.9%)	117 (13.1%)	12 (12%)	313 (11.9%)
General Ophthalmology	0 (0%)	2 (0.2%)	2 (1.4%)	1 (0.2%)	1 (0.1%)	0 (0%)	6 (0.2%)
Glaucoma	12 (5.9%)	112 (13%)	6 (4.3%)	18 (4.1%)	33 (3.7%)	14 (14%)	195 (7.4%)
Miscellaneous	40 (19.8%)	116 (13.5%)	86 (62.3%)	111 (25.4%)	69 (7.7%)	23 (23%)	445 (16.9%)
Neurophthalmology	9 (4.5%)	37 (4.3%)	0 (0%)	22 (5%)	63 (7%)	0 (0%)	131 (5%)
Oncology	16 (7.9%)	13 (1.5%)	3 (2.2%)	5 (1.1%)	30 (3.4%)	1 (1%)	68 (2.6%)
Optics and Refraction	1 (0.5%)	7 (0.8%)	0 (0%)	3 (0.7%)	1 (0.1%)	0 (0%)	12 (0.5%)
Orbit and Oculoplasty	14 (6.9%)	47 (5.5%)	1 (0.7%)	30 (6.9%)	142 (15.9%)	6 (6%)	240 (9.1%)
Pediatric ophthalmology	2 (1%)	30 (3.5%)	4 (2.9%)	17 (3.9%)	8 (0.9%)	1 (1%)	62 (2.4%)
Refractive Surgery	0 (0%)	2 (0.2%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	3 (0.1%)
Retina	28 (13.9%)	182 (21.1%)	16 (11.6%)	97 (22.2%)	262 (29.3%)	13 (13%)	598 (22.7%)
Squint	2 (1%)	31 (3.6%)	1 (0.7%)	25 (5.7%)	25 (2.8%)	5 (5%)	89 (3.4%)
Trauma	0 (0%)	8 (0.9%)	1 (0.7%)	2 (0.5%)	15 (1.7%)	1 (1%)	27 (1%)
Uvea	19 (9.4%)	15 (1.7%)	3 (2.2%)	10 (2.3%)	51 (5.7%)	3 (3%)	101 (3.8%)
Total	202 (100%)	862 (100%)	138 (100%)	437 (100%)	894 (100%)	100 (100%)	2633 (100%)

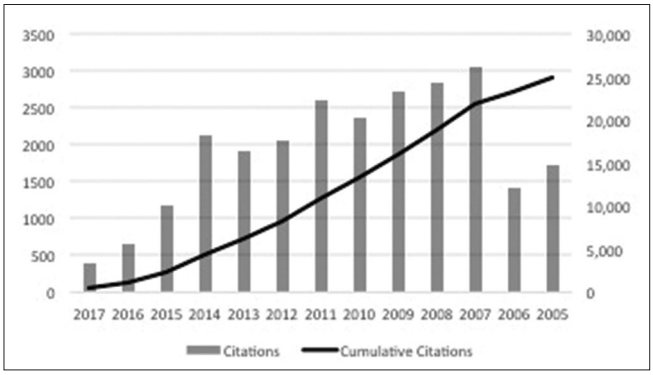

Figure 3: Citation patterns over time

Discussion

In this scientometric analysis of papers published in IJO from 2005 to 2017, we found a healthy trend of progressive increase in the number of papers published year after year. Articles related to vitreoretinal diseases contributed maximum articles almost every year and amounted to one out of every 5 papers published. Original articles and case reports were the main types of articles published with a slight reduction in the number of case reports over time. Not surprisingly, articles related to vitreoretinal diseases contributed the maximum number of original articles and case reports. The journal "Ophthalmology" was most commonly cited by the papers published in the IJO and angiogenesis inhibitors were the commonest chemical substance group mentioned in articles. We found more than 5000 unique authors from 64 countries contributing to articles over the study period, giving the journal some resemblance with its more illustrious international counterparts, though more than 60% authors were Indian. Less than 80% papers were cited over time with most papers being cited between 1 and 10 times and about 6% papers cited more than 40 times over 12 years. Vitreoretina-related articles were cited most and original articles had more than three times higher chance of getting cited compared to case reports.

The trend of increasing number of articles being published is a healthy one and shows a growing desire of Indian ophthalmologists to do more clinical research and publish papers. This is also evidenced by the development of the journal from a quarterly to bimonthly to a monthly journal over the study period. In a previous study spanning the last decade, Kumaragurupari showed that there was a growing trend of papers being published from India; however, 50% papers came from 9 major institutions.[9] We found similar trends with four institutes contributing more than 25% of the published literature. In addition, a previous study showed that majority of papers presented at an all India conference are not published over the subsequent 5 years.[10] Keeping these trends in mind, it may be prudent to encourage more clinical research and publications from other promising institutions across the country which experience high patient loads and hence are privy to abundant patient data.

It is not surprising that articles related to vitreoretinal diseases contributed a large majority of total articles published. A previous editorial in a retina special issue of the IJO by one of the editors also hinted at similar numbers and attributed this to the overall mood and direction of ophthalmic literature.[11] This has also led to many national and international organizations and societies launching retina subspecialty journals over the past few years. These trends also show that the rate of innovations in the field of retinal diseases has outpaced most other subspecialties, especially imaging-related studies. Bibliometric trends in global ophthalmology from 1997 to 2009 also showed similar trends with a jump in the impact and ranking of the subspecialty journal "Retina."[12]

Authorship-related scientometric analysis showed that 63% papers were published by Indian authors giving the journal content a predominantly Indian outlook, though

Table 5: Subject-wise reference count distribution over years

Subject	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Cataract and IOL	1 (0.2%)	3 (10.3%)	47 (6.8%)	137 (6.8%)	338 (19.5%)	269 (14.2%)	214 (7.2%)	212 (10.2%)	265 (8.2%)	630 (12.1%)	242 (5.6%)	292 (7.7%)	1328 (20.4%)	3978 (11.4%)
Community ophthalmology	1 (0.2%)	0 (0%)	0 (0%)	20 (1%)	8 (0.5%)	86 (4.5%)	21 (0.7%)	150 (7.2%)	33 (1%)	114 (2.2%)	94 (2.2%)	194 (5.1%)	99 (1.5%)	820 (2.3%)
Cornea	130 (30.2%)	2 (6.9%)	67 (9.6%)	330 (16.3%)	278 (16%)	151 (8%)	267 (9%)	334 (16%)	660 (20.5%)	480 (9.2%)	255 (5.9%)	334 (8.8%)	1190 (18.3%)	4478 (12.8%)
General Ophthalmology	0 (0%)	0 (0%)	1 (0.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	35 (0.5%)	36 (0.1%)
Glaucoma	24 (5.6%)	6 (20.7%)	0 (0%)	108 (5.3%)	262 (15.1%)	143 (7.6%)	1288 (43.2%)	134 (6.4%)	243 (7.5%)	746 (14.3%)	517 (11.9%)	442 (11.7%)	393 (6%)	4306 (12.3%)
Miscellaneous	49 (11.4%)	2 (6.9%)	50 (7.2%)	303 (15%)	153 (8.8%)	154 (8.1%)	147 (4.9%)	581 (27.9%)	408 (12.7%)	1061 (20.3%)	1065 (24.5%)	741 (19.6%)	492 (7.6%)	5206 (14.9%)
Neurophthalmology	12 (2.8%)	2 (6.9%)	24 (3.5%)	78 (3.9%)	88 (5.1%)	47 (2.5%)	294 (9.9%)	33 (1.6%)	118 (3.7%)	519 (9.9%)	42 (1%)	111 (2.9%)	290 (4.5%)	1658 (4.7%)
Oncology	0 (0%)	0 (0%)	17 (2.4%)	0 (0%)	0 (0%)	8 (0.4%)	0 (0%)	24 (1.2%)	66 (2%)	101 (1.9%)	786 (18%)	218 (5.8%)	204 (3.1%)	1424 (4.1%)
Optics and Refraction	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	7 (0.2%)	29 (1.4%)	22 (0.7%)	78 (1.5%)	1 (0%)	0 (0%)	0 (0%)	137 (0.4%)
Orbit and Oculoplasty	24 (5.6%)	2 (6.9%)	33 (4.7%)	210 (10.4%)	177 (10.2%)	69 (3.6%)	154 (5.2%)	123 (5.9%)	136 (4.2%)	314 (6%)	267 (6.1%)	493 (13%)	225 (3.5%)	2227 (6.4%)
Pediatric ophthalmology	1 (0.2%)	6 (20.7%)	1 (0.1%)	60 (3%)	53 (3.1%)	30 (1.6%)	46 (1.5%)	54 (2.6%)	10 (0.3%)	86 (1.6%)	9 (0.2%)	56 (1.5%)	343 (5.3%)	755 (2.2%)
Refractive Surgery	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	28 (1.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	0 (0%)	0 (0%)	29 (0.1%)
Retina	180 (41.9%)	5 (17.2%)	412 (59.3%)	424 (21%)	209 (12%)	425 (22.5%)	511 (17.2%)	388 (18.6%)	810 (25.1%)	845 (16.2%)	799 (18.3%)	661 (17.5%)	1418 (21.8%)	7087 (20.3%)
Squint	0 (0%)	0 (0%)	15 (2.2%)	110 (5.4%)	123 (7.1%)	71 (3.8%)	20 (0.7%)	11 (0.5%)	63 (2%)	184 (3.5%)	112 (2.6%)	36 (1%)	175 (2.7%)	920 (2.6%)
Trauma	0 (0%)	0 (0%)	6 (0.9%)	22 (1.1%)	0 (0%)	16 (0.8%)	0 (0%)	0 (0%)	71 (2.2%)	24 (0.5%)	13 (0.3%)	24 (0.6%)	52 (0.8%)	228 (0.7%)
Uvea	8 (1.9%)	1 (3.4%)	22 (3.2%)	217 (10.7%)	46 (2.7%)	394 (20.8%)	10 (0.3%)	8 (0.4%)	318 (9.9%)	45 (0.9%)	152 (3.5%)	183 (4.8%)	263 (4%)	1667 (4.8%)
Total	430	29	695	2019	1735	1891	2979	2081	3223	5227	4355	3785	6507	34956

Table 6: Subject-wise citation count distribution over years

Subject	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Cataract and IOL	174 (10.2%)	90 (6.4%)	155 (5.1%)	131 (4.6%)	471 (17.4%)	253 (10.7%)	159 (6.1%)	144 (7%)	198 (10.4%)	269 (12.7%)	60 (5.1%)	68 (10.6%)	58 (14.9%)	2230 (8.9%)
Community ophthalmology	4 (0.2%)	26 (1.9%)	0 (0%)	114 (4%)	20 (0.7%)	128 (5.4%)	19 (0.7%)	329 (16%)	44 (2.3%)	65 (3.1%)	30 (2.5%)	79 (12.3%)	12 (3.1%)	870 (3.5%)
Cornea	492 (28.8%)	305 (21.8%)	826 (27.1%)	376 (13.2%)	593 (21.9%)	216 (9.2%)	324 (12.5%)	216 (10%)	661 (34.6%)	175 (8.3%)	79 (6.7%)	61 (9.5%)	68 (17.4%)	4392 (17.6%)
General ophthalmology	0 (0%)	0 (0%)	1 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (0.8%)	4 (0%)
Glaucoma	276 (16.2%)	132 (9.4%)	100 (3.3%)	135 (4.8%)	360 (13.3%)	163 (6.9%)	870 (33.6%)	89 (4.3%)	112 (5.9%)	210 (9.9%)	85 (7.2%)	50 (7.8%)	14 (3.6%)	2596 (10.4%)
Miscellaneous	140 (8.2%)	77 (5.5%)	171 (5.6%)	773 (27.2%)	267 (9.8%)	318 (13.5%)	126 (4.9%)	586 (28%)	91 (4.8%)	380 (18%)	234 (19.8%)	105 (16.4%)	49 (12.6%)	3317 (13.3%)
Neuro-Ophthalmology	39 (2.3%)	77 (5.5%)	116 (3.8%)	64 (2.3%)	100 (3.7%)	82 (3.5%)	322 (12.4%)	103 (5%)	91 (4.8%)	207 (9.8%)	21 (1.8%)	16 (2.5%)	10 (2.6%)	1248 (5%)
Oncology	0 (0%)	9 (0.6%)	47 (1.5%)	0 (0%)	0 (0%)	3 (0.1%)	0 (0%)	2 (0.1%)	36 (1.9%)	43 (2%)	233 (19.7%)	35 (5.5%)	23 (5.9%)	431 (1.7%)
Optics and Refraction	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	14 (0.5%)	76 (3.7%)	14 (0.7%)	40 (1.9%)	0 (0%)	0 (0%)	0 (0%)	144 (0.6%)
Orbit and Oculoplasty	121 (7.1%)	184 (13.1%)	182 (6%)	321 (11.3%)	231 (8.5%)	91 (3.9%)	170 (6.6%)	116 (5.6%)	76 (4%)	105 (5%)	73 (6.2%)	66 (10.3%)	15 (3.8%)	1751 (7%)
Pediatric ophthalmology	26 (1.5%)	69 (4.9%)	76 (2.5%)	49 (1.7%)	89 (3.3%)	33 (1.4%)	40 (1.5%)	27 (1.3%)	6 (0.3%)	72 (3.4%)	1 (0.1%)	9 (1.4%)	27 (6.9%)	524 (2.1%)
Refractive Surgery	0 (0%)	0 (0%)	9 (0.3%)	0 (0%)	0 (0%)	22 (0.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	31 (0.1%)
Retina	404 (23.7%)	356 (25.4%)	965 (31.7%)	394 (13.9%)	355 (13.1%)	678 (28.7%)	529 (20.4%)	331 (16%)	377 (19.7%)	452 (21.4%)	290 (24.5%)	125 (19.5%)	80 (20.5%)	5336 (21.4%)
Squint	0 (0%)	5 (0.4%)	71 (2.3%)	238 (8.4%)	90 (3.3%)	39 (1.7%)	11 (0.4%)	12 (0.6%)	24 (1.3%)	72 (3.4%)	21 (1.8%)	1 (0.2%)	9 (2.3%)	593 (2.4%)
Trauma	0 (0%)	0 (0%)	15 (0.5%)	86 (3%)	0 (0%)	9 (0.4%)	0 (0%)	0 (0%)	72 (3.8%)	14 (0.7%)	10 (0.8%)	2 (0.3%)	7 (1.8%)	215 (0.9%)
Uvea	32 (1.9%)	70 (5%)	313 (10.3%)	158 (5.6%)	135 (5%)	324 (13.7%)	7 (0.3%)	24 (1.2%)	109 (5.7%)	12 (0.6%)	46 (3.9%)	25 (3.9%)	15 (3.8%)	1270 (5.1%)
Total	1708 (100%)	1400 (100%)	3047 (100%)	2839 (100%)	2711 (100%)	2359 (100%)	2591 (100%)	2055 (100%)	1911 (100%)	2116 (100%)	1183 (100%)	642 (100%)	390 (100%)	24952 (100%)

authors from more than 60 countries contributed making it a truly international journal. However, given that most highly cited international papers originate out of America[13,14] and a relatively small proportion of papers in the IJO were authored by American authors, it may be wise to persuade more international authors to publish in the IJO. Since IJO is one of the few journals which are open access and do not charge a manuscript processing fee, it is an attractive option for most authors, especially if manuscript turnaround times are competitive and decisions arrive soon.

Citations are the start of a paper's journey once it is published and is a parameter that really determines the paper's quality and influence on the literature to follow. Citations are also utilized to calculate the impact factor of journals which in turn is used to rank journals, thus making this one of the most important parameters to study in detail. Analysis of citations over the study period showed that original articles were cited much more frequently compared to case reports published in the IJO. Though retina-related articles contributed greater number of citations, this was offset by the highest number of papers published under the vitreoretina domain. We also found that more than 20% of the papers, mostly case reports, were never cited over a 12-year period. Given the fact that original articles are cited more frequently, the IJO may do well to increase the proportion of original articles and reduce case reports, a trend which has already been observed.

A similar scientometric analysis was performed to evaluate the papers published in the Australian and New Zealand Journal of Ophthalmology (ANZJO) to its successor, Clinical and Experimental Ophthalmology.[4] Disease specific scientometric analysis has also been performed for age-related macular degeneration and glaucoma.[5-7] To the best of our knowledge, this is the first paper describing scientometric data from the IJO and will help readers and the editorial board get a better perspective of the direction in which the journal is headed in the future. The limitation of the study is that only the data available on PubMed was considered for the study for ease of export and availability of streamlined data points. However, the actual data of the journal which is not indexed in PubMed was not used for the analysis. For the ranking analysis of authors and institutions, only information from the first author was considered. Lastly, citation data after 4th October 2018 was not considered in the study.

Conclusion

In conclusion, an exhaustive scientometric analysis from the IJO showed a steady increase in the number of publications from year to year. Papers from the vitreoretinal domain were the commonest and were cited most often. Original articles and case reports contributed equally to the published content though the former were cited much more frequently than the latter. This information will help the journal to reevaluate and rejuvenate its activities. This will also be helpful to librarians to serve the ophthalmic community in a better way. Lastly, the readership will understand the scope of ophthalmic literature published by the journal over the study period which will motivate them to endeavor to perform new research and build up the journal quality.

Acknowledgements

Authors acknowledge the inputs by Dr. Sabyasachi Sengupta from Sengupta's Research Academy, Mumbai, India for manuscript preparation.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Choudhri AF, Siddiqui A, Khan NR, Cohen HL. Understanding bibliometric parameters and analysis. Radiographics 2015;35:736-46.
2. Hsu YH, Ho YS. Highly cited articles in health care sciences and services field in science citation index expanded. A bibliometric analysis for 1958 - 2012. Methods Inf Med 2014;53:446-58.
3. Yao Q, Chen K, Yao L, Lyu P, Yang T, Luo F, *et al.* Scientometric trends and knowledge maps of global health systems research. Health Res Policy Syst 2014;12:26.
4. Chou CY, Chew SS, Patel DV, Ormonde SE, McGhee CN. Publication and citation analysis of the Australian and New Zealand Journal of Ophthalmology and Clinical and Experimental Ophthalmology over a 10-year period: The evolution of an ophthalmology journal. Clin Exp Ophthalmol 2009;37:868-73.
5. Ramin S, Gharebaghi R, Heidary F. Scientometric analysis and mapping of scientific articles on diabetic retinopathy. Med Hypothesis Discov Innov Ophthalmol 2015;4:81-100.
6. Ramin S, Soheilian M, Habibi G, Ghazavi R, Gharebaghi R, Heidary F. Age-related macular degeneration: A scientometric analysis. Med Hypothesis Discov Innov Ophthalmol 2015;4:39-49.
7. Ramin S, Pakravan M, Habibi G, Ghazavi R. Scientometric analysis and mapping of 20 years of glaucoma research. Int J Ophthalmol 2016;9:1329-35.
8. Yu ZL, Hu XY, Wang YN, Ma Z. Scientometric analysis of published papers in global ophthalmology in the past ten years. Int J Ophthalmol 2017;10:1898-901.
9. Kumaragurupari R, Sieving PC, Lalitha P. A bibliometric study of publications by Indian ophthalmologists and vision researchers, 2001-06. Indian J Ophthalmol 2010;58:275-80.
10. Kumaragurupari R, Sengupta S, Bhandari S. Publication rates from the All India Ophthalmic Conference 2010 compared to 2000: Are we improving?-Indian J Ophthalmol 2016;64:722-6.
11. Sengupta S. A perspective on the evolving field of vitreoretinal diseases. Indian J Ophthalmol 2018;66:1668.
12. Mansour AM, Mollayess GE, Habib R, Arabi A, Medawar WA. Bibliometric trends in ophthalmology 1997-2009. Indian J Ophthalmol 2015;63:54-8.
13. Fan JC, McGhee CN. Citation analysis of the most influential authors and ophthalmology journals in the field of cataract and corneal refractive surgery 2000-2004. Clin Exp Ophthalmol 2008;36:54-61.
14. Liu L, Li Y, Zhang GS, Wu JY, Majithia S, Tham YC, *et al.* Top 100 cited articles in ophthalmic epidemiology between 2006 and 2016. Int J Ophthalmol 2018;11:1994-8.