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# RESEARCH OUTPUT ON MYOPIA

## DURING THE PERIOD 2016-2018: A SCIENTOMETRIC ANALYSIS

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### Abstract

The article covers 3092 publications on myopia research in global level from the period of 2016-2018. Web of science database has been used to retrieve the scientometric records for the study period. The trends within the most influential publications and authors were analyzed. The aim of this study was to analyze the year wise distribution of articles & citations, authorship pattern of articles, most productive countries and institutions and type of document published. From the analysis, it has been observed that in the year 2016, the highest number of 1085(35.1%) articles were published out of 3092 articles in three years. Multiple author contributions were more dominant with 2879(93.11%) articles. In geographical distribution articles, United States of America has contributed the highest number of 769 articles with 24.9%. The study discloses that the Degree of Collaboration was low at 2017 (0.91), regarding collaborators contribution. The study analyzes the Relative Growth Rate (RGR) has increased from 2016 to 2018 in the span of three years. Doubling time (DT) has rapidly decreased when calculated year wise, i.e. 2016 to 2018.

**Keywords:** scientometrics, yearwise growth, document type, authorwise, ophthalmology, myopia, research literature.

## **Introduction**

Healthy vision requires three basic processes: creation of an image on the retina, motivation of rods and cones, and transfer of nerve impulses to the brain. Failure of these processes can disturb normal vision. Focusing a clear image on the retina is essential for good vision. In the normal eye, light rays enter the eye and are focused onto a clear, reversed image on the retina. If the eyeball is extended, the image focuses in front of the retina rather than on it. Then, the retina receives only an unclear image. This condition is called myopia or nearsightedness.

Myopia is a refractive error, that is when the eye does not bend light properly. Myopia happens once the attention is longer than traditional or contains a tissue layer that's too steep. In this case, one can see near objects clearly, but distant objects will appear blurred. It is an eye focusing disorder, not an eye sickness. It can be corrected by using concave contact lenses, glasses or refractive surgery. More recent advances in refractive eye surgery involve the use of surgical lasers. It is used to flatten the cornea to correct mild to moderate nearsightedness. A recent refractive eye surgery procedure to correct myopia is called Laser-Assisted In Situ Keratomileusis (LASIK).

Scientometrics is the revision of measuring and analyzing science, technology and novelty. Most important research issues include the quantity of impact, reference sets of articles to investigate the impact of journals and institutes, understanding of scientific citations, mapping scientific fields and the production of indicators for use in policy, and management contexts. It analyses the quantitative aspects of generation, dissemination, and utilization of scientific information in order to contribute to the understanding of the mechanism of scientific research. The assessment of the presentation of scientific research is the most important application of scientometry.

### **Literature related works:**

Numerous scientometric studies were conducted on world, provincial and country distribution of ophthalmology and visual science literature. Few reviews were used here to emphasize the prominence of this paper.

Boudry, C; Denion, E; B & Mouriaux, F. (2016) extracted records from Pubmed in order to analyse the articles related to eye diseases during the period 2010-2014. Records were

downloaded through developed PHP scripts for extra analysis. This study provides a wide view of scientific productivity related to the field of ophthalmology during that period.

Zou, F., Wu, M., & Wu, K. (2009) taking SCI-Expanded database on the Web of Science, used to collect data of research literature on ophthalmology, optometry and visual science (OOVS) from 2000-2007. With this most cited references came from Investigative Ophthalmology and Visual Science. Also, greatest number of studies focused on the retina. Within 14 collaborative countries or regions, the top first three numbers of co-authors came from the USA (83, 40%), Germany (28, 14%) and Hong Kong (26, 13%). Most of them were written in English (n=933) others include 26 Chinese and two German articles.

Ugolini, D., Cimmino, M., Casilli, C., & Mela, G. (2001) together did a quantitative analysis for the three-year period from 1995-1997. It was observed that a total of 11,219 papers were published in ophthalmological journals throughout the world. In these, 94 times the keyword myopia appeared, indicating its usual occurrence in people.

Rezaei, L., & Mohammadi, M. (2018) conducted a scientometric analysis of Iran's scientific productions in the field of ophthalmology between 2000 and 2018. Tehran University of Medical Sciences (37.19%) was the most prolific organization in Iran. Iran ranked 19th in the world concerning scientific production on ophthalmology. The most frequently used keywords in ophthalmology-related papers belonged to the clusters of Treatment of Retinal Diseases and Glaucoma, with 49 appearances.

Ohba, N. (2005) reviewed the current condition of international ophthalmic publications. The study found that 55,591 articles by National Library of Medicine database Medline, search for 32 international ophthalmic journals throughout 1988 to 2002. The top 10 productive countries were USA, United Kingdom, Japan, Germany, Canada, Australia, Italy, Netherlands, Sweden, and France. Among the Asian countries, India ranked 13th, China 18th, and Korea 21st. The most productive country was USA.

Gupta, B. M., Bala, A., & Gupta, R. (2013) conducted a scientometric study of publication output globally in conjunctivitis research through 2000-2011. For this, they were using several parameters together with the research contribution and impact of top institutions and authors and productivity of the top journals etc. The Scopus Citation Database has been used to retrieve the data for 10 years by searching the keyword, "conjunctivitis". The revision exposed that the global publications output in this research contained 8550 papers with an annual average growth rate of 5.44%.

Mandal, K., Benson, S., & Fraser, S. G. (2004) made a study for a 3 year period 1998, 1999 and 2000 inclusive. The number of articles identified within the five journals over this period was 5190. Correspondence, news articles and book reviews were excluded from their study. It is obvious that Japan is a major contributor to ophthalmic literature while a South East Asian country. They made a comparison in between the number of articles from the developed and developing countries and the result is developing world contributed to only 5.47% of the literature compared to the 92.19% from the developed world. The mainstream of the contribution to ophthalmic literature from the developing countries originated from Israel, S. America, China, Saudi Arabia, India, Singapore and Korea.

Guerin, M. B., Flynn, T. H., Brady, J., & O'Brien, C. J. (2009) analysed records from five ophthalmological journals using the Medline/Pubmed search engine. In this, global ophthalmology research output was analysed in relation to population demographics and research expenditure. In sum 7,754 articles from 67 countries during 2002 to 2006 were analysed. The greatest number of articles was produced by United States. The percentage of world wide publications from the US and Australia increased, while those of the UK, Japan and Germany decreased in these years. In brief, publications in ophthalmology have increased dramatically from 2002 to 2006. Also Singapore, Iceland and Australia were the most prolific contributors. Relative expenditure on research and development was greater in these countries.

## **Objectives**

The main objective of this study is to analyze the global research output in Myopia research during 2016-2018, with a view:

- To measure year wise growth of myopia literature
- To analyze document type distribution
- To examine most productivity authors
- To learn the publications productivity and impact of leading institutions and authors
- To study the pattern of communication in most productive journals.

## **Methodology**

The research publications were retrieved from web of science core collections database on the topic ‘myopia’, which are scattered over the period from 2016-2018. A total of 3092 publications were downloaded and the same was analyzed using the software Histcite and Microsoft Excel as per objectives of the study.

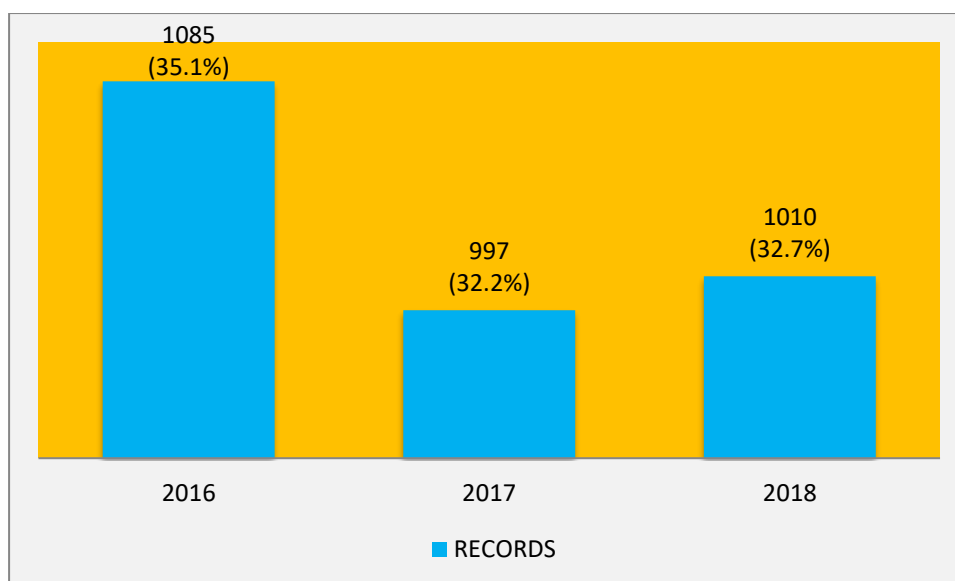
**Table.1:Year-Wise Publications**

Sl.No:	Publication Year	No: of Records	Percentage	TLCS	TGCS
1	2016	1085	35.1	1819	4791
2	2017	997	32.2	634	1809
3	2018	1010	32.7	152	376
	Total	3092	100	2605	6976

**Interpretation:**

The chart shows the year wise publication of records through 2016 to 2018. The year 2016 includes 1085 records with 35.1 percentage. The year 2017 includes 997 of 32.2 percentage. 2018 contains 1010 records with 32.7 percentages. In accordance with the year wise publication of records; the year 2016 includes more records of 1085 with 35.1 percentage.

**Graph.1:Year-Wise Publications**



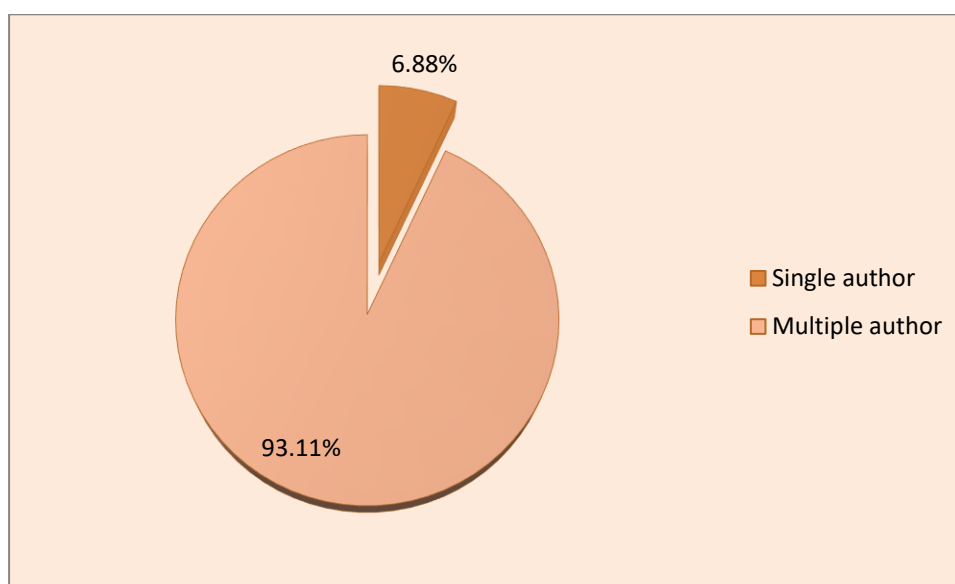
**Table.2:Single author vs. Multiple Authors**

Sl.No:	Authorship Pattern	Publication	Percentage
1	Single author	213	6.88%
2	Multiple author	2879	93.11%
	Total	3092	100%

**Interpretation:**

The chart displays the donation of single author and multiple authors. This shows that multiple authors have donated more than single authors. Multiple authors have published 2879 records with 93.11 percentage, but single authors only donated 213 publications with an average of 6.88 percentage.

**Graph.2:Single author vs. Multiple Authors**



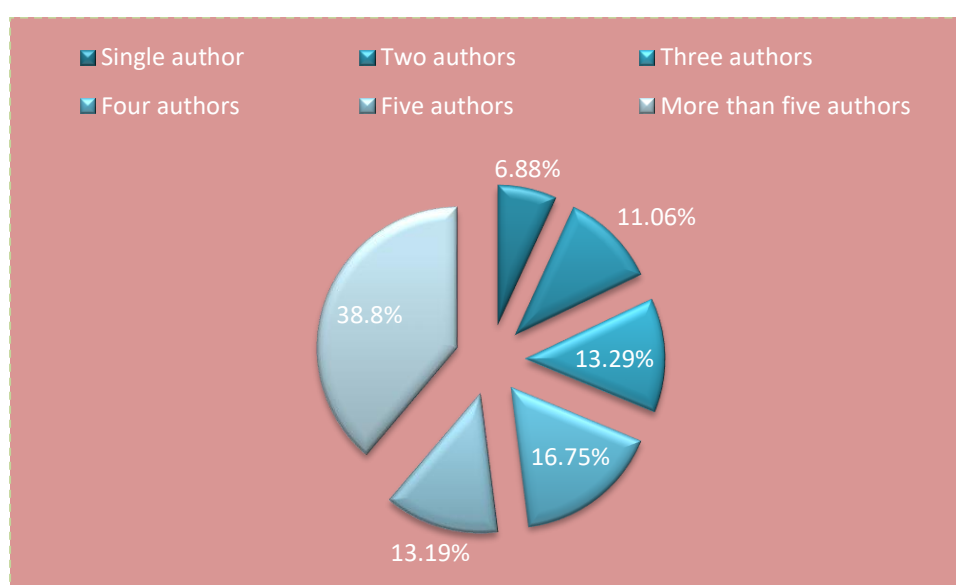
**Table.3: Authorship pattern**

SL: No	No: of authors	No: of publications	Percentage
1	Single author	213	6.88
2	Two authors	342	11.06
3	Three authors	411	13.29
4	Four authors	518	16.75
5	Five authors	408	13.19
6	More than five authors	1200	38.8
Total		3092	100

### Interpretation:

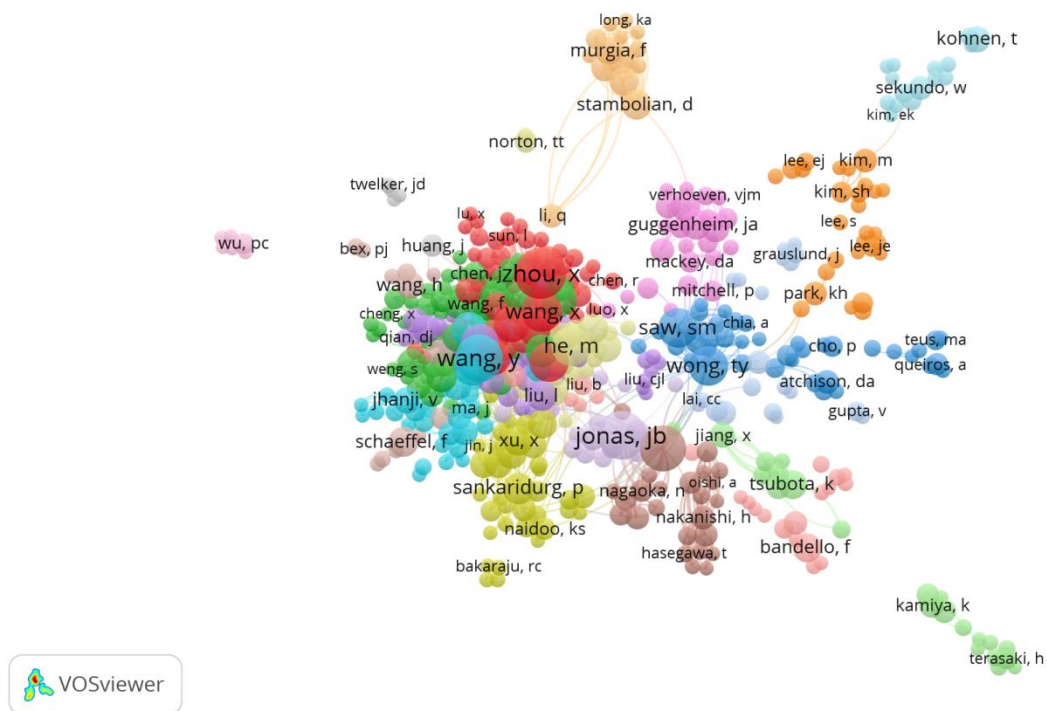
This chart shows the authorship pattern observed from 2016 to 2018. Overall single authored articles published were 6.88% whereas 11.06% of authors donated at two authors groups. 13.29% and 16.75%, 13.19% of authors donated at three four and five authored groups respectively. Above five authored group have 38.8% and has the leading output (38.8%), followed by four authored collaboration (16.75%). Single authored group of authored collaboration is very low.

**Graph.3: Authorship pattern**





**Figure 1: Network visualization of Co-authorship with prolific author**



**Table.4:Analysis of Degree of Collaboration**

Years	Single Author (Ns)	Multiple Author (Nm)	Total Authors (Ns+Nm)	Degree Of Collaboration
2016	71	1014	1085	0.93
2017	81	916	997	0.91
2018	61	949	1010	0.93
Total	213	2879	3092	0.93

**Interpretation:**

The chart describes the details about the degree of collaboration during 2016 – 2018. The degree of collaboration ranges from 0.93, decreases to 0.91 and then increases to 0.93. The average degree of collaboration is 0.92.

$$DC = \frac{NM}{NS + NM}$$

DC = Degree of Collaboration

NM = Number of Multi-Authored publications

NS = Number of Single Authored publications

$$DC = \frac{2879}{213+2879}$$

In the present study, the value of DC is 0.93.

**Table.5:Relative Growth Rate (RGR) & doubling time**

Year	No. of publications	Cumulative total of publications	W1	W2	R(a)=W2-W1	Mean R(a)	Doubling Time(DT)	Mean(DT)
2016	1085	1085	....	6.98	....			
2017	997	2082	6.90	7.64	0.74	1.49	0.93	0.77
2018	1010	3092	6.91	8.03	1.12		0.61	
Total	3092							

**Interpretation:**

It will visibly define the Relative Growth Rate and Doubling Time of a record through the year 2016 to 2018. In accordance with the table, results indicate the Relative Growth Rate was improved from year to year. In the year 2017 the relative growth rate was 0.74. It increased to 1.12 in 2018. The Doubling time decreased from one year to the next. In 2017, Doubling time value was 0.93. It decreased to 0.61 in 2018. Therefore the mean value of Relative Growth Rate is 1.49 during the span of 2016 to 2018. The Doubling Time mean value is 0.77 in the period 2016 to 2018.

**Table.6:Country wise Distribution(Top Ten)**

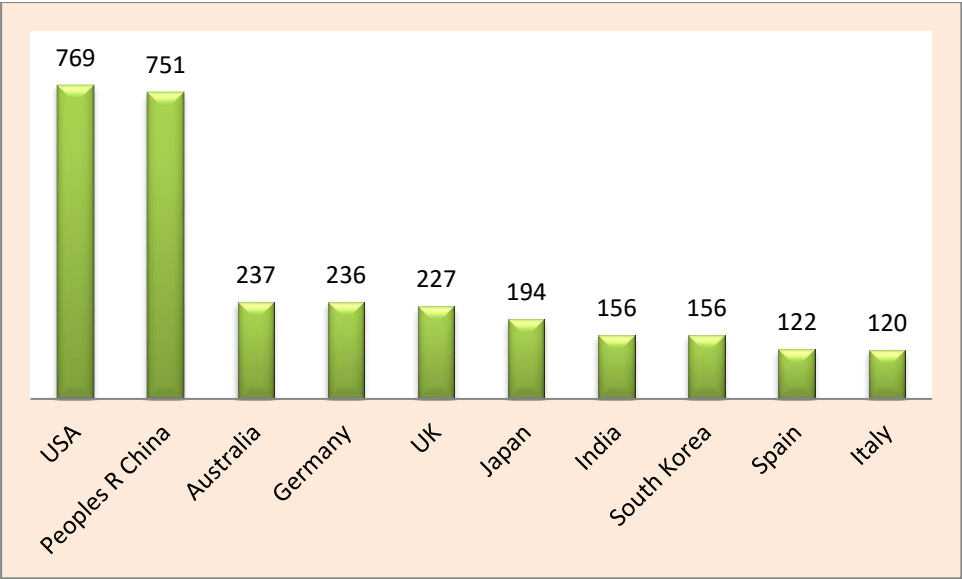
SL.No:	Country	Records	Percentage	TLCS	TGCS
1	USA	769	24.9	728	2339

2	Peoples R China	751	24.3	711	1688
3	Australia	237	7.7	536	945
4	Germany	236	7.6	307	788
5	UK	227	7.3	254	852
6	Japan	194	6.3	188	628
7	India	156	5.0	86	259
8	South Korea	156	5.0	101	355
9	Spain	122	3.9	65	268
10	Italy	120	3.9	106	304

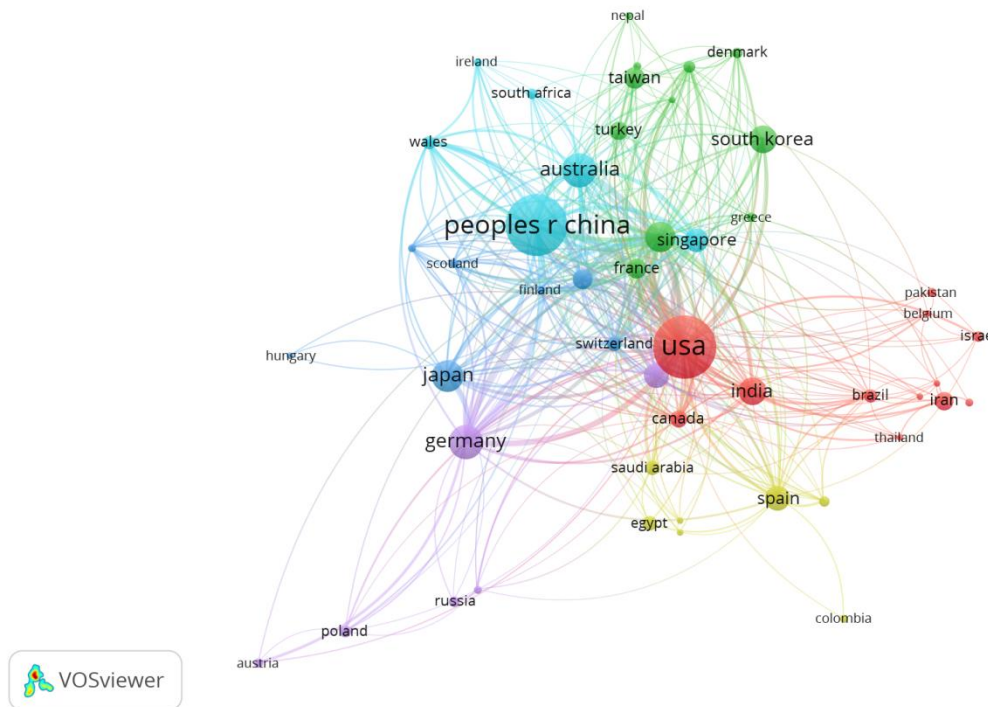
**Interpretation:**

The country-wise distribution of publications on Myopia show that the overall output observed in the revision was 3092 during the period 2016-2018. The analyses reveal that the USA is ranked to be in the primary position, and it has produced 769(24.9%) publications on Myopia. The USA is measured to be the most productive country in this research area. The second rank is engaged by Peoples R China which has brought out 751(24.3%) publications and the third rank to Australia which has reflected with 237(7.7%) publications output. India is ranked to the 7th in order. The output of India is accounted to 156(5%).

**Graph.4:Countrywise Distribution**



**Figure 2: Network visualization of Co-authorship with prolific countries**



**Table.7:Journal wise Distribution (Top Ten)**

SL. No:	Journal	Publications	Percentage	TLCS	TGCS
1	Investigative Ophthalmology & Visual Science	375	12.1	222	495
2	Plos One	95	3.1	0	237
3	International Journal Of Ophthalmology	88	2.8	46	87

4	BMC Ophthalmology	85	2.7	0	109
5	Retina-The Journal Of Retinal And Vitreous Diseases	83	2.7	97	243
6	Optometry And Vision Science	81	2.6	161	222
7	Journal Of Ophthalmology	79	2.6	0	37
8	Journal Of Cataract And Refractive Surgery	76	2.5	86	243
9	Journal Of Refractive Surgery	73	2.4	103	262
10	Scientific Reports	67	2.2	0	152

**Interpretation:**

The chart contains the list of the top ten journals that published most of the publications brought out on Myopia research. The journals are arranged in decreasing order by the number of articles published. There have been 375(12.1%) papers published by Investigative Ophthalmology & Visual Science. It ranked at the primary place of research output in the field of Myopia. The second position is taken by Plos One which has 95(3.1%) publications of Myopia with 0 TLCS, 237 TGCS. International Journal of Ophthalmology 88(2.8%) Publications, 46 TLCS, and 87 TGCS are rated and it stands in the third position. The last positions occupied in Scientific Reports have published 67(2.2%) articles with; 0 TLCS, 152 TGCS rated on top ten journals.

**Table.8:Document type wise Distribution of Myopia (Top Ten)**

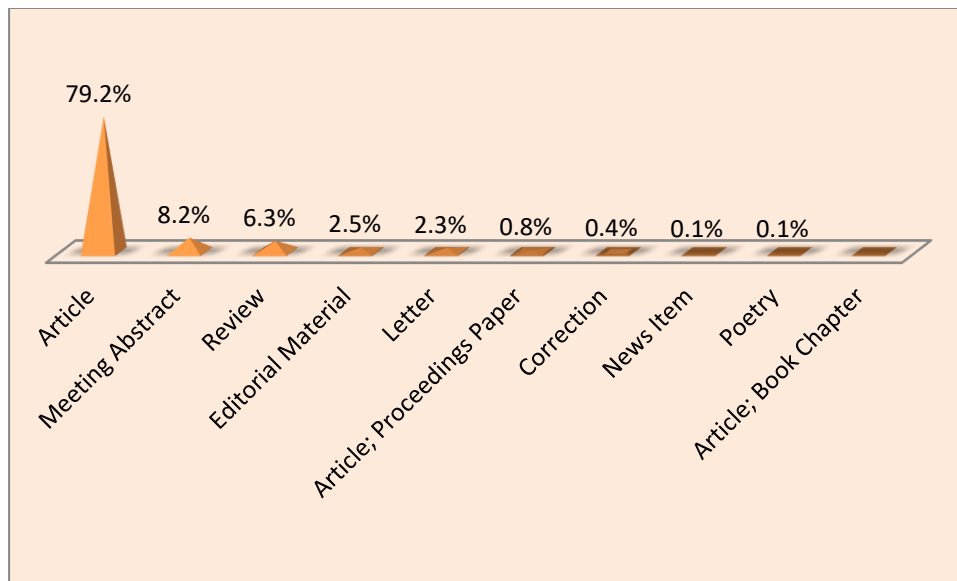
Sl.No	Document Type	Records	Percentage	TLCS	TGCS
1	Article	2450	79.2	2180	5936
2	Meeting Abstract	254	8.2	3	7
3	Review	196	6.3	314	854
4	Editorial Material	77	2.5	37	56
5	Letter	72	2.3	19	32
6	Article; Proceedings Paper	24	0.8	51	86
7	Correction	11	0.4	0	2
8	News Item	2	0.1	1	1
9	Poetry	2	0.1	0	0
10	Article; Book Chapter	1	0.0	0	0

**Interpretation:**

The above chart shows the types of documents published during 2016-2018. It was observed that the article type document has the highest score i.e. 79.2%. The other types of documents score below 10%. This investigation has again proved that articles are the most preferred form to share research results.



**Graph.5:Document type wise Distribution of Myopia**



## Findings

- To study the year wise output of publication of Myopia. We could clearly see that during the period 2016 – 2018 total number 3092 records were published in Web of Science online database at World Level. The highest publication, ranked first was 1085 in 2016 . The second rank is 2018 in 1010 records. The third rank is 2017 in 997 records and this is the lowest record during these years.
- The study concludes that out of 3092 articles, single author contributed only 213 (6.88 %) articles while the rest 2879 (93.11 %) articles were contributed by Multi-authors.
- The study details the degree of collaboration which indicate trend in single and multiple authorship during 2016 – 2018 as shown in the Table. Degree of collaboration in these years are 0.93, 0.91 and 0.93 and the average degree of collaboration is 0.92. The DC is calculated by using the formula K. Subramaniam, 1982: In the present study, the value of DC is 0.93. As a result, the degree of collaboration in the study Myopia is 0.93 which shows the collaborations of multiple authors.
- Relative Growth Rate and Doubling time is shown about the highest value and lowest value. The highest relative growth is 1.12 in the year of 2018. And the lowest relative growth is 0.74 in the year of 2017. Then highest doubling time is 0.93 in the year 2017. The lowest doubling time is 0.61 in the year of 2018.

- We observed that the Country “USA” occurs the most, in 769 records, securing first position, followed by “Peoples R China” in 751 records, which attained second position, followed by “Australia” in 237 records, which was given the third position.
- We observed the Journal “Investigative Ophthalmology & Visual Science” appear in 375 records- giving it first position, followed by the “Plos One” in second position with 95 records and “International Journal of Ophthalmology” in third position with 88 records.

## Conclusion

This scientometric analysis showed the growth of scientific productions in the field of Myopia and how its global contribution is constructive. Myopia is a large and increasing universal problem. People with high shortsightedness can also have the next risk of developing eye disease like cataracts. There is no best methodology for correcting shortsightedness. Improvements can be attained by regular eye examination, standard of living and diet changes. Even though the tendency to develop myopia may be hereditary, its real growth may be affected by how a person utilizes his or her eyes. Persons who spend huge time reading, working at a computer, or doing other extreme close visual work may be more likely to contract myopia. People with myopia have some options existing to recover clear distance vision. Eyeglasses, Contact lenses, Ortho-k or CRT, Laser procedures, etc are some general surgical services capable of delivering good vision. This study provides a wide view of scientific productivity related to myopia during the period 2016–2018 and allows us to better realize this field.

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