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TITLE PAGE

Title of the article

Eye Neoplasm Research: A Bibliometric Analysis from 1966 to 2012

Short Title

Eye Neoplasm Research: A Bibliometric Analysis

Authors

Christophe Boudry PhD¹, Frédéric Mouriaux, MD, PhD²

Author affiliations

^{1,2} Normandy University, Université de Caen Basse-Normandie, Caen, France

¹URFIST/Ecole nationale des Chartes, Paris, France and Laboratoire « Dispositifs d'Information et de Communication à l'Ère Numérique » Conservatoire National des Arts et Métiers, Paris, France

²Service d'Ophtalmologie, Caen CHU Côte de Nacre F-14000, France

Corresponding author:

C. Boudry

Centre de Formation aux Carrières de Bibliothèques (CFCB)

Université de Caen Basse-Normandie

Esplanade de la Paix

CS 14032

France

14032 CAEN Cedex 5

Tel: (+33) 02.31.56.51.60

Fax: (+33) 02.31.56.58.18

Email: boudry@enc.sorbonne.fr

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ABSTRACT

Purpose: To calculate the growth rate of biomedical literature on eye neoplasms and to assess which journals, countries, and continents are the most productive.

Methods: PubMed was used to search for papers published from 1966 to 2012. Total number of articles per year was fitted to a linear equation as well as an exponential curve. To identify the core journals and predict the number of journals containing articles related to eye neoplasms, Bradford's law was applied. ~~The mean number of publications per year and per author were calculated.~~ For each country and each continent, the Gross Domestic Product (GDP) index (publications per 1 billion US dollars of GDP) and the population index (publications per million inhabitants) were calculated.

Results: A total of 27 943 references were retrieved. The growth in the number of publications showed a linear increase with a yearly average growth rate of 2.08%, which was lower than for the whole PubMed database (3.59%). Using Bradford's law, 17 core journals were identified among which two journals produced more than 1 000 articles (JAMA Ophthalmology and American journal of ophthalmology). Europe was the most productive continent, followed by North America and Asia. The United States was by far the predominant country in number of publications, followed by Germany and the United Kingdom. However, population and GDP indexes showed that absolute production did not reflect the production per capita nor the economic efficiency.

Conclusions: This bibliometric study provides data contributing to a better understanding of the eye neoplasm research field.

Key words: eye – neoplasms – socioeconomics – publication – journal

INTRODUCTION

“Eye neoplasms” is a general term used to describe many types of tumors that occur in and around the eye. Eye neoplasms include primary and metastatic tumors of the globe (intra ocular and conjunctiva) and ocular adnexa (orbit, eyelid and lacrimal structures). The treatment of ocular tumors is generally a multi-disciplinary effort requiring coordination between ocular oncologists, medical oncologists, radiation specialists, pediatricians, and internal medicine specialists. There are a number of excellent institutions and departments in the world that specialize in the diagnosis and management of eye cancer. International journals serve as a forum for exchange and are a significant indicator of research activity. Bibliometrics, first introduced by Pritchard in 1969 (1), refers to methods which utilize quantitative analysis and statistics to describe distribution patterns of publications, temporal evolution, and geographical distribution of research in a given field. Bibliometrics is helpful in mapping the literature related to a research field and can provide useful data, leading to a better understanding of scientific fields such as cancer research (2,3) or ophthalmology (4–8). To the best of our knowledge, there are no similar reports examining worldwide contributions to the body of literature related to eye neoplasms.

The objective of the study was to give an overview of eye neoplasm research using the PubMed database over the period of 1966 to 2012. More specifically, we wanted to know which journals, countries, and continents are the most productive.

MATERIAL AND METHODS

Bibliographic search

The Medline database via PubMed developed by the National Center for Biotechnology Information (NCBI) at the National Library of Medicine (NLM) was used for the search for papers in this study. PubMed was used because it was the most widely used database in the field of medicine (9). The search strategy was: "Eye Neoplasms" [Mesh] AND 1966:2012 [DP] AND journal article [PT], where MeSH stands for "Medical Subject Headings", DP "Date of Publication", and PT "Publication Type". The MeSH term "Eye Neoplasms", whose definition in the NLM controlled vocabulary thesaurus is "Tumors or cancer of the eye", was chosen because it covers all tumors or cancer of the eye (Fig. 1). "Journal Article [MeSH]" includes the following publication types: journal articles, introductory journal articles, and reviews. The year 1966 was chosen because it corresponds to the beginning of the Medline database. The study was limited to original research articles, corresponding to "Journal article" shown under the "Publication type" field. Data were downloaded from PubMed in Extensible Markup Language (XML) and were processed through developed Hypertext Preprocessor language (PHP) scripts, then were imported to Microsoft Excel 2010 (Microsoft, Redmond, USA) for data processing.

Analysis of growth of literature

Using Excel software, the total number of articles related to eye neoplasms per year was fitted to a linear equation as well as an exponential curve for our search strategy. The average yearly growth rate (10) of the literature related to eye neoplasms was calculated as the mean percentage of annual growth rate for the period studied using

the equation: Annual Growth Rate = Current Year Total Number of Articles – Previous Year Total Number of Articles/Previous Year Total Number of Articles. The average yearly growth rate was also calculated for the whole PubMed database for the period 1966-2012.

Bradford's law

Bradford's law has been used extensively in the information science literature to describe the dispersion of articles in any scientific field (11) and to identify "core journals" of serial titles (10). In this way, Bradford's law may predict the total number of journals containing articles on a subject once the number in the core and middle zone of journals is known (12). To identify the core journals and predict the number of journals containing articles dedicated to eye neoplasms, Bradford's law was applied by dividing the publication frequency ranked journals into three groups with each group representing approximately the same number of articles.

Analysis of journals and language of publication

The 2012 Journal Citation Reports (JCR) (Thomson Reuters, New York, USA) was used for Impact Factor (IF) determination and for the rank of the journal in the JCR in the category "Ophthalmology". Moreover, we divided the entire period (1966-2012) into five periods (1966-1972, 1973-1982, 1983-1992, 1993-2002, 2003-2012) for analyzing the 17 most productive journals during the divided period. Thus, the 1982, 1992, 2002 Journal Citation Reports (JCR) were also used to assess IF for the same years. Language of publication was determined using the "Language" field for all articles retrieved. The percentage of papers published in English in the entire PubMed database between 1966 and 2012 was also calculated using the following

search strategy: Medline [sb] OR publisher [sb] OR pubstatusaheadofprint AND 1966:2012 [DP] AND journal article [PT] where sb means “subset”.

Analysis of country affiliations

The country of affiliation of the first author was determined by the address in the “Affiliation” field. When the country was absent in the address, it was determined from the city or email address using an Internet search engine if necessary. If the name of a country no longer existed (eg, Yugoslavia), the city was used to find the name of the existing country in 2012. England, Scotland, Northern Ireland, and Wales were grouped into the United Kingdom. Hong Kong was considered as part of China.

The Gross Domestic Product (GDP) is the market value of all officially recognized final goods and services produced within a country in a given period. GDP per capita is often considered an indicator of a country's standard of living (13). For each country and each continent, the GDP index (publications per 1 billion US dollars of GDP) and the population index (publications per million inhabitants) were calculated using the World Development Indicators from the online databases of the World Bank (13), as done previously (14–16). The GDP and the population index were calculated using the mean GDP and mean number of inhabitants from 1993 to 2012.

RESULTS

Growth of literature

The publication search resulted in a total of 27 943 references over the period of 1966 to 2012. The number of articles produced overall has grown from 372 articles per year in 1966 to 756 in 2012. Using the cumulative number of publications for eye

neoplasms, we calculated the linear adjustment and the exponential adjustment ($y = 591.71x - 1E + 6$ with $r^2 = 0.99$, and $y = 2^{-54} * e^{0.0667x}$ with $r^2 = 0.84$, respectively), showing linear growth (Fig. 2). We calculated that the average yearly growth rate was 2.08% from 1966 to 2012. For the whole PubMed database the average yearly growth rate was 3.59%.

Journals

The number of journals that published at least one article related to the eye during the period 1966-2012 was 2 153. According to Bradford's law, the total number of articles compared to the number of journals in order of decreasing productivity was divided into 3 zones containing the same number of articles (Fig. 3). The first third of the total number of articles ($n=9\ 356$) represents the journals ($n=17$; 0.8%) that published the most articles (between 252 and 1 260 articles). This first third is presumed to be of the highest interest for researchers interested in eye neoplasms (core journals). The middle third ($n=9\ 297$) corresponds to the journals ($n=108$; 5%) that contained an average number of articles, and the last third ($n=9\ 290$) includes the "long tail" of journals ($n=2\ 028$; 94.2%) that published few articles (from 1 to 35). The last third should be regarded as of less importance for eye neoplasm researchers. As an example, 1 155 journals (53.6%) published only 1 or 2 articles related to eye neoplasms over the 46-year study period. The distribution of journals in the three groups corresponds respectively to ratios equal to 1; 6.4 (108/17), and 119.3 (2 028/17). Consequently, according to Braford's'law, the theoretical number of journals was calculated in the three groups using 1, n , n^2 ratios which were 17 ($n=1$), 108 ($n=6.4$), and 686 ($n^2=40.3$), respectively. Thus, the theoretical ratio of number of

journals and theoretical number of journals (686) in the last third are lower than the real values (2 028).

Table 1A describes the core journals according to Bradford's law (17 most productive journals for the period 1966-2012). Five journals of 17 did not have any IF. The 12 journals with IF all belong to the category "Ophthalmology" of the JCR. Among the 17 core journals according to Bradford's law, only six were classified in the top ten according to the IF of the category "Ophthalmology". Furthermore, the journal with the highest IF in the category "Ophthalmology" (Progress in retinal and eye research) was not among the 17 most productive journals.

Two journals produced more than 1 000 articles (JAMA ophthalmology, formerly Archives of ophthalmology and American journal of ophthalmology) from 1966 to 2012 (Table 1A). Five journals produced more than 20 articles related to eye neoplasms per year of activity (JAMA ophthalmology, American journal of ophthalmology, Ophthalmology, Ophthalmic plastic reconstructive surgery, and Bulletin des sociétés d'ophtalmologie de France).

The percentage of articles related to eye neoplasms relative to the total number of articles published by the 17 core journals according to Bradford's law was from 2.6 (Investigative ophthalmology & visual science) to 24.49 (Ophthalmic plastic and reconstructive surgery). Unexpectedly, JAMA ophthalmology, which was the most productive journal, published only 10.27% of articles related to eye neoplasms compared to the total number of articles published.

Because some journals were recent, we decided to divide this long period of 47 years into five periods (1966-1972, 1973-1982, 1983-1992, 1993-2002, 2003-2012) (Tab.

IB). Some of the 17 core journals according to Bradford's law for the period 1966-2012 showed a recent growth in the number of articles published in ocular oncology, especially Ophthalmic plastic reconstructive surgery, Investigative ophtalmology & visual science, and Retina. Note that only 9 journals among the 17 core journals according to Bradford's law (Table 1A) published articles related to eye neoplasms during the five consecutive periods (Table 1B). Among them, four were always in the top 17 most productive journals during these five consecutive periods (JAMA ophthalmology, American journal of ophthalmology, The British journal of ophthalmology and Klinische Monatsblätter für Augenheilkunde). In order to complete data shown in Table IB, Table IC describes others journals (not belonging to the 17 core journals according to Bradford's law) appearing in the 17 most productive journals for the 5 periods studied: as an example, for the period 2003-2012, five journals not belonging to the 17 core journals according to Bradford's law appear. Of note, two journals that were not ophthalmologic emerge: Cancer for the three first periods and International journal of radiation oncology, biology, physics for the last period.

Languages of publication

Thirty different languages of publication were identified. The 7 predominant languages were English ($n=20\,599$; 73.72%), French ($n=1\,948$; 6.97%), German ($n=1\,929$; 6.90%), Russian ($n=684$; 2.45%), Japanese ($n=579$; 2.07%), Polish ($n=545$; 1.95%), and Chinese ($n=423$; 1.51%). All other languages amounted to less than 1%. The percentage of articles in English in the entire Pubmed database for the same period was 82.3%.

Geographical distribution of authors (country contributions)

The study of the affiliation of the first author allowed us to identify 16 005 country affiliations for the 27 943 articles (57.27%). Because Medline did not collect affiliations of authors from 1966 to 1975, and in addition from 1976 on the collection of affiliations gradually reached and exceeded 95% only in 1993, we decided to study affiliations only from 1993 to 2012. For this period, the total number of articles was 13 687 and the number of affiliations was 13 285. Thus, 97.06% of the articles had country affiliations that could be determined. Ninety-two countries were identified. The highest absolute production was in the USA, representing 30.91% of the 13 687 articles written (Table IIA). Among the most productive countries, 17 of 25 are classified as developed countries (according to the definition of the United Nations). When normalized by population, Switzerland was the most productive country and the USA was in 7th place (Table IIB). Twenty-two of the top 25 countries were developed countries ($n=22$). European Nordic countries were efficient when adjustment was made for population. When normalized by GDP, Comoros, Nepal and, Tunisia were the most productive countries and the United States was absent from the top 25 countries (Table IIC). When analyzing continents, Europe was the most productive with 5 052 (38.03%) articles, followed by North America with 4 656 (35.05%) articles and Asia with 2 725 (20.51%) articles (Table III).

DISCUSSION

International journals represent the most common resource for the methods used in a broader discipline known as bibliometrics. Bibliometrics adopts a quantitative approach to studying all types of documents in order to forecast a discipline's development and to identify and follow trends. From an overall perspective, it has been suggested that no specialty in medicine is any better than its published

literature (17). In our study we used the same methodology of bibliometric analysis that have been already published (14,18). In ophthalmology, Guerin et al. (8) described an analysis from 2002 to 2006 using only 5 journals. Our study included all journals and demonstrated that bibliometric analysis can provide an interesting view of the development of ocular oncology over a 47-year period. Although the number of articles is not limited in our study, there are limitations: 1) PubMed is the most widely used for bibliometric analysis, but it does not contain all biomedical journals and is biased in favor of English journals (14,19); 2) We were unable to distinguish between basic scientific research and clinical research trials; 3) The methodology for identifying authors' country affiliations did not allow us to assess the country for all articles studied. Furthermore, when present, the country affiliation of the authors indicated only one country per article and fails to identify collaborative research; 4) The address of the corresponding author may not always relate to the country in which the research was conducted. For example, many fellows from outside the United States publish in the United States, then return to their native country. Despite these limitations, this study provides a wide view of scientific productivity related to eye neoplasms.

As the world of scientific literature continues to expand through the 21st century, the field of ocular oncology also continues to expand. However, the growth of ocular neoplasm publications is lower than for the whole PubMed database, and is linear, which suggests a stabilization of publication rate (20). However, the high number of articles related to eye neoplasms justifies why, in 2015, a journal specifically dedicated to ocular oncology now exists (Ocular oncology and pathology). Articles related to eye neoplasms are published in a vast number of journals ($n=2153$), which

is more than the expected theoretical value ($n=811$). This can be explained by the large spectrum of the subject studied. The core journals identified using Bradford's law showed a high amount of heterogeneity. Thus, we should consider the weight of a journal not only by the number of publications, but also by the peer review process and language of publication as well as the impact factor. The impact factor is the most commonly used indicator for journal importance (21) even though it is widely criticized in the literature (22). However, as shown in this study and others (23), it can fall or even disappear altogether, particularly when a journal changes its name and the old and new titles are not unified (24). A longitudinal study of core journals in occupational health, for example, found that periodicals that change their name often lose their impact factors and also vary in country and language (25). Our study focused on productivity, ie the number of articles published by a journal. Productivity is only a quantity evaluation. In contrast, the IF, which takes into account the average number of citations to articles published by a journal in a two year period, is more qualitative, but does not reflect individual citations of articles. Although PubMed does not permit access to these individual citations of articles, it is often chosen for such studies because of its open access, coverage and international visibility (26).

As expected, English was the predominant language of publication (73.72%) (7,14,16,27). Similar to findings in other specialties (2,15,16), we reported that the USA is the leading gross contributor. In contrast, using continent analysis, Europe is the largest gross contributor. Of note, the population index and GDP indexes showed that absolute production did not reflect the production per capita and the economic efficiency of countries in the field of eye neoplasms. The production per capita showed a higher proportion of developed countries (88% of the top 25 countries),

and the production normalized by GDP showed a low proportion of developed countries (32% of the top 25 countries). These results suggest a lower economic efficiency in developed countries in producing articles related to eye neoplasms.

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FIGURE



Fig.1 - MeSH trees corresponding to the MeSH term “Eye Neoplasms”. This term is located in two different places in the NLM controlled vocabulary thesaurus used for indexing PubMed

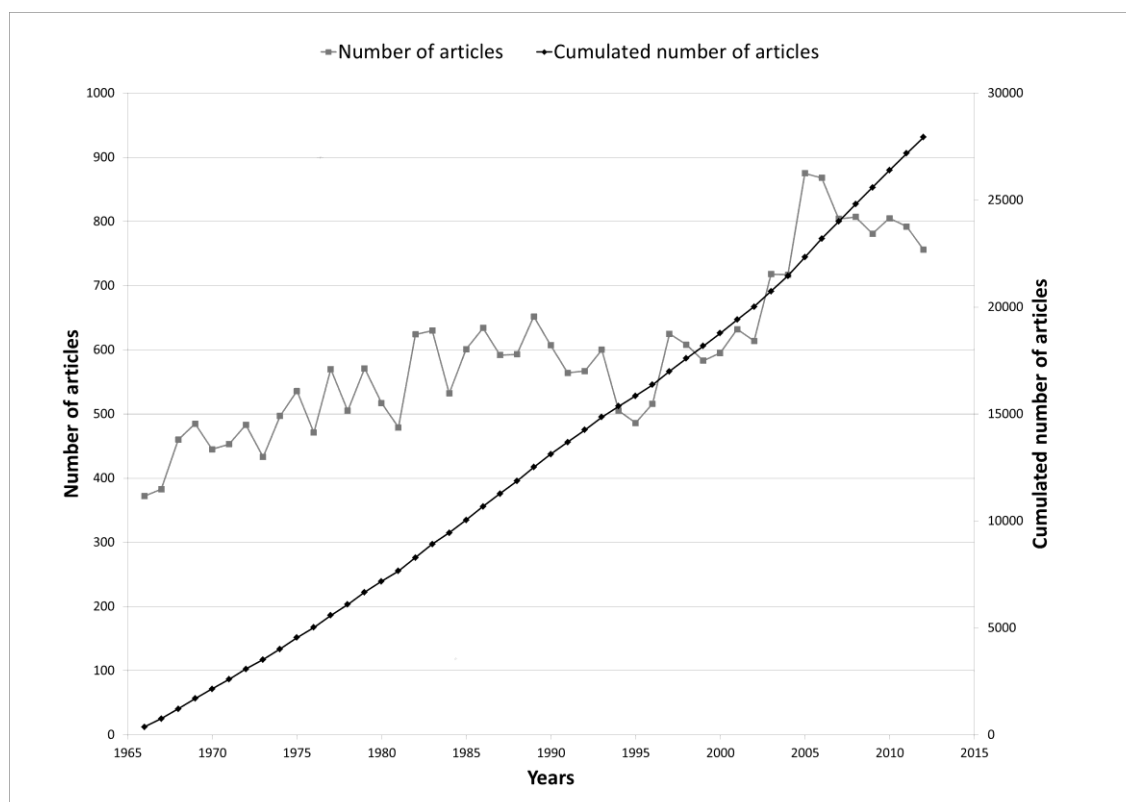


Fig. 2 - Growth of literature related to eye neoplasms (annual number and total number)

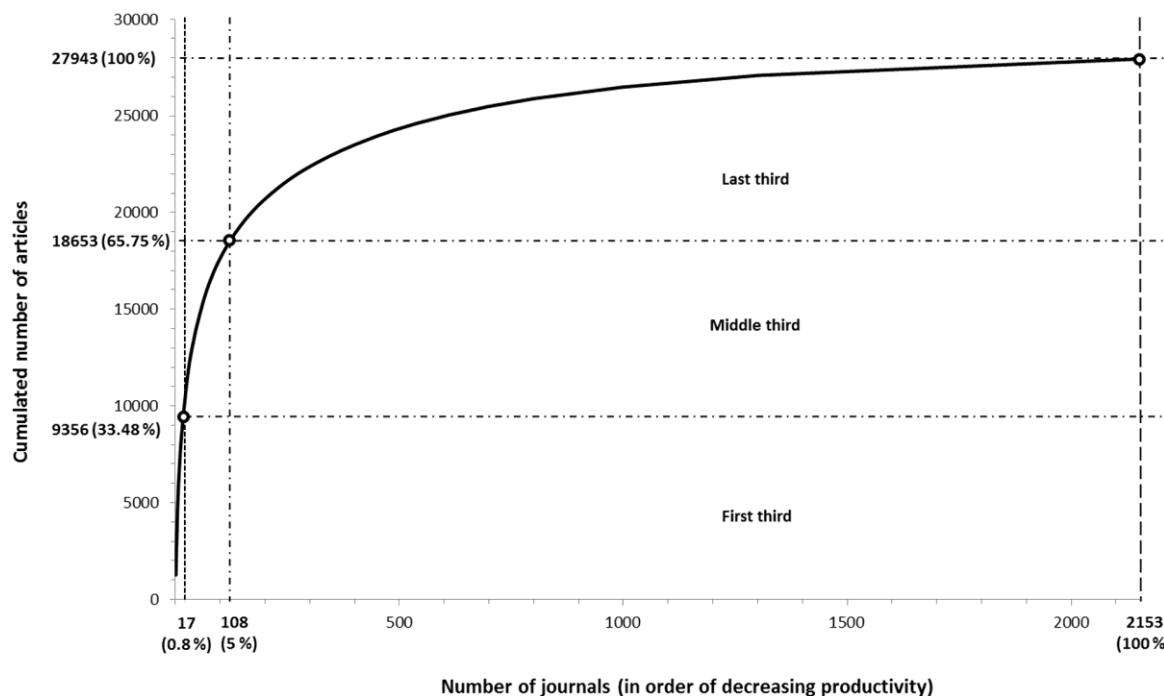


Fig. 3 - Total number of articles and number of journals in decreasing order of productivity according to Bradford's law. "Bradford's law states that "If scientific journals are arranged in order of decreasing productivity of articles on a given subject, they may be divided into a nucleus of periodicals more particularly devoted to the subject and several groups or zones containing the same number of articles as the nucleus, when the numbers of periodicals in the nucleus and succeeding zones will be as 1; n ; n^2 ". Thus the total number of articles compared to the number of journals in order of decreasing productivity was divided in 3 zones containing the same number of articles

TABLE IA - Core journals according to Bradford's law (top 17 most productive journals between 1966 and 2012)

Journal	Impact Factor ^a (JCR rank ^b)	Language of publication	Number of articles related to eye neoplasms (Rank)	Articles %/total ^c	Number of articles related to eye neoplasms per year of activity	Total number of articles published by the journal	Percentage of articles related to eye neoplasms relative to the total number of articles published
JAMA Ophthalmology ^d	3.826 (3)	English	1 260 (1)	4.51	26.81	12263	10.27
American journal of ophthalmology	3.631 (4)	English	1 108 (2)	3.97	23.08	14718	7.53
Ophthalmology	5.563 (2)	English	910 (3)	3.26	25.28	10223	8.90
The British journal of ophthalmology	2.725 (9)	English	811 (4)	2.90	16.90	10373	7.45
Klinische Monatsblätter für Augenheilkunde	0.699 (49)	German	790 (5)	2.83	16.81	9882	7.99
Ophthalmic plastic and reconstructive surgery	0.671 (50)	English	605 (6)	2.17	21.61	2470	24.49
Bulletin des sociétés d'ophtalmologie de France *	N/A	French	545 (7)	1.95	21.8	6112	8.91
Ophthalmologica	1.412 (35)	English	430 (8)	1.54	9.15	4106	10.47
Klinika oczna	N/A	Polish	429 (9)	1.54	9.33	6155	6.97
Journal français d'ophtalmologie	0.438 (53)	French	425 (10)	1.52	12.14	4618	9.20
Investigative	3.441 (5)	English	417 (11)	1.49	11.58	16033	2.60

ophthalmology & visual science							
Acta Ophthalmologica	2.345 (15)	English	306 (12)	1.10	6.51	2822	10.84
Retina	2.825 (8)	English	297 (13)	1.06	9.28	4243	6.99
Canadian journal of ophthalmology	1.145 (39)	English	279 (14)	1.00	5.94	2942	9.48
Annals of ophthalmology	N/A	English	269 (15)	0.96	11.21	3045	8.83
Zhonghua yan ke za zhi	N/A	Chinese	265 (16)	0.95	7.79	3894	6.80
Vestnik oftalmologii **	N/A	Russian	264 (17)	0.94	5.62	6165	4.28

^a IF for year 2012

^b Ranking of journals in the Journal Citation Report with IF in the category “Ophthalmology” (Year 2012). This category includes 59 journals

^c Percentage of articles related to eye neoplasm relative to the total number of articles retrieved in the study ($n=29\,743$)

^d Formerly Archives of ophthalmology

* Non peer reviewed. ** Peer review process unknown

TABLE IB - Core journals according to Bradford's law: number of articles, rank and IF for periods 1966-1972; 1973-1982; 1983-1992; 1993-2002; 2003-2012

Journal	Number of articles relative to eye neoplasms (Rank)												
	1966-1972 ^a		1973-1982	IF (year 1982)		1983-1992	IF (year 1992)		1993-2002	IF (year 2002)		2003-2012	IF (year 2012)
JAMA Ophthalmology ^b	164 (2)		267 (2)	1.427		267 (2)	2.007		298 (1)	2.337		264 (2)	3.826
American journal of ophthalmology	215 (1)		278 (1)	1.331		216 (3)	2.208		225 (3)	1.978		174 (7)	3.631
Ophthalmology	0		127 (8)	1.291		301 (1)	2.142		241 (2)	2.863		241 (3)	5.563
The British journal of ophthalmology	108 (5)		112 (9)	0.985		194 (5)	1.096		166 (4)	1.779		231 (4)	2.725
Klinische Monatsblätter für Augenheilkunde	141 (3)		245 (3)	0.262		159 (6)	0.202		131 (7)	0.534		114 (11)	0.699
Ophthalmic plastic and reconstructive surgery	0		0	N/A		63 (18)	0.204		140 (5)	0.588		402 (1)	0.671
Bulletin des sociétés d'ophtalmologie de France *	120 (4)		217 (4)	N/A		208 (4)	N/A		0	N/A		0	N/A
Ophthalmologica	90 (6)		149 (5)	0.333		75 (11)	0.273		68 (13)	0.647		48 (22)	1.412
Klinika oczna	87 (7)		137 (7)	N/A		69 (15)	N/A		65 (15)	N/A		71 (18)	N/A
Journal français d'ophtalmologie	0		55 (16)	N/A		88 (8)	0.057		138 (6)	0.311		144 (8)	0.438
Investigative ophthalmology & visual science	0		35 (21)	2.212		76 (10)	3.639		93 (8)	4.091		213 (5)	3.441
Acta Ophthalmologica	45 (10)		52 (19)	0.736		42 (24)	0.413		71 (12)	0.796		96 (13)	2,345
Retina	0		10 (26)	N/A		64 (16)	0.471		93 (8)	1.058		130 (9)	2.825
Canadian journal of ophthalmology	30 (13)		61 (15)	0.422		47 (22)	0.192		46 (19)	0.655		95 (14)	1.145
Annals of ophthalmology	23 (14)		142 (6)	N/A		95 (7)	0.171		9 (28)	0.086		0	N/A
Zhonghua yan ke za zhi	0		39 (20)	N/A		72 (12)	N/A		63 (16)	N/A		91 (16)	N/A
Vestnik oftalmologii **	51 (9)		63 (13)	N/A		64 (16)	0.062		30 (24)	N/A		56 (21)	N/A

* Non peer reviewed. ** Peer review process unknown

0 = no paper because the journal was not active

^aIF for year 1972 unavailable because IF appears in 1975

^bFormerly Archives of ophthalmology

TABLE IC – Other journals (not belonging to the 17 core journals according to Bradford’s law) appearing in the top 17 most productive journals for periods 1966-1972; 1973-1982; 1983-1992; 1993-2002; 2003-2012

	Journal	Number of articles related to eye neoplasms (Rank)	IF ^a
1966-1972	Oftalmologicheskii zhurnal	67 (8)	N/A
	International ophthalmology clinics	38 (11)	N/A
	Nippon Ganka Gakkai zasshi	31 (12)	N/A
	Survey of ophthalmology	23 (14)	N/A
	Cancer	22 (16)	N/A
	Indian journal of ophthalmology	8 (17)	N/A
1973-1982	Oftalmologicheskii zhurnal	101 (10)	N/A
	Cancer	83 (11)	2.657
	Indian journal of ophthalmology	76 (12)	N/A
	International ophthalmology clinics	62 (14)	N/A
	Ophthalmic surgery	54 (17)	0.541
1983-1992	Ophthalmic surgery	88 (8)	0.607
	Cancer	70 (13)	2.271
	Indian journal of ophthalmology	70 (13)	N/A
1993-2002	Der Ophthalmologe	91 (10)	N/A
	Graefe's archive for clinical and experimental ophthalmology	78 (11)	1.191
	Journal of pediatric ophthalmology and strabismus	67 (14)	0.434
	Eye	58 (17),	1.028
2003-2012	Orbit	192 (6)	N/A
	Der Ophthalmologe	125 (10)	N/A
	Graefe's archive for clinical and experimental Ophthalmology	101 (12)	1.932
	Eye	94 (15)	1.818
	International journal of radiation oncology, biology, physics	80 (17)	4.524

^a IF for year 1972 unavailable because IF appears in 1975. IF of the year 1982 is given for the period 1973-1982, IF of the year 1992 is given for the period 1983-1992, IF of the year 2002 is given for the period 1993-2002, IF of the year 2012 is given for the period 2003-2012

TABLE - II: Top 25 countries for publication in ocular oncology (1993-2012). (A) Based on the total number of publications, (B) Based on the number of publications per million inhabitants (population index), (C) Based on the number of publications per 1 billion US dollars of gross domestic product (GDP index)

A		B		C	
Country	No. of articles (%)	Country	Population index	Country	GDP index
United States	4 231 (30.91%)	Switzerland	26.59	Comoros	5.72
Germany	1 060 (7.74%)	Israel	21.99	Nepal	1.77
United Kingdom	839 (6.13%)	Netherlands	18.16	Tunisia	1.29
Japan	698 (5.10%)	Finland	15.70	Romania	1.22
China	623 (4.55%)	Denmark	14.48	Uganda	1.08
France	622 (4.54%)	Australia	14.07	Israel	1.07
India	501 (3.66%)	United States	13.82	Congo, Rep.	1.04
Italy	499 (3.65%)	United Kingdom	13.37	Malawi	1.03
Canada	425 (3.11%)	Germany	12.53	Zimbabwe	1.02
Spain	343 (2.51%)	Canada	12.45	Serbia	0.88
Netherlands	314 (2.29%)	Austria	11.79	Poland	0.80
Turkey	302 (2.21%)	Belgium	10.72	Turkey	0.71
Australia	289 (2.11%)	Sweden	10.53	Morocco	0.67
Poland	230 (1.68%)	Iceland	10.29	Mali	0.59
Switzerland	215 (1.57%)	France	9.60	India	0.55
South Korea	196 (1.43%)	Singapore	8.72	Croatia	0.53
Brazil	184 (1.34%)	Norway	8.49	Netherlands	0.52
Israel	150 (1.10%)	Italy	8.01	Switzerland	0.51
Belgium	114 (0.83%)	Spain	7.59	Hungary	0.51
Romania	108 (0.79%)	Ireland	6.96	Finland	0.47
Austria	102 (0.75%)	Poland	5.76	Nigeria	0.45
Sweden	99 (0.72%)	Japan	5.25	United Kingdom	0.43
Finland	84 (0.61%)	New Zealand	5.24	Australia	0.43
Denmark	82 (0.60%)	Romania	4.86	Canada	0.39
Argentina	57 (0.42%)	Croatia	4.47	Germany	0.39

TABLE III - Research production of continents in oncology (1993-2012). (A) Based on the total number of publications, (B) Based on the number of publications per million inhabitants (population index), (C) Based on the number of publications per 1 billion US dollars of Gross Domestic Product (GDP index)

A		B		C	
Continent	No. of articles (%)	Continent	Population index	Continent	GDP index
Europe	5052 (38.03%)	North america	13,74	Oceania	0,42
North america	4656 (35.05%)	Oceania	9,42	North America	0,37
Asia	2725 (20.51%)	Europe	6,58	Europe	0,36
Oceania	312 (2.35%)	Asia	0,67	Africa	0,24
Latin America*	309 (2.33%)	Latin America*	0,54	Asia	0,23
Africa	231 (1.74%)	Africa	0,25	Latin America*	0,10
Total	13285 (100)	World	2,00	World	0,3

* and the Caribbean