

Growth and Distribution of Research Journals Across the World

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ABSTRACT

This study assesses the growth and distribution of research journals indexed in Scopus from 2000 through 2019, using SCImago data for journal and country ranking. A total of 15,484 journals were indexed in Scopus up till 1999, and from 2000 to 2019, 11,037 journals were indexed in Scopus at an average of 581.85 journals per year at an average annual corresponding growth of 2.74%. Of the total journals indexed in Scopus, 41.61% were indexed during the last two decades. Europe is the leading continent publishing nearly 60% of the total world journals, while Africa publishes around 1% of journals, the lowest among all the continents. The United Kingdom, United States (US), China, Brazil, Australia, and Egypt are the leading countries publishing the maximum number of journals from their respective continents. Of the total journals indexed across the world, nearly one-fourth (6,425, 24.23%) are published in the US. Still more, of the 109 journal publishing countries across the world, nearly 90% of journals are published in twenty leading journal publishing countries. Among the 27 major Scopus recognized subject disciplines, the majority (1,606, 6.06%) of journals are published in the field of medicine. The growth of research journals and the growth of research results has moved at a uniform pace, and any asymmetry between the two is bound to result either in the introduction of predatory and dubious journals or in the production of sub-standard research results.

Keywords: journal growth, journal distribution, Scopus, world, SCImago, scientometrics

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1. INTRODUCTION

Researchers across the world are always keen to publish their research results in quality research journals that have greater visibility and acceptance among information seekers. The research journals indexed in Scopus and Web of Science (WoS) are by and large considered as qualitative and authoritative sources of information, and enjoy both popularity and acceptance across the world for maintaining a very high indexing standard for research journals desirous to be indexed. Given this fact, research journals indexed in any of these two popular indexes are considered both qualitative and authoritative, whereby the genuineness of such journals is not generally questioned by researchers while submitting their research results for publication. Researchers publishing their research results in journals not indexed in Scopus or WoS are generally considered substandard, low quality, fake, dubious, and even of a predatory nature. The question remains, are mainstream recognized research journals available in sufficient numbers to publish all the research results produced across the world? This is more a race between demand and supply, whereby the demand and availability of quality and authentic research journals to publish all the research results produced by the world scientific community is met or not. Any existing gap between the quality journals published and the number of research results published in them somewhere offers a breeding ground for predatory, dubious, sub-standard, and poor-quality research journals.

The research results publishing platform is as important as the research itself. What is more a paradox is that a journal attains recognition by publishing quality research results over the years, and thereafter it is the very journal which becomes the parameter in deciding research quality; furthermore, the irony is that the scientific community too upholds this notion that research papers published in a particular mainstream recognized journal shall be more qualitative. The need is to understand that a journal is not the reason for quality research, but quality research is the reason for the quality journal. In absence of a good publishing platform, it is difficult to ascertain and validate the research results. Research journals are the globally accepted medium to publish research results produced, still more when the journal publishing market is flooded with predatory, dubious, sub-standard, and low-quality journals; thereon the only choice left with the scientific and research community is to trust the journals indexed in Scopus and Web of Science, or for that matter, journals

indexed in any other popular index for being both qualitative and authoritative. Accordingly, in the undergoing study, an attempt has been made to reflect the growth and distribution of journals indexed in Scopus during the last two decades, viz. for the period 2000 through 2019.

2. PROBLEM STATEMENT

The research results produced across the world and the number of quality research journals available for publishing all such research results is quite disproportionate. The requirement of quality journals is more than available, hence the research results produced are beyond the publishing capacity of the available quality journals; as a result, researchers seek alternate routes to publish their research results, which mostly lead to predatory, dubious, sub-standard, poor, and low-quality research journals. Still more, researchers spend a good amount of time in ascertaining whether a particular journal is indexed in a specific index or not, so apart from relevance, the indexing of a journal plays an important part in submitting a manuscript for publication. Given this fact, it becomes quite imperative to ascertain the growth and distribution of quality research journals across the world on the similar lines as the quantification of research growth at subject level is done. Accordingly, the present study assesses the growth, distribution, and quantum of quality research journals indexed in Scopus and launched globally on an annual basis.

3. OBJECTIVES OF THE STUDY

The present study has been undertaken with the following objectives.

- To assess the growth of research journals at the global level based on indexing of journals in Scopus during the last two decades, viz., the year 2000 through the year 2019.
- To compute the distribution and growth of Scopus-indexed research journals at the continental level.
- To find out the average annual corresponding growth of journals both at the continental and world level, along with the average number of journals introduced each year.
- To identify the leading journal publishing countries at the world level along with the leading journal publishing countries at the continental level.
- To work out the distribution and growth of journals

across the major subject disciplines as identified in Scopus alongside some other leading sub-subject disciplines.

4. REVIEW OF LITERATURE

Quantification of research output of individuals, institutions, countries, continents, subject disciplines, etc., is very common among the research and scientific community of the world. The quantification of research journals rather than the platforms available where researchers may publish their research results is quite uncommon. Meadows (1993) did some pioneering work to assess the growth of research journals at the global level and found around 10,000 journals published during 1951, and the number reached around 71,000 journals during 1987, while Price (1963) was of the view that the number of journals would reach around one million towards the end of the twentieth century. Ulrich's periodical directory is known for its comprehensiveness in covering almost all research journals published across the length and breadth of the world, available both in CD-ROM and online form (Mabe, 2003). Around one lakh research journals are indexed in Ulrich's periodical directory, including both open and toll-access journals published all across the world (ProQuest, 2021).

The fact of the matter is that research journals are as important as the research itself, because it is these recognized mainstream journals that not only help convey the research results to its end users but also are the authority to uphold and validate the research results (Mesa Melgarejo & Galindo Huertas, 2011). In a study Laakso et al. (2011) analyzed the growth of research journals and research articles during the period 2000 to 2009 and found that research articles on average grew at 30% annually, while the research journals on average grew at 18%. For the timely publication of research results and for sustainable and balanced research growth, introduction of new research journals is equally important (Pandita et al., 2017). The introduction of new journals or the growth of journals depends upon several factors, foremost being the quantum of research work undertaken in any given subject discipline (Singh, 1978). It is being observed that chemistry is one of the leading subject disciplines in which research results are published in far greater numbers across the world; consequently, manifold growth is being observed in the introduction of new research journals in the field of chemistry. By the year 1910, chemical abstract covered 435 research journals in the field of chemistry, and this number grew up to 14,000 journals by 1975-1976 (Dutta,

1968; Singh, 1978). Similarly, research journals in the field of library and information sciences were found to double in every 13.8 years (Bottle & Efthimiadis, 2016).

In another study, while assessing the growth of journals, articles, and authors in the field of malaria for the period 1955 through 2005, Rao and Srivastava (2010) observed that the number of journals, articles, and authors in the malaria field grew annually at 5.31%, 7.38%, and 10.06%, respectively. While analyzing the growth of research journals in India indexed in Scopus and the growth of research articles published by Indian authors in Scopus indexed journals, Singh and Pandita (2017) found that between 2002 to 2010 research journals in India grew at 3.29% annually, while research articles grew at 5.44% annually, which also means the growth of research articles in India during the period of study remained 65.34% greater than the growth of research journals. In a similar study, Mabe (2003) computed the growth of journals in the twentieth century during three different periods. The first period lasted between 1900 through 1940 and the researcher found that journals during this period grew by 3.23% annually; during the second phase, which lasted between 1945 through 1976, the journals grew at 4.35% annually and during the third phase, which lasted from 1977 to 2000, journals grew at 3.26% in number annually.

There are other similar studies which were undertaken to assess the growth of research journals at the local level. The growth of journals at the local level may correspond to country level, subject level, regional level, or even the continental level. In a similar study, while assessing the growth of journals indexed in WoS from Los Angeles (LA), the researcher observed that journals from Latin American and the Caribbean increased from 69 in 2006 to 248 in 2009; however, the researcher owed this manifold growth to change in the editorial policy of WoS which resulted in the inclusion of more existing journals in WoS rather than the introduction of new journals (Collazo-Reyes, 2014). Accordingly, Pandita et al. (2017) found that 15,631 journals were introduced in India from 2005 through 2014, but only 3% of them were indexed in Scopus while the majority of them were non-indexed and grew annually in quantity by 31.44%. This also indicates that around 97% of journals introduced failed to get recognized and listed in quality indexes. Given this fact, Sen and Lakshmi (1992), while finding only a few journals in science and technology from India among Science Citation Index (SCI) journals, observed that slight improvements in the quality of publishing can help many Indian research journals to find a place among SCI journals.

The introduction of new journals is important to cater to both present and future research results publishing requirements. Besides this, every journal has its limitations of being confined to certain subject disciplines, having a limited scope, covering research articles of local interest generally, and more. Accordingly, all such journals published in countries like India, Australia, Israel, and Canada have been dubbed as journals with an “island effect” (Arunachalam & Markanday, 1981). Factually, it takes time for a journal to mature over the years and then get indexed in any quality index. Indexing, apart from giving recognition to a research journal as a quality journal, also gives it more visibility among the scientific community. The low visibility of a journal among its professionals has been referred to as “cloistering culture” (Mesa Melgarejo & Galindo Huertas, 2011), but the fact of the matter is that each journal enjoys a certain degree of reputation and popularity among its readers, which generally depends upon the degree of standard each journal follows while publishing research results (Seglen, 1997). Still more, when the journal publishing market is flooded with predatory and dubious journals, it becomes imperative for all the quality and genuine journal publishers to index their journals in quality indexes. Indexing status is one important criterion for a journal to establish itself as a recognized mainstream research journal (Ayeni & Adetoro, 2017).

5. MATERIALS AND METHODS

This study is based on secondary data retrieved from the SCImago journal and country rankings on July 30, 2021, and can be accessed at www.scimago.com (SCImago, 2021). The data upon retrieval was in semi-structured form, and as such was structured keeping in view the objectives of the study. While structuring the data, trade journals, conferences, and proceedings and book series were excluded from the study, and only journals were considered for the present study. It is pertinent to mention that SCImago data is based on a Scopus data source maintained by Elsevier. It is a well-known fact that it takes at least anything between four to five years for a journal to mature and be indexed in Scopus or WoS, and accordingly, the growth and distribution of journals has been computed based on their indexing in Scopus. To avoid any controversy or ambiguity around the concept of the introduction of new research journals, we have considered all such journals from the date they have been indexed in Scopus. The scope of the study is global, and to make

it more authentic and relevant, it was desired to analyze the data for a longer period. Accordingly, the undergoing study has been undertaken on the data lasting for the period 2000 through 2019.

6. RESULTS

To structure the data and to perform mathematical expressions like addition, subtraction, multiplication, and drawing percentages, Microsoft Excel 2010 (Microsoft, Redmond, WA, USA) has been used. The percentage at most of the places has been drawn up to two decimal places and has been rounded off to a hundred percent figure. The formula used to perform mathematical expressions has been reflected in each column.

The primary objective of the present study is to reflect the growth of research journals across the world during the last two decades; as such the data reflected in Table 1 lasts for the period year 2000 through 2019. It is pertinent to mention that up till the year 1999, 15,484 research journals were indexed in Scopus, and accordingly, the corresponding growth and percentage corresponding to the growth of research journals for the year 2000 have been computed. A total of 11,037 research journals were indexed in Scopus at an average of 551.85 research journals each year, constituting around 2.74% of the average annual corresponding growth. This also means that approximately 550 new research journals are launched each year across the world. Nevertheless, it takes anything between three to five years for a new research journal to get indexed in a database like Scopus, but for our study and to avoid any controversy or ambiguity around the introduction of new research journals we have considered all journals from the date they have been indexed in Scopus. The highest number (1,009, 9.14%) of research journals were indexed during the year 2011 and the lowest number (154, 1.40%) were indexed during the year 2000. On the date of data retrieval, a total of 26,521 research journals were indexed in Scopus, and of these 11,037 (41.61%) were indexed during the last two decades.

It is quite interesting to know that up till 1999, 15,484 (58.39%) journals were indexed in Scopus. It can also be inferred that post-year 2000, Scopus has somewhat raised the quality bar to index newly introduced research journals, which has resulted in indexing a lesser number of research journals post-2000. On the other hand, post-2000, exponential growth was observed in the launch of new research journals, which in turn should have resulted in the indexing of a far greater number of research journals,

Table 1. Year wise growth of research journals indexed

Serial no.	Year (A)	Journals indexed (B)	Corresponding growth (C)	Percentage corresponding growth (D) ^{a)}	Percentage of C (E) ^{b)}	Percentage of cumulative growth (F) ^{c)}
n	1999	15,484	-	-	-	-
01	2000	15,638	154	0.99	1.40	58.96
02	2001	15,971	333	2.13	3.02	60.22
03	2002	16,723	752	4.71	6.81	63.06
04	2003	16,900	177	1.06	1.60	63.72
05	2004	17,214	314	1.86	2.84	64.91
06	2005	17,624	410	2.38	3.71	66.45
07	2006	18,151	527	2.99	4.77	68.44
08	2007	18,673	522	2.88	4.73	70.41
09	2008	19,623	950	5.09	8.61	73.99
10	2009	20,622	999	5.09	9.05	77.76
11	2010	21,462	840	4.07	7.61	80.92
12	2011	22,471	1,009	4.70	9.14	84.73
13	2012	23,105	634	2.82	5.74	87.12
14	2013	23,642	537	2.32	4.87	89.14
15	2014	24,252	610	2.58	5.53	91.44
16	2015	24,718	466	1.92	4.22	93.20
17	2016	25,117	399	1.61	3.62	94.71
18	2017	25,460	343	1.37	3.11	96.00
19	2018	26,257	797	3.13	7.22	99.00
20	2019	26,521	264	1.01	2.39	100.00
Total (average)			11,037 (551.85)	54.71 (2.74)		

a) $\frac{Bn-B(n-1)}{B(n-1)} \times 100$. b) $\frac{C}{Total\ of\ C} \times 100$. c) $\frac{B}{Total\ of\ B} \times 100$.

but the case is not so. Also, the recent exponential growth in research journals has raised much hue and cry among the research and scientific community across the world, whereby many predatory publishers and predatory journals have surfaced. Given this fact, it has become more important for indexes like Scopus or WoS to opt for more stringent measures to index a research journal. A good number of predatory research journals were previously found to be indexed in indexes like Scopus and WoS; thereby it somewhere doubles the responsibility of all such agencies to be careful with such predatory publishers while indexing new research journals. If the research journals indexed in Scopus continue to grow at the same pace,

then by 2030 there will be around 36,000 journals indexed in Scopus.

It is equally desirable and important to assess the growth of research journals across different continents of the world. Accordingly, Table 2 depicts the scenario of the number of research journals introduced across different continents during the last two decades and indexed in Scopus. From the data it is evident that Europe is the leading continent, publishing as of date 14,944 research journals, distantly followed by North America and Asia, publishing 6,709 and 3,308 research journals, respectively. As reflected in Table 1, on average around 550 research journals are being introduced each year across the world

Table 2. Year wise journals indexed across continents

Serial no.	Year	Africa		Asia		Australia		Europe		North America		South America		Total									
		JrIs	CG (%)	JrIs	CG (%)	JrIs	CG (%)	JrIs	CG (%)	JrIs	CG (%)	JrIs	CG (%)	JrIs	CG (%)								
	1999	79	-	1,336	-	177	-	8,498	-	5,135	-	256	-	15,481	-								
1	2000	76	-3	1,371	35	2.62	169	-8	-4.52	8,611	113	1.33	5,154	19	0.37	257	1	0.39	15,638	157	1.01		
2	2001	79	3	3.95	1,451	80	5.84	166	-3	-1.78	8,838	227	2.64	5,174	20	0.39	263	6	2.33	15,971	333	2.13	
3	2002	83	4	5.06	1,488	37	2.55	175	9	5.42	9,228	390	4.41	5,467	293	5.66	282	19	7.22	16,723	752	4.71	
4	2003	88	5	6.02	1,531	43	2.89	167	-8	-4.57	9,380	152	1.65	5,451	-16	-0.29	283	1	0.35	16,900	177	1.06	
5	2004	93	5	5.68	1,576	45	2.94	166	-1	-0.60	9,607	227	2.42	5,485	34	0.62	287	4	1.41	17,214	314	1.86	
6	2005	97	4	4.30	1,670	94	5.96	173	7	4.22	9,865	258	2.69	5,527	42	0.77	292	5	1.74	17,624	410	2.38	
7	2006	101	4	4.12	1,810	140	8.38	187	14	8.09	10,128	263	2.67	5,573	46	0.83	352	60	20.55	18,151	527	2.99	
8	2007	104	3	2.97	1,869	59	3.26	195	8	4.28	10,463	335	3.31	5,618	45	0.81	424	72	20.45	18,673	522	2.88	
9	2008	131	27	25.96	2,048	179	9.58	236	41	21.03	10,964	501	4.79	5,709	91	1.62	535	111	26.18	19,623	950	5.09	
10	2009	157	26	19.85	2,292	244	11.91	292	56	23.73	11,370	406	3.70	5,925	216	3.78	586	51	9.53	20,622	999	5.09	
11	2010	193	36	22.93	2,446	154	6.72	331	39	13.36	11,781	411	3.61	6,087	162	2.73	624	38	6.48	21,462	840	4.07	
12	2011	211	18	9.33	2,625	179	7.32	350	19	5.74	12,399	618	5.25	6,225	138	2.27	661	37	5.93	22,471	1,009	4.70	
13	2012	221	10	4.74	2,730	105	4.00	353	3	0.86	12,809	410	3.31	6,278	53	0.85	714	53	8.02	23,105	634	2.82	
14	2013	239	18	8.14	2,796	66	2.42	352	-1	-0.28	13,144	335	2.62	6,374	96	1.53	737	23	3.22	23,642	537	2.32	
15	2014	254	15	6.28	2,870	74	2.65	361	9	2.56	13,542	398	3.03	6,463	89	1.40	762	25	3.39	24,252	610	2.58	
16	2015	252	-2	-0.79	2,934	64	2.23	368	7	1.94	13,884	342	2.53	6,501	38	0.59	779	17	2.23	24,718	466	1.92	
17	2016	251	-1	-0.40	3,032	98	3.34	366	-2	-0.54	14,124	240	1.73	6,539	38	0.58	805	26	3.34	25,117	399	1.61	
18	2017	254	3	1.20	3,085	53	1.75	361	-5	-1.37	14,334	210	1.49	6,589	50	0.76	837	32	3.98	25,460	343	1.37	
19	2018	265	11	4.33	3,247	162	5.25	377	16	4.43	14,777	443	3.09	6,711	122	1.85	880	43	5.14	26,257	797	3.13	
20	2019	273	8	3.02	3,308	61	1.88	379	2	0.53	14,944	167	1.13	6,709	-2	-0.03	908	28	3.18	26,521	264	1.01	
	Avg (AACG)	6.65 (9.70)		4.67 (98.60)		4.13 (10.10)		2.87 (322.30)		1.35 (78.70)		6.75 (32.60)		2.74 (552.00)									

JrI, journals; CG, corresponding growth; Avg, average; AACG, average annual corresponding growth.

at an average annual growth of 2.74%. Similarly, at the continental level, Europe is the largest publisher of research journals, which on average introduces 322.30 new research journals each year at an average annual growth of 2.87%. This also means that of the total new research journals introduced across the world, nearly 60% of journals are introduced alone from Europe, and the average annual growth of European research journals is almost on par with the average global journal growth, viz. 2.87%. Asia is the second leading continent, which on average introduces 98.60 new research journals each year, followed by North America with an average introduction of 78.70 research journals, while South America on average introduces 32.40, Australia 10.10, and Africa 9.70 research journals each year. The growth of research journals in terms of percentage is highest across South America at 6.75% followed by Africa at 6.65%, Asia at 4.67%, Australia at 4.13, Europe at 2.87%, and North America at 1.35%, which is even below the average global journal growth rate. It is needless to mention that the higher percentage growth of research journals across continents like South America and Africa is due to the lower number of journals published across these continents, while the introduction of every new research journal across these continents immediately inflates the average annual percentage growth of research journals when compared to the average annual percentage growth rate of journals at the global level.

The growth of research journals in Asia, Europe, and South America was consistent and showed growth over the past two decades, while the growth of research journals across Africa and Australia remained inconsistent, recording mixed corresponding growth. North America by and large recorded consistent corresponding growth in the introduction of new research journals. However, during the years 2003 and 2019 North America recorded negative corresponding growth.

The highest annual corresponding growth rate of newly introduced research journals recorded at the global level remained at 1,009 research journals during the year 2011, while at the continental level, the highest annual corresponding growth levels of newly introduced research journals were recorded for Africa (36, 2010), Asia (244, 2009), Australia (56, 2009), Europe (618, 2011), North America (293, 2002), and South America (111, 2008). Almost all the continents recorded the highest annual corresponding growth in journals during different years; however, the annual corresponding growth of research journals introduced across Europe can be seen as having a significant impact on the overall global journal growth

levels.

Of the total 26,521 research journals indexed in Scopus across the world, the majority (14,944, 56.35%) of research journals are published alone across Europe, reflecting the dominance of Europe in publishing research journals across the world. Even putting together, the research journals published across the remaining five continents, the rate is lesser by 6.35% than the number of research journals published alone across Europe. This dominance of Europe in publishing research journals at such a large scale can be seen for several reasons, the foremost being that it is the home of the world's leading academic and research institutions producing quality research results. The other leading continents publishing research journals are North America, publishing 6,709 (25.30%) research journals, and Asia, publishing 3,308 (12.47%) of the total research journals. Together, Europe, North America, and Asia are publishing 24,961 (94.12%) of world research journals, while Africa, Australia, and South America together are publishing a meager 5.88% of research journals. Africa is publishing a mere 273 journals, constituting 1.03% of the total global research journals, the lowest among all the continents (Table 3).

There are around 195 recognized countries all over the world; however, as per the data retrieved from SCImago, there are 218 countries around the world that are actively undertaking research. Of these, 109 (50%) countries are publishing research journals, while the remaining countries depend on these 109 countries for publishing their research results. Each research country is supposed to have its own publishing channels as well, not only to publish the research results of their local researchers but also to provide a publishing platform to other global researchers, which is also imperative to have balanced and sustainable growth. Even if we take 50% of countries as a standard measure for publishing research journals in a region or in a continent, then Africa and South America are the two continents that have inadequate research results publishing platforms. But the fact of the matter is that even 50% of countries publishing journals is not sufficient to fulfill the actual publishing requirement of a region or the world. Contrary to the other five continents, 81% of countries across Europe are publishing their research journals, which reflects the availability of a balanced and wholesome publishing platform for researchers at both the local and global level.

While assessing the leading journal publishing countries at the continental level, it emerged that Egypt is the leading country from Africa, publishing the highest

Table 3. Journals published across continents

Serial no.	Name of continent (A)	No. of journals published (B)	Percentage of B (C) ^{a)}	No. of journal publishing countries (D)	Total research countries (E)	Leading journal publishing country at continental level		Percentage share of G from B (H) ^{b)}
						Name of Country (F)	No. of Journals (G)	
01	Africa	273	1.03	17	48	Egypt	130	47.61
02	Asia	3,308	12.47	31	59	China	665	20.10
03	Australia	379	1.43	03	06	Australia	242	63.85
04	Europe	14,944	56.35	43	53	United Kingdom	6,337	42.40
05	North America	6,709	25.30	02	04	United States	6,425	95.76
06	South America	908	3.42	13	48	Brazil	401	44.16
	Total	26,521	100.0	109	218		14,200	53.54

a) $\frac{B}{\text{Total of B}} \times 100$. b) $\frac{G}{B} \times 100$.

number (130) of journals, constituting 47.61% of the total research journals published across Africa. Similarly, 20.10% of the total research journals published across Asia are published in China, 63.85% of the total research journals published across Oceania are published in Australia, 42.40% of the total research journals published across Europe are published across North America, 95.76% of journals published across North America are published in the United States, and 44.16% of the research journals published across South America are published in Brazil. These six leading journal publishing countries from their respective continents together publish 53.54% of the total research journals globally.

Except in Asia, more than 40% of research journals in each continent are published in one country. This again somewhere reflects that the concentration and dominance of journal publishing in each continent is almost limited to one country. This inequitable and disproportionate publication of research journals across countries at the continental level is bound to be the reason for inequitable and unsustainable growth across countries in each continent.

The dominance of Europe also gets reflected by the number of countries actively publishing research journals across Europe. Of the 109 countries actively publishing research journals across the world, 43 countries come from Europe alone, constituting 39.44% of the total nation-states publishing research journals at the global level. Still more, Europe is a continent with 53 nation-states, which means that over 81% of the countries across Europe are publishing their own research journals. This also some-

what signifies the fact that equitable distribution of resources and services is the sole reason for the proportionate and sustainable growth and development of a country or a region, and so this holds true of Europe, an evenly developed continent in the world. Asia despite being the largest continent in the world both in terms of population and the number of countries, only 31 countries publish research journals, constituting 28.44% of the total countries publishing research journals in the world. Together, 67.88% of countries publishing research journals across the world come from Europe and Asia alone.

Australia and North America are the two continents from where the lowest number of countries, three (2.75%) and two (1.83%), publish research journals, respectively. It is needless to mention that Australia and North America are largely known as single nation continents, and as such these figures cannot be counted as low or less for any reason.

The production of journals around the world is disproportionate. More than half of all journals published worldwide are based in Europe, while continents like Africa, Australia, and South America appear to publish for participation's sake. The research journals published across Africa, Australia, and South America appear even insufficient to publish the research results produced from these continents. Understandably, Europe is one of the most developed continents in the world and is also the home of the world's leading academic, scientific, technical, and research institutions; as such, it being the home of most of the research journals of the world is not that surprising. But what concerns the most is that somewhere this over-

and-above dominance of Europe in publishing research journals is bound to create an imbalance in the research result publishing world, and this concentration of journal publishing in Europe may lead to monopolizing publishing research results in days to come.

It is highly desirable that journal publishing be promoted across Africa, Australia, and South America, but what is more important is that promoting journal publishing should not come at the cost of compromising the quality of research journals. Institutions or publishers across these continents can seek the necessary expertise, support, and help from the institutions and publishers known for publishing quality research journals, even be they from other parts of the world. Equitable and proportionate pub-

lication of research journals across continents is bound to promote equitable and sustainable growth across continents, regions, and countries all over the world. There is a need to let quality academics, research, and scientific investigations move outside the few concentrated pockets of the world to lesser-known regions and countries to extend equal opportunities to underprivileged ones.

The distribution of research journals published across different continents reflects a huge imbalance, somewhat reflecting the research prowess of different continents in producing and publishing research results.

Of the total research journals indexed during the last two decades across the world, the majority of 6,425 (24.23%) journals were indexed alone from the United

Table 4. Twenty leading journal publishing countries across the world

Serial no.	Name of country (A)	Continent (B)	Journals indexed as of 2019 (C)	Percentage share (D) ^{a)}
1	United States	North America	6,425	24.23
2	United Kingdom	Europe	6,337	23.89
3	Netherlands	Europe	1,771	6.68
4	Germany	Europe	1,521	5.74
5	China	Asia	665	2.51
6	Switzerland	Europe	660	2.49
7	Spain	Europe	655	2.47
8	France	Europe	584	2.20
9	Russian Fed	Asia	571	2.15
10	India	Asia	564	2.13
11	Italy	Europe	553	2.09
12	Japan	Asia	499	1.88
13	Poland	Europe	459	1.73
14	Brazil	South America	401	1.51
15	Canada	North America	284	1.07
16	South Korea	Asia	286	1.08
17	Turkey	Europe	245	0.92
18	Australia	Australia	242	0.91
19	Iran	Asia	214	0.81
20	Czech Republic	Europe	208	0.78
21-109	Rest of the world		3,377	12.73
	Total (average)		26,521 (1,263)	100.0 (4.76)

^{a)} $\frac{C}{\text{Total of } C} \times 100$.

States (US), constituting around one-fourth of the total research journals indexed across the world. The US is closely followed by the United Kingdom (UK) by indexing as many as 6,337 (23.89%) research journals, which again comprises around one-fourth of total journals indexed across the world. Around half of the research journals indexed across the world during the last two decades are from the US and the UK. Similarly, of the total research journals published across the world, 88.91% are published across the twenty leading tabulated countries, while the remaining 11.09% of journals were indexed from 89 countries of the world (Table 4).

A country that does not have its own recognized channels or mediums to communicate its research results can be considered as a country lagging in wholesome research activity. After all, the purpose of research gets fulfilled the moment the end results of research reach their end users for practical use, and these research results are delivered through the recognized channels, what we know as research journals. The need is to promote a journal publishing culture among all such countries which are dependent on other countries to publish their own research results. All this, apart from providing a platform for local and budding researchers to publish their research results, will

Table 5. Twenty leading subject disciplines

Serial no.	Name of the subject (A)	Journals Indexed as of 2019 (B)	Percentage share of B (C) ^{a)}
1	Medicine	1,606	6.06
2	Education	734	2.77
3	History	687	2.59
4	Literature and literary theory	608	2.29
5	Cultural studies	606	2.28
6	Law	518	1.95
7	Language and linguistics	457	1.72
8	Engineering	413	1.56
9	Animal science and zoology	350	1.32
10	Agronomy and crop science	332	1.25
11	Business and international management	328	1.24
12	Cardiology and cardiovascular medicine	323	1.22
13	Electrical and electronic engineering	310	1.17
14	Economics and econometrics	298	1.12
15	Applied mathematics	291	1.10
16	Agricultural and biological sciences	261	0.98
17	Anthropology	244	0.92
18	Earth and planetary sciences	241	0.91
19	Communication	234	0.88
20	Geography, planning, and development	226	0.85
21-297	Rest of the subject areas	17,454	65.81
	Total	26,521	99.99

The sum of the percentage is not 100% because of rounding.

a) $\frac{B}{\text{Total of B}} \times 100$.

Table 6. Decadal growth of research journals across main subject disciplines

Serial no.	Subject (A)	2000 (B)	2010 (C)	CG (D) ^{a)}	CG of D (%) (E) ^{b)}	2019 (F)	CG (G) ^{c)}	CG of G (%) (H) ^{d)}	Avg CG (I) ^{e)}	Avg CG of I (%) (J) ^{f)}
01	Agriculture and biological sciences	1,246	1,830	584	46.87	2,236	406	22.19	495	34.53
02	Arts and humanities	1,399	2,776	1377	98.43	4,257	1,481	53.35	1,429	75.89
03	Biochemistry, genetics, and molecular biology	1,300	1,829	529	40.69	2,130	301	16.46	415	28.57
04	Business, management, and accounting	654	1,118	464	70.95	1,463	345	30.86	404.5	50.90
05	Chemical engineering	437	500	63	14.42	637	137	27.40	100	20.91
06	Chemistry	645	771	126	19.53	870	99	12.84	112.5	16.18
07	Computer sciences	730	1,296	566	77.53	1,717	421	32.48	493.5	55.00
08	Decision sciences	172	305	133	77.33	430	125	40.98	129	59.15
09	Dentistry	108	174	66	61.11	211	37	21.26	51.5	41.18
10	Earth and planetary Sciences	979	1,022	43	4.39	1,193	171	16.73	107	10.56
11	Economics, econometrics, and finance	438	831	393	89.73	1,130	299	35.98	346	62.85
12	Energy	244	332	88	36.07	477	145	43.67	116.5	39.87
13	Engineering	1,671	2,217	546	32.68	2,956	739	33.33	642.5	33.00
14	Environmental science	939	1,122	183	19.49	1,535	413	36.81	298	28.15
15	Health professions	336	490	154	45.83	583	93	18.98	123.5	32.40
16	Immunology and microbiology	384	521	137	35.68	591	70	13.44	103.5	24.56
17	Material science	792	982	190	23.99	1,235	253	25.76	221.5	24.87
18	Mathematics	744	1,199	455	61.16	1,569	370	30.86	412.5	46.01
19	Medicine	5,863	6,949	1,086	18.52	7,401	452	6.50	769	12.51
20	Multidisciplinary	67	111	44	65.67	143	32	28.83	38	47.25
21	Neuroscience	341	500	159	46.63	592	92	18.40	125.5	32.51
22	Nursing	384	623	239	62.24	641	18	2.89	128.5	32.56
23	Pharmacology, toxicology, and pharmaceuticals	489	715	226	46.22	748	33	4.62	129.5	25.42
24	Physics and Astronomy	768	959	191	24.87	1,113	154	16.06	172.5	20.46
25	Psychology	780	1,049	269	34.49	1,289	240	22.88	254.5	28.68
26	Social sciences	2,816	4,629	1,813	64.38	6,779	2,150	46.45	1,981.5	55.41
27	Veterinary sciences	146	209	63	43.15	256	47	22.49	55	32.82
	Total (Avg)	24,872 (921.18)	35,059 (1,298.4)	10,187 (377.2)	1,262.50 (46.74)	44,182 (1,636.37)	9,123 (456.15)	682.50 (25.27)	9,655 (482.75)	972.27 (36.01)

Avg, average; CG, corresponding growth.

a) $C-B$. b) $\frac{D}{B} \times 100$. c) $F-C$. d) $\frac{G}{C} \times 100$. e) $\frac{D+G}{2}$. f) $\frac{E+H}{2}$.

also help in promoting equitable research activities and communicating and availing research benefits across the world uniformly for the sustainable growth and development of all nation-states.

To assess the growth of research journals at the subject discipline level, it emerged that a maximum of 1,606 journals were indexed in the field of medicine, constituting 6.06% of the total journals introduced during the last two decades across all subject disciplines in the world. Medicine is distantly followed by education and cultural studies with the indexing of 734 and 606 research journals each, respectively. A minimum of 226 research journals were introduced in the subject area of geography, planning, and development, constituting around 0.85% of the total journals indexed during the last two decades. In all, 297 subject areas were identified in which 26,521 research journals are published, of which 9,067 research journals are published across the twenty leading tabulated subject disciplines, constituting 34.14% of the total research journals indexed, while 17,454 (65.81%) research journals were indexed across the remaining 277 subject disciplines. On average, 88.38 research journals are published within each individual identified subject discipline (Table 5).

The actual number of journals indexed as reflected in Tables 1 to 2 is 26,521, while the number of journals reflected in columns B, C, and F of Table 6 vary considerably, solely because of the scope of the journals which most of the time can be found falling under different subject heads, as such resulting in variation in the actual number of journals indexed.

As per SCImago data, there are 27 main subject disciplines under which all 26,521 journals are indexed under 297 major and minor subject disciplines as reflected in Table 5. The data reflected in Table 6 shows the growth of research journals across 27 major subject disciplines at the decadal level. However, a considerable difference can be found in the total number of journals indexed across 27 major subject disciplines, and this difference is mainly because a good number of journals are multidisciplinary and a few others have scopes beyond a specific subject discipline; as such they stand indexed under different subject disciplines, hence there is a considerable difference in the actual number of journals indexed and those indicated in Table 6.

While analyzing the growth of research journals at the subject level during the first decade of the twenty-first century, it emerged that arts and humanities recorded the maximum 1,377 (98.43%) growth rate in research journals, followed by economics, econometrics, and finance

with 89.73%, and computer sciences, which recorded 77.53%. The minimum 4.39% growth rate of research journals was recorded in the subject discipline earth and planetary sciences. During the second decade of the century, again the maximum growth of research journals was recorded in arts and humanities, registering a growth of 1,481 (53.35%) research journals. Arts and humanities is the only subject discipline that recorded more than 50% growth, while the rest of the subject disciplines recorded less than 50% growth. Only 18 new research journals were indexed in nursing in the second decade of the century across the world, thereby registering 2.89% of decadal corresponding growth, the lowest among all the subject disciplines. On average research journals in each subject discipline during the first decade of the century grew at 46.74%, while during the second decade of the twenty-first century, the research journals in each subject discipline on average grew at 25.27%.

From 2000 through 2019, research journals in the field of arts and humanities grew by 75.89%, the highest among the 27 subject disciplines listed in Table 6. Arts and humanities are followed by economics, econometrics, and finance with 62.85% of journals, and decision sciences with 59.15%. However, a minimum of 10.56%, of research journals were indexed in the field of earth and planetary sciences. Overall, research journals in each subject discipline during the period of study on average grew at 36% each decade.

7. DISCUSSION

With the manifold growth of research journals across the world, the existence of journal publishers has become questionable, especially when the journal publishing market is flooded with fake, sub-standard, and predatory research journals; with this result, the research journals indexed in quality indexes like Scopus and WoS are also being seen with suspicion regarding their genuineness and authenticity. It is quite interesting to note that research journals over the years indexed in Scopus have grown in number at a very moderate and steady pace, viz., 2.74% per annum. The steady growth of these research journals also confirms that journal indexing parameters and standard practices followed over the years by Scopus are intact and have not been diluted. In fact, in post-year 2000 the process of indexing research journals in Scopus has become more rigorous, with the result that of the total journals indexed in Scopus only 40% of journals have been added during the last two decades. Post-2011, a steady

decline can be observed in the indexing of new research journals in Scopus, and this may be primarily because of the manifold growth in predatory and sub-standard journals, with the result that leading indexing agencies want to doubly ensure the legitimacy and genuineness of a research journal before its indexing.

The credibility of indexes like Scopus and WoS may become questionable if the scenario of indexing dubious, predatory, or sub-standard research journals continues. It is a well-known fact that a newly launched research journal must prove its credibility and seriousness in publishing research results in the early years of its publication and thereafter it qualifies for indexing in Scopus or WoS or any other quality index. Since most researchers presume that everything indexed in Scopus or WoS is credible, as such they do not bother to look at or ascertain the credibility of a journal at their level, with the result that indexing service providers have more responsibility to ensure that no dubious research journal is indexed. There is a far greater need to raise the standard of indexing a research journal, whereby all the dubious, sub-standard, and predatory journals may be kept at bay.

The scenario of journal publishing at the continental level is entirely different, which cannot be considered ideal for holistic, uniform, and sustainable research growth across the world. Europe as a continent is publishing around 57% of the total global research journals, which speaks about the tilt in the global journal publishing industry of not only being concentrated in Europe, but also create an imbalance which may over the years monopolize the research results publishing industry of the world. Europe is far ahead of the other five continents even if put together in publishing research results, and this scenario has not changed over the years. Of the newly introduced journals across the world, nearly 60% are launched in Europe alone, with the result that the facts and figures of journal publishing in Europe move almost neck and neck with that of overall global journal publishing figures, thereby confirming the dominance of Europe over the rest of the world in publishing research journals. The global journal publishing market is primarily dominated by Europe, which is not good for the overall health and wholesome growth of research practices across the world. The only way out to overcome this European dominance in publishing research journals is by improving the quality of research journals published across the rest of the world in general and in the continents like Africa, Australia, and South America in particular, who together publish less than 6% research journals of the world. This small per-

centage of contribution from these continents needs to be improved considerably. It would be ideal if the publishers from Europe might come forward and extend support to journal publishers from these continents in improving the quality of their research journals. The world can grow and prosper only when there is uniform growth across all the regions of the world. The irony is that research journals published across continents like Africa, Australia, and South America are concentrated in countries like Egypt, Australia, and Brazil respectively, and as such need to be pushed and promoted beyond these countries. The journal publishing scenario across other continents is almost similar, whereby countries like China, the UK, and the US dominate journal publishing in their respective continents. These six countries together publish nearly 54% of the total global research journals, which again is alarming, whereby participation of the rest of the countries from each continent must be promoted.

Publishing research journals and publishing research articles are altogether two different aspects, and there are countries in the world that do not publish even a single Scopus-indexed journal, but on the other hand, most of these countries publish their research results in Scopus-indexed journals. Accordingly, at the global level of the 218 recognized research countries, only 109 countries are actively publishing research journals, constituting less than 50% of countries of the world, while of the 109 countries actively publishing research journals, 43 countries come alone from Europe. This also signifies that 50% of the countries of the world completely depend on other countries to publish their research results, which by no means can be considered good for the research health of the world.

The dominance of journal publishing is equally prevalent at the country level. The US and the UK alone publish around one-fourth of global research journals each, together constituting around 50% of the research journals published across the world. This dominance of individual countries should be seen as more dangerous than the dominance of an individual continent vis-à-vis Europe. The concentration of publishing research journals limited to a few countries somewhat questions the research prowess of the rest of the world and indirectly signifies that if not all, nearly 50% of research results produced in any part of the world are to seek the route of the UK and the US journal publishing industry to validate their results. Here again, the need is to promote the publishing of research journals across different countries of the world for uniform and sustainable growth. Still more, of the 109

journal publishing countries a meager 11% of journals are published across 89 countries, which is far less than the desired levels of journal publishing, both in terms of number and percentage.

The volume of research undertaken in any given subject discipline at the global level has a direct bearing on the number of research journals published in any subject field, and the practice proceeds according to demand and supply. The greater the number of research results produced in any subject discipline; the larger will be the platform required to publish all such research results. Accordingly, the growth of research journals can be seen as an indicator to assess the research output in any subject discipline. The results depict that medicine is one of the leading research areas, covering more than 6% of core research journals of the world, the highest among all the subject disciplines. However, when taking together all the allied subject disciplines of medicine and other inter-disciplinary journals, the number of journals published in the field of medicine then rises to around 7,400, which constitutes around 27.90% of the total journals published. The same is the case with other subject disciplines where the number of core journals published in that subject discipline may be less, but while aggregating other interdisciplinary and allied subjects, the number becomes far greater. There are some subject areas where the required number of journals available for publishing research results may be less, with the result that the journal packing density (Singh & Pandita, 2017) of research journals available in that particular subject may be higher than the average packing density of research journals. The availability of an adequate platform to publish research results is as important as the research itself, while the absence of the same or the availability of an inadequate platform can hamper research growth in that subject discipline.

While assessing the growth of subject disciplines at the decadal level, it emerged that arts and humanities recorded the highest growth in the introduction of new journals. The higher growth of research journals is also an indicator of the fact that the volume of research work undertaken in the field of arts and humanities has also increased manifold. Besides this, subject disciplines being interdisciplinary as such encourages the growth of newer research journals.

8. CONCLUSION

A shortage of quality research journals in any subject discipline can badly hamper the growth of that subject

discipline, and the obligation to have adequate and quality journals in that very subject discipline rests with the existing scholarly community of that subject discipline. The research journals published across continents like Africa, Australia, and South America are not sufficient even to cater to the research results publishing requirements of their local researchers, hence there is a need to improve the journal publishing scenario across these continents among all the major subject disciplines. The countries, regions, or for that matter continents lesser known for publishing quality research journals are not generally preferred by researchers from other regions for publishing their research results. The journal publishers from these continents have to more or less compete with the publishers from other continents both in terms of quality and quantity. Similarly, the number of research journals published across different subject disciplines is far lesser than desired. The concentration of journal publishing being limited to a few continents or a few countries in a continent equally acts as an impediment to the wholesome and sustainable growth of the entire region or the continent. There is a far greater need to have a proportionate distribution of journal publishing across different regions of the world. Every country undertaking research should publish its quality research journals and by no means should it completely depend on other countries for publishing their research results.

The introduction of new quality research journals is as important as publishing new research results or research concepts. The introduction of new journals becomes even more important for the fact that an existing lot of journals published across the world is not sufficient to publish all the research results produced in a time-bound manner. It is imperative to have sustainable growth and distribution of quality research journals across the world in each subject discipline. It is very important to have evenly distributed quality research journals across all the continents, countries, and subject disciplines, and more so the researchers from all continents, countries, and subject disciplines should have equal opportunity to publish their research results in any quality journal all over the world.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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