Compromising quality parameters lead to fallout: a study of de-indexing of research journals

Ramesh Pandita[1] and Shivendra Singh[2*]
[1]Baba Ghulam Shah Badshah University,
Rajouri, Jammu & Kashmir, INDIA
[2]Guru Gobind Singh Medical College and Hospital,
Baba Farid University of Health Sciences,
Faridkot-151203, Punjab, INDIA
e-mail: *rameshpandita@bgsbu.ac.in (corresponding author); shivendra@ggsmch.org
ORCID: R. Pandita: 0000-0001-8568-412X
S.Singh: 0000-0002-4020-7255

ABSTRACT

The study aims to investigate the number of journals de-indexed by Scopus during the last two decades, specifically, from 2000 through 2019. Data for the study were retrieved from SCImago, a Scopus database. The scope of the study is global, covering all the 27 major subject disciplines categorized in Scopus. A total of 6059 research journals were found to be de-indexed from Scopus up until 2019, accounting for 18.61 percent of the total journals indexed in Scopus till date. Among the total de-indexed journals, 2311 (38.14%) journals were de-indexed from the period between 2000 and 2019. A steady decline in the de-indexing of journals has been observed after the year 2010. Among the top 20 countries with the highest number of de-indexed journals, it was found that 90.11 percent of journals have been de-indexed from these countries altogether. The United States stands out as the leading country, contributing to nearly one-third of the total de-indexed journals worldwide, with Medicine (44%) being the leading subject area in the de-indexed journals. On a national level, Sweden takes the lead, recording the highest de-indexing rate of 40.70 percent of journals. Following standard publishing parameters in publishing research results is of utmost importance for several reasons, with the primary one being dissemination of genuine and authentic research for the larger benefit of society. Any compromise with the quality of published research must be addressed seriously, and if necessary de-indexing a journal as a punitive measure should be considered appropriate and welcomed.

Keywords: Scientific journals; Journal studies; Indexing; De-indexing; Scholarly publishing.

INTRODUCTION

Research communication is an important aspect of research activity and selecting the appropriate journal for publishing one's research results is of utmost importance. The indexing status of a research journal, such as its impact factor, plays a very significant role when submitting research findings for publication (Shokraneh et al. 2012)**.** A good indexed journal is more popular and visible among the scientific community which increases the chances of receiving a greater number of citations (Erfanmanesh, Tahira, and Abrizah 2017)**.** The indexation status of a research journal reflects its quality and determines its inclusion among a select group of journals that are recognized by the global scholarly community as authoritative sources of research information. While de-indexing of a research journal reflects its fall on quality parameters, leading to its exclusion from the group of reputable journals and entry into the realm of substandard publications. Research

is an activity which has more to do with the personal endeavour driven by individual interests, however it is always desirable to educate faculty members to publish their research results in mainstream recognized research journals. This helps safeguard against the risks associated with dubious and predatory journals (Pandita, Koul, and Singh 2022).

The research journals indexed in global citation databases such as Scopus or Web of Science (WoS) are deemed as of quality and reliable, making them favourable choices for researchers to publish their research results (Kosmopoulos and Pumain 2007; Singh et al. 2021). Choosing journals indexed in these databases ensure that the research findings will be disseminated in reputable and credible platforms. The indexation status of a journal in a reputable citation database is one of the indicators of its quality and authenticity. It is important to note that scholarly publishers aiming to have their research journals indexed in reputable database must meet the parameters laid down by an indexing agency. Only then can a research journal secure its position among the esteemed and recognized journals. Here, it is important to understand that indexing a research journal is not a one-way process. Journals that fail to comply with the established publishing standards may also face the consequence of de-indexing them, leading to their removal from the database. Researchers continue to engage in debates regarding the parameters established by leading indexing agencies to evaluate the quality of a research journal and the criteria for indexing new journals or de-indexing those that do not meet these quality parameters. The editors of *PLoS Medicine* expressive their perspective, stating that the current evaluation process for scientific research is itself unscientific, subjective and conducted with a level of secrecy (The *PLoS Medicine* Editors 2006).

Standardization is an ongoing and perpetual process, involving constant improvement and enhancement of quality. The beauty of quality improvement lies in the fact that something declared perfect based on the quality parameters at one point in time, might become deemed imperfect as new high standards are set. Thus, maintaining and upgrading quality are important for both sustaining and surviving because even a one-perfect practice can swiftly become obsolete without such efforts. Similarly, research journals that fail to consistently and continuously upgrade their publishing practices to maintain the quality standard may come under scrutiny for maintaining poor or outdated publishing practices. It is important to note that there have been instances of research journals previously indexed in reputable databases like Scopus or WoS for their quality publishing, later being de-indexed due to their failure to sustain the required quality bar (Kosmopoulos and Pumain 2007; Krauskopf 2018). It has been observed that once a journal is indexed, publishers may become complacent over time and relax their adherence to quality parameters. Additionally, some publishers driven by commercial interests, might compromise on the quality aspect and other factors. These and many more factors contribute to the de-indexing of research journals. According to Scopus (2022), the research journals indexed by them are regularly re-evaluated and if any journal is found to compromise with quality during re-evaluation, it may be discontinued. To address this concern, the present study aims to assess the research journals that have been de-indexed by Scopus globally over the last two decades. It also investigates the leading country and the highest subject discipline that have experienced de-indexing over the years.

LITERATURE REVIEW

Scholarly publishing is dynamic process where new journals are continuously launched, while some journals cease publication, others get re-named, and a few may merge or get

acquired (Laakso, Solomon, and Björk 2016; Matthias, Jahn, and Laakso 2019). This dynamism of scholarly publishing contributes to the de-indexing of journals. The indexing and de-indexing of journals are also seen as indicators for active and inactive journals. Journals currently listed in reputable databases such as Scopus or WoS are considered active, while those indexed in the past but not present in the latest active journal index lists are considered de-indexed. Researchers perceive that commercial databases like WoS, Scopus, or the Ulrich's Web play a significant role in classifying the active and inactive journals, although there is a concern about the accuracy of the data used for such classification (Abrizah et al. 2012; Barnett and Lascar 2012; Mongeon and Paul-Hus 2015)

The credibility of indexing agencies is often questioned regarding the qualitative nature of everything indexed by them; and if every journal indexed in reputable indices is indeed of high quality, then why do some journals get de-indexed. This raises the point that not everything indexed in good indices is necessarily qualitative and may not always adhere to the ethical indexing guidelines laid down by agencies like the Committee of Publication Ethics (COPE), Directory of Open Access Journals (DOAJ), Open Access Scholarly Publishing Association (OASPA), and World Association of Medical Editors (WAME) (Kratochvíl et al. 2020). These researchers also assert that there are quality journals that are still not covered in good indexes. This observation emphasizes the need for frequent journal re-evaluation, and the necessity to de-index a journal if it fails to meet the ethical indexing rules set by the indexing agency.

Scopus and WoS are considered the two competing databases convincingly used for research evaluation by researchers all across the world. These two leading journal indexing databases follow their respective in-house criteria to index new journals, with Scopus having broader coverage compared to WoS (Aksnes and Sivertsen 2019). Despite being launched in 2004 by Elsevier, Scopus has also indexed research articles published before 2004 and is extensively used by the researchers in their studies (Zhu and Liu 2020). What makes Scopus more popular among the global research and scientific community is its comprehensive list of over 43,000 research journals indexed from all around the world (Scopus 2022). This coverage of journals is quite large when compared to WoS, which maintains two separate lists of journals known as core and emerging, having over 22,000 journals as of the current date (Clarivate 2022). Both indexes are known for maintaining high quality parameters when indexing a journal.

Previous studies observed a similar pattern of deficiencies in both indexes while covering the subject areas in the field of social sciences and humanities (van Eck and Waltman 2019). Maintaining a high quality standard while publishing research results is important for journals to remain listed in in the indexing databases, as any lapse in meeting these standards can lead to the de-indexing of a journal (Krauskopf 2018). In his study on discontinued journals by Scopus, Krauskopf (2018) found that during 2016, Scopus de-indexed 56 journals. However these journals continued to falsely claim on their websites that they were indexed in Scopus, deceiving researchers and undermining their hard work. Krauskopf also observed that this deceptive practice extends to other means as well, where some journals simply add a widget of the popular index on their website to mislead researchers about the journals indexing status.

There are limited studies available on the concept of de-indexing research journals; as such a comprehensive theoretical base on this subject is yet to be developed. The long-term accessibility of content published in online open-access research journals has become an area of concern. In their study, Laakso, Matthias, and Jahn (2021a; 2021b) discovered that

174 open access journals disappeared from the web between 2000 to 2019. The vanishing of these open access journals can be attributed to various reasons, and decline in the publishing standard being the foremost, leading to their de-indexing from the web and other indexes. Questions were also raised over the true nature of all such vanished journals. Researchers are not ruling out the possibility that all these vanished journals may actually be of predatory nature. According to Shelomi (2021), in an effort to eliminate all questionable journals, DOAJ undertook the process of re-indexing all journals from scratch; journals of predatory nature failed to meet the indexing criteria, and consequently vanished from all platforms. It is being argued that research journals indexed in Scopus or WoS are often assumed to be of high quality, but this indexing does not guarantee that a journal is free from predatory nature (Pandita and Singh 2021). Similarly, journals de-indexed by Scopus or WoS can have different reasons for their de-indexing, not solely liked to falling publishing quality. However, it is generally the poor publishing quality of a research journal that predominantly leads to its de-indexing.

The predatory journal publishers' market is flourishing on daily basis upon the primary reason of 'pressure to publish' among academicians and faculty members, where their promotions and career advancement are tied to their research contribution. According to (Pandita, Koul, and Singh (2017), around 15000 new research journals were introduced in India from 2005 to 2014 with an average annual growth of 31.44 percent. Of these journals, 83.02 percent were introduced after 2010, the year when the University Grants Commission (the highest governing body of higher education in India) introduced regulations linking career advancement of faculty members with their research contribution This unprecedented growth of research journals can be examined by implementing a robust index system, making indexing mandatory for journals and raising awareness among faculty members about the need and importance of publishing research results in well-indexed journals.

MATERIALS AND METHODS

Data for the study were retrieved on February 19 2022, from the SCImago journal and country ranking database (SCImago 2022). The secondary data used for analysis is based on Scopus maintained by Elsevier, and is readily available in the public domain under SCImago journal and country ranking. The data, upon retrieval, was semi-structured, and then structured in accordance with the objectives of the study. The raw data, apart from having information about the research journals, also included data on conferences and proceedings, book series, trade journals, etc., which was excluded during data structuring. The structured data was processed using MS Excel to perform simple mathematical expressions such as addition, subtraction, division, multiplication, drawing percentage, etc., for further analysis. A list of unique journal titles was prepared by removing all the duplicate titles from the years 2000-2019, and this list was then compared with the list of journals indexed in 2019. This process helped identify research journals covered in more than one subject discipline with one specific principal subject discipline in alphabetic order. Journals not found in the 2019 journal list were considered as de-indexed. Similarly, de-indexing was computed at the country level, continental level, subject level, and years wise as well. The findings have been tabulated and percentages across all the tables have been calculated up to two decimal places, as accurately reflected in the mathematical expressions used for computation in each column.

RESULTS

Table 1 illustrates the year-wise number of journals de-indexed during the last two decades. Column 'B' displays the total unique titles in the existing annual indexing list of Scopus, while column 'C' shows the total number of unique titles indexed in Scopus up until a specific year. The number of titles de-indexed during each year has been calculated accordingly. Up to the year 1999, 3,748 journals were de-indexed by Scopus, constituting 61.86 percent of the total titles de-indexed from the Scopus index list to date. This also reflects less than 40 percent of the total journal were de-indexed by Scopus during the last two decades. Furthermore, a noticeable trend is observed post-2012, with a steady decline in the number of journals being de-indexed. This decline can be primarily attributed to the implementation of more stringent quality criteria, leading to the indexing of only those journals that adhere to the high quality parameters set by the indexing agency.

Table 1: Year-wise Number of Journals De-indexed During the Last Two Decades

No	Year	Journals indexed as per year 'A'	Total unique titles indexed till Year 'A'	No of titles de-indexed each year except '*' $C - B$	Cumulative growth of titles de-indexed till Year 'A'	Percentage share of E $= \frac{E}{Total\ of\ E} X\ 100$
	A	B	C	D	E	F
	1999	15456	19204	3748* (61.86)	3748	61.86
1	2000	15615	15834	219 (3.61)	3967	65.47
2	2001	15947	16182	235 (3.88)	4202	69.35
3	2002	16698	16960	262 (4.32)	4464	73.68
4	2003	16878	17047	169 (2.79)	4633	76.46
5	2004	17194	17351	157 (2.59)	4790	79.06
6	2005	17601	17763	162 (2.67)	4952	81.73
7	2006	18128	18302	174 (2.87)	5126	84.60
8	2007	18648	18769	121 (2.00)	5247	86.60
9	2008	19599	19715	116 (1.91)	5363	88.51
10	2009	20595	20783	188 (3.10)	5551	91.62
11	2010	21436	21550	114 (1.88)	5665	93.50
12	2011	22441	22572	131 (2.16)	5796	95.66
13	2012	23072	23144	72 (1.19)	5868	96.85
14	2013	23609	23654	45 (0.74)	5913	97.59
15	2014	24220	24272	52 (0.86)	5965	98.45
16	2015	24575	24632	57 (0.94)	6022	99.39
17	2016	25085	25091	6 (0.10)	6028	99.49
18	2017	25429	25437	8 (0.13)	6036	99.62
19	2018	26221	26244	23 (0.38)	6059	100.00
20	2019	26489	26489	0 (0.00)	6059	
	Total			6059		

'*' number of titles de-indexed up till 1999

In the year 2002, a total of 262 titles were de-indexed, accounting for 4.32 percent of the total journals de-indexed. This figure represents the highest number of de-indexed journals during the period of study, barring the figures reflected against the year 1999. In the years 2000 and 2001, there were again more than 200 titles were indexed, making it the second and third highest figures of de-indexing journals recorded during the last two decades. On the other hand, the year 2016 recorded the lowest percentage of titles de-indexed, with only 0.10 percent of the total. Of the 40 percent journals de-indexed from 2000 to 2019, nearly 30 percent of them journals were de-indexed during the first decade of study (2000

to 2009). The remaining 10 percent of journals were de-indexed during the second decade of the (2010 to 2019). This observation further supports the idea that the substantial decline in the de-indexing of journals in Scopus is maninly attributed to increased quality standards of indexing. The fact that predatory, dubious, substandard, and poor quality journals are being de-indexed indicates that the higher the percentage of de-indexed journals, the lower the quality of content published in those journals.

These figures reflect encouraging signs that the rate of de-indexing journals has declined considerably over the years from 4.32 percent recorded in 2002 to 0.10 percent in 2016. The number of journals de-indexed annually has decreased to under 50 journals, compared to more than 200 titles during the initial years of the turn of the century. The de-indexing of journals also raised a question mark over the functioning of indexing agencies and the quality parameters they put in place for research journals before indexing them. The percentage of journals de-indexed serves as a reflection of the reputation of the indexing agency. Indexing agencies must ensure that there is no quality compromised during the indexing process of new research journals. Failing to maintain strict quality standards can not only degrade the overall research quality but also cast doubts on the credibility of the indexing agency.

Continent-wise Analysis of De-indexed Journals

Analyzing journals de-indexed at the continental level is equally an interesting aspect of the study, whereby one can get an idea about the level of quality maintained by the research journals published across different continents. Of the total journals indexed in Scopus, 6,059 research journals have been de-indexed so far , constituting 18.61 percent of the journals. Presuming 18.61 percent as an average de-indexing figure at the global level, then Australia and North America stand out as the continents with higher journal de-indexing percentages of 24.35 percent and 22.83 percent respectively. On the other hand, South America has the lowest journal de-indexing percentage of 11.35 percent. Africa, Asia, and Europe are the three continents that have nearly the same journal de-indexing percentage, slightly lower than the average global de-indexing percentage (Table 2).

Table 2: Continent-wise Analysis of De-indexed Journals

No	Name of the Continent	No of Journals indexed as per 2019	Total Journals indexed till date	No of Journal de-indexed (B-C). Percentage (%) of $D = \frac{D}{C}x100$	Total Countries across continent publishing journals	Leading Journal de-indexing Country at Continental level		Percentage share of F from B $G = \frac{G}{D}x100$
						Name of the Country	No of journals de-indexed	
	A	B	C	D	E	F	G	H
1	Africa	273	332	59 (17.77)	17	Nigeria	14	23.73
2	Asia	3307	3999	692 (17.30)	26	Japan	197	28.47
3	Australia	379	501	122 (24.35)	04	Australia	88	72.13
4	Europe	14750	17787	3037 (17.07)	36	UK	972	32.01
5	North America	6869	8902	2033 (22.83)	02	US	1911	94.00
6	South America	906	1022	116 (11.35)	14	Brazil	45	38.79
	Total	26484	32543	6059 (18.61)	99			

A total of 99 countries across the world have indexed journals in Scopus, with the highest number of countries (36; 36.36%) being from Europe. Table 2 presents these findings. Asia and Africa are the other two leading continents with 26 (26.26%) and 17 (17.17%) countries respectively having their journals indexed. It is worth noting that the US and Canada, as the two countries from North America, have the lowest representation among

all continents, with only 2.02 percent of their journals indexed in Scopus. Of the total journals indexed in Scopus, 1.03 percent were published across Africa, 12.48 percent from Asia, and 25.93 percent from North America, with the United States and Canada being the only countries having journals indexed in Scopus. Additionally, 1.43 percent of journals were published in Australia, and the highest percentage (55.69%) came from Europe. South America contributed 3.42 percent of the indexed journals.

It is equally desirable to identify the leading country from each continent from where the maximum number of journals were de-indexed. Accordingly, Nigeria is the leading country in Africa from where 14 journals have been so far de-indexed, constituting 23.73 percent of the total journals de-indexed from Africa. Japan is the leading country in Asia from where 197 journals were de-indexed, constituting 28.47 percent of the total journals de-indexed from Asia. Of the total journals de-indexed across Oceania, 88 (72.13%) alone were de-indexed from Australia. Similarly, 972 (32.01%) journals were de-indexed from the UK in Europe, 1,911 (94%) journals were de-indexed from the US in North America and 45 (38.79%) journals were de-indexed from Brazil in South America. A total of 3,227 (53.25%) journals have been de-indexed from the six leading countries from each continent. This implies that the remaining 46.75 percent of journals have been de-indexed across the remaining 93 countries in the world.

Country-wise Analysis of De-indexed Journals

Of the total 26,484 journals indexed in Scopus and published across 99 countries, 22692 (85.68%) journals were indexed from the world's 20 leading countries. Among the total 6,059 journals de-indexed across the world, 5460 (90.11%) de-indexed journals were from the world's 20 leading countries, while the remaining 9.89 percent of de-indexed journals were from the other 79 countries. Among the 20 leading countries with de-indexed journals, 12 (60%) countries are from Europe, 4 (20%) from Asia, 2 (10%) from North America, and 1 (5%) each from South America and Australia. Interestingly, no country from Africa figures among the 20 leading countries in terms of journal de-indexing. Table 3 presents the top 20 countries with de-indexed journals .

The US is the leading country with the highest number of de-indexed journals, accounting for 1,911 journals, which constitutes 31.54 percent of the total journals de-indexed globally, nearly one-third of the total. This figure is alarming and raises a big question mark on the quality standards maintained US publishers for their journals. It is important to emphasize that the percentage de-indexed journals at the country level provides valuable insights into a country's overall journal publishing landscape and the quality upheld by publishers within it. Researchers need to be extra vigilant and careful to note that not all publications from well-developed or renowned countries necessarily exhibit superior quality. Evaluation against different quality parameters remains essential. Similarly, the UK ranks as the second highest contributor, with 972 (16.04%) journals having been de-indexed to date. There is a considerable difference in the percentage of journals de-indexed, ranging from the US, which stands at the top with significant de-indexing, to Hungary, where de-indexing remains below 1 percent. Among the 20 leading countries, nine have encountered de-indexing rates of less than 2 percent.

Table 3 shows that among the top 20 countries with journal de-indexing, 12 nations exceed the average global journal de-indexing rate of 18.62 percent. Sweden leads with the highest percentage at 40.70 percent, followed by Canada (30.05%) and Japan (28.30%). Other leading contributors include Italy (27.45%), France (26.73%), Australia (26.67%), Belgium (24.02%), Hungary (23.91%), United States (22.49%), Russian Federation (21.88%),

China (21.00%) and Germany (20.48%). The percentage of de-indexing journals from a particular country offer insights of the quality of the research journals published in the given country. This perspective can help dispel the arbitrary misconceptions sometimes made about research journals from certain countries being of low or poor quality. Countries having journal de-indexing percentages higher than the average global journal de-indexing percentage should focus on improving the quality of their research journals to reduce the prevalence of de-indexing.

Table 3: Top 20 Countries with De-indexed Journals

No	Name of the Country	Continent	Journals indexed as per 2019 list	Total Journals Indexed	Journals de-indexed $(D - C)$	Percentage of E $= \frac{E}{Total\ of\ E}\ x\ 100$	Percentage of E from D $= \frac{E}{D}\ x\ 100$
	A	B	C	D	E	F	G
1	United States	North America	6585	8496	1911	31.54	22.49
2	United Kingdom	Europe	6326	7298	972	16.04	13.32
3	Netherlands	Europe	1768	2160	392	6.47	18.15
4	Germany	Europe	1518	1909	391	6.45	20.48
5	France	Europe	584	797	213	3.52	26.73
6	Italy	Europe	547	754	207	3.42	27.45
7	Japan	Asia	499	696	197	3.25	28.30
8	China	Asia	666	843	177	2.92	21.00
9	Switzerland	Europe	667	817	150	2.48	18.36
10	Spain	Europe	651	785	134	2.21	17.07
11	Canada	North America	284	406	122	2.01	30.05
12	Russian Federation	Europe	400	512	112	1.85	21.88
13	India	Asia	561	665	104	1.72	15.64
14	Poland	Europe	458	548	90	1.49	16.42
15	Australia	Australia	242	330	88	1.45	26.67
16	Brazil	South America	398	443	45	0.74	10.16
17	Turkey	Asia	246	290	44	0.73	15.17
18	Belgium	Europe	136	179	43	0.71	24.02
19	Sweden	Europe	51	86	35	0.58	40.70
20	Hungary	Europe	105	138	33	0.54	23.91
21-99	Rest of the world		3792	4391	599	9.89	13.64
	Total (Avg)		26484	32543	6059		18.62

Subject-wise Analysis of De-indexed Journals

According to the 2019 Scopus journal list, there were 26,484 unique titles indexed across 27 major subject disciplines. However, upon examining the all-time unique journal titles indexed in Scopus across the 27 major subject disciplines, it emerged that a total of 32,543 unique titles have been indexed in Scopus over time. This data suggests that a total of 6,059 (18.62%) titles have been de-indexed by Scopus up until the release of the 2019 list. The reasons behind the de-indexing of journals are altogether a different context which can be taken up separately. However, certain key factors leading to the de-indexing a journal title include, a failure to adhere to established publishing standards, and a noticeable deficiency in journal quality. Some other reasons include ceasing publication due to poor response, bankruptcy or financial issues, changing the title along with the volume information, introducing new titles, consolidating titles through merging and various other considerations. From the tabulated data (see Table 4), it is evident that Medicine is the leading subject discipline in which 2,618 (43.21%) titles being de-indexed, the highest count among all the subject disciplines examined. Engineering and Biochemistry, Genetics and Molecular Biology follow at a distance with 489 (8.07%) and

366 (6.04%) titles were de-indexed respectively. The de-indexing of journals is evident across all subject disciplines, with Decision Sciences recording the lowest occurrence of de-indexing (4 titles, 0.07%).

It is equally desirable to assess the percentage of de-indexed research journals both at the subject discipline level and their overall contribution to the entire pool of de-indexed journals. Among the 27 subject disciplines, 10 (37.03%) have recorded deindexing rates exceeding the average 18.62 percent at the specific subject discipline level. However, 62.96 percent of subject disciplines recorded below-average de-indexing rates, indicating an encouraging sign. Pharmacology, Toxicology and Pharmaceutics is the leading subject discipline which recorded the highest de-indexing rate of 37.26 percent twithing the broader field of Medicine, while the subject's overall de-indexing percentage share stands as a relatively low 1.62 percent. This is note worthy considering that only 263 journals from this subject discipline have been indexed in Scopus thus far. Medicine (33.86%), Earth and Planetary Sciences (31.75%), Material Sciences (29.57%), Immunology and Microbiology (24.94%), and Engineering (23.37%) are other leading subject disciplines that recorded more than average de-indexing rates at the subject level. Decision Sciences has the lowest de-indexing rates, both within the specific subject level and when contributing to the overall de-indexing percentage.

Table 4: Subject-wise De-indexing of Journals

Subject Code	**Subject Discipline**	**Journals indexed as per the 2019 list**	**Total journals indexed**	**Journals de-indexed = $(C - B)$**	**Percentage journals de-indexed overall $\frac{D}{Total\ of\ D}\ x100$**	**Percentage journals de-indexed Subject level $\frac{D}{C}\ x100$**
	A	B	C	D	E	
01	Agriculture & Biological Sciences	2234	2515	281	4.64	11.17
02	Arts and Humanities	4223	4473	250	4.13	5.59
03	Biochemistry, Genetics and molecular biology	1748	2114	366	6.04	17.31
04	Business, Management and Accounting	1363	1481	118	1.95	7.97
05	Chemical Engineering	475	605	130	2.15	21.49
06	Chemistry	457	541	84	1.39	15.53
07	Computer Sciences	1371	1547	176	2.90	11.38
08	Decision Sciences	158	162	4	0.07	2.47
09	Dentistry	203	230	27	0.45	11.74
10	Earth and Planetary Sciences	948	1389	441	7.28	31.75
11	Economics, Econometrics and Finance	562	604	42	0.69	6.95
12	Energy	263	328	65	1.07	19.82
13	Engineering	1603	2092	489	8.07	23.37
14	Environmental Science	484	594	110	1.82	18.52
15	Health Professions	439	517	78	1.29	15.09
16	Immunology and Microbiology	331	441	110	1.82	24.94
17	Material Science	262	372	110	1.82	29.57
18	Mathematics	752	791	39	0.64	4.93
19	Medicine	5113	7731	2618	43.21	33.86
20	Multidisciplinary	98	112	14	0.23	12.50
21	Neuroscience	123	145	22	0.36	15.17
22	Nursing	181	231	50	0.83	21.65
23	Pharmacology, Toxicology and Pharmaceutics	165	263	98	1.62	37.26
24	Physics and Astronomy	218	282	64	1.06	22.70
25	Psychology	537	591	54	0.89	9.14
26	Social Sciences	2066	2265	199	3.28	8.79
27	Veterinary Sciences	107	127	20	0.33	15.75
	Total* (Avg)	26484	32543	6059		18.62

The de-indexing of research journals should be seen as a form of declining integrity among publishers and a lapse in upholding the research standards during the dissemination of research findings. As the percentage of de-indexed research journals within a subject discipline increases, it raises concerns about the research integrity of the researchers associated with that particular field. Nevertheless, it is often the researchers within the same subject discipline who raise concerns about the subpar quality which journals maintain when publishing research outcomes. This highlights the need for timely rectification of these issues. Publishers driven by commercial interests are generally found to compromise quality by publishing research results that fall below acceptable standards.

The situation regarding the de-indexing of subject-wise journals at the continental level is an entirely disctinct narrative. Medicine is the leading subject discipline in which the highest de-indexed journals has been recorded across all the continents. Of the total journals de-indexed across Africa, 49.15 percent are from Medicine alone. Similarly, of the total journals de-indexed across Asia, 31.07 percent are from Medicine. In Australia, 25.41 percent are from Medicine, Europe 40.96 percent, North America 51.50 percent, and South America 44.83 percent (see Table 5).

As Medicine stands out as the primary subject discipline with the highest number of de-indexed journals across all continents, it leads to identifying the second-leading subject discipline in which the second-highest number of journals were de-indexed across continents. Accordingly, Agriculture and Biological Sciences and Earth and Planetary Sciences are the two subject disciplines from Africa which recorded the second-highest de-indexing of 10.17 percent each. Likewise, within Asia, Engineering registered the highest de-indexing rate of 18.52 percent, followed by 16.38 percent in South America, and 7.97 percent in North America, while Earth and Planetary Sciences recorded an 18.85 percent de-indexing rate across Australia and an 8.20 percent rate across Europe.

Europe and North America are the only continents in which all the major subject disciplines recorded journal de-indexing. In Africa, de-indexing was not observed across 14 subject disciplines, making up 51.85 percent of all subject disciplines. Similarly, in Asia 4 (14.81%), Australia 10 (37.03%) and South America 8 (29.62%) subject disciplines did not record any de-indexing. Decision Sciences and Neuroscience are the only subject disciplines that recorded journal de-indexing in Europe and North America only. However, at the global level, Medicine (43.21%), Engineering (8.07%), and Earth and Planetary Sciences (7.28%) are the three leading subject disciplines that recorded the highest journal de-indexing among the 27 subject disciplines examined.

DISCUSSION

Indexing a journal in a reputable index is not a straightforward process and this is further corroborated by the fact that more than 6,000 journals have so far been de-indexed by Scopus. Publishers who disregard the established norms and fail to adhere to the standard publishing practices have also been excluded from this database. There is a need to understand that to index a research journal, a journal has to maintain consistency in its existing publishing standards and once the journal is covered in the indexing database, this consistency has to be improved over the years by upholding the standard global journal publishing practices. Failing to do so can lead to the journal losing its indexation status over time.

Table 5: Subject-wise Journals De-indexing Across Continents

Subject	Africa		Asia		Australia		Europe		N America		S America		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Agriculture & Biological Sciences	6	10.17	38	5.49	17	13.93	156	5.14	54	2.66	10	8.62	281	4.64
Arts and Humanities	3	5.08	8	1.16	9	7.38	142	4.68	89	4.38	2	1.72	253	4.18
Biochemistry, Genetics and molecular biology	1	1.69	35	5.06	2	1.64	224	7.38	98	4.82	4	3.45	364	6.01
Business, Management and Accounting	-	-	12	1.73	4	3.28	50	1.65	50	2.46	1	0.86	117	1.93
Chemical Engineering	-	-	22	3.18	-	-	66	2.17	41	2.02	1	0.86	130	2.15
Chemistry	1	1.69	8	1.16	-	-	57	1.88	17	0.84	1	0.86	84	1.39
Computer Sciences	-	-	25	3.61	4	3.28	77	2.54	70	3.44	-	-	176	2.90
Decision Sciences	-	-	-	-	-	-	1	0.03	3	0.15	-	-	4	0.07
Dentistry	-	-	-	-	1	0.82	19	0.63	7	0.34	-	-	27	0.45
Earth and Planetary Sciences	6	10.17	73	10.55	23	18.85	249	8.20	71	3.49	19	16.38	441	7.28
Economics, Econometrics and Finance	-	-	-	-	1	0.82	20	0.66	19	0.93	2	1.72	42	0.69
Energy	1	1.69	14	2.02	-	-	30	0.99	19	0.93	1	0.86	65	1.07
Engineering	2	3.39	128	18.50	7	5.74	185	6.09	162	7.97	5	4.31	489	8.07
Environmental Science	3	5.08	13	1.88	2	1.64	68	2.24	24	1.18	-	-	110	1.82
Health Professions	1	1.69	6	0.87	1	0.82	41	1.35	29	1.43	-	-	78	1.29
Immunology and Microbiology	-	-	8	1.16	-	-	78	2.57	21	1.03	3	2.59	110	1.82
Material Science	1	1.69	18	2.60	1	0.82	60	1.98	29	1.43	1	0.86	110	1.82
Mathematics	-	-	5	0.72	3	2.46	18	0.59	12	0.59	1	0.86	39	0.64
Medicine	29	49.15	215	31.07	31	25.41	1244	40.96	1047	51.50	52	44.83	2618	43.21
Multidisciplinary	-	-	8	1.16	-	-	2	0.07	4	0.20	-	-	14	0.23
Neuroscience	-	-	-	-	-	-	16	0.53	6	0.30	-	-	22	0.36
Nursing	-	-	3	0.43	-	-	21	0.69	26	1.28	-	-	50	0.83
Pharmacology, Toxicology and Pharmaceutics	2	3.39	22	3.18	-	-	48	1.58	20	0.98	6	5.17	98	1.62
Physics and Astronomy	-	-	9	1.30	1	0.82	39	1.28	14	0.69	1	0.86	64	1.06
Psychology	-	-	1	0.14	2	1.64	26	0.86	23	1.13	2	1.72	54	0.89
Social Sciences	3	5.08	19	2.75	13	10.66	90	2.96	71	3.49	3	2.59	199	3.28
Veterinary Sciences	-	-	2	0.29	-	-	10	0.33	7	0.34	1	0.86	20	0.33
Total	59	-	692	-	122	-	3037	-	2033	-	116	-	6059	-

The de-indexing of a research journal can occur for several reasons, but if the reason for de-indexing is a decline in publishing quality, it becomes a matter of significant concern. Indeed, viewing a decline in publishing quality as a prime reason for the de-indexing a research journal is valid. The severity of this problem becomes evident when considering the expansive presence of predatory, substandard, dubious, and poor-quality journals in the market, surpassing the size and reach of the mainstream recognized research journals. The research findings clearly indicate that approximately every 5th journal indexed by Scopus is at a significant risk of being de-indexed. On a positive note, the results also reveal a steady decline in the percentage of journals de-indexed by Scopus since 2010. This decline can be attributed to the substantial increase in literature addressing the issue of predatory journals. This increased awareness has led to both researchers and indexing agencies becoming more cautious about such publishers, making it more challenging for them to gain recognition and indexing within the research and scientific community. On the other hand, in the year 2002, a total of 262 journals were de-indexed by Scopus, but this number had gone down to just 6 journals by the year 2016, These two points represent the extreme ends of journal de-indexing over the past two decades in terms of numbers.

A number of research journals despite being indexed in reputable indexes have been found to maintain very poor publishing practices. This unfortunate situation undermines and contradicts the fundamental purpose of genuine research. The research journals published with the sole objective to extend the frontiers of knowledge and broaden the horizon of human outreach have lesser chances of compromising research quality. However, when the focus of publishing shifts from the welfare of many to the welfare of one, then the risk of compromising research quality significantly increases.

Up until now, 18.62 percent of journals have been de-indexed by Scopus, which is quite an alarming statistic and signals how certain journal publishers grow complacent about the quality parameters once their journals gain indexation status. Unfortunately, this complacency often leads to the eventual de-indexing of these journals. Upholding standard publishing practices is very important for the sustenance and survival of a scholarly journal. Floating with the quality standards is just one of the reasons which may lead to the de-indexing of a journal. There are additional reasons that contribute to the de-indexing of research journals. There are numerous high-quality research journals published across diverse subject disciplines, yet they might not enjoy widespread popularity within the scholarly and scientific community. Consequently, many of these journals encounter challenges, such as a lack of substantial manuscript submissions, low readership, poor subscription rates and more, all of which contribute to their struggle for survival. The multidisciplinary nature of a research journal indiscreetly speaks about the reality that the journal struggles to garner support from a singular scientific community within a specific subject area. Consequently, it depends on diverse subject disciplines to ensure its survival. The act of merging multiple titles into a multidisciplinary journal can offer a fresh lifeline to these journals, providing them with a renewed support system. In a few more cases, the publishers may intentionally cease to publish a particular title, perhaps due to commercial reasons. Moreover, the publishing activities may cease altogether, particularly if the publisher turns bankrupt. There are instances when a journal fails to attain popularity among the scientific community. In such cases, the publisher generally rebrand the journal with a new title and re-launch it. Some of these journals continue with the same volume and publishing information, while others change completely, which more or less can be deemed as a fresh title.

The de-indexing of research journals can be likened to a library's weed-out policy. The key distinction lies in the fact that, in the former case, journals are weeded out from the indexing list due to their failure to comply with the established journal publishing practices. While in latter case, books are weeded due to factors like irrelevance, obsolescence, redundancy, and the need to create space for the inclusion of more relevant and up-to-date library materials.

From the results, it is evident that Medicine is the subject discipline that has recorded the highest number of de-indexed journals, both in terms of subject discipline level and the overall percentage among all the de-indexed journals. Of the total journals de-indexed across 27 major subject disciplines, 43.21 percent journals have been de-indexed in the discipline of Medicine alone. Furthermore, within the domain of Scopus-indexed journals in the field of Medicine, 33.86 percent journals have been de-indexed so far, constituting over one-third of the total journals indexed in this field. This also means that every third journal indexed in the field of medicine fails to comply with the standard journal publishing practice, resulting in the de-indexing. Morover, it is noteworthy that nearly every second journal de-indexed by Scopus belongs to Medical journal. These figures raise concerns over the quality of medical journals. A steady decline is being observed in the percentage of journals de-indexed after 2010, in a way reflecting that publishers apart from adhering to the laid down publishing quality parameters are also making continuous strides in elevating their publishing standards. It is plausible that an indexing agency may not necessarily de-index the entire journal of poor quality, even if it had indexed it in the past. This could be due to the fact that the indexing agency may have compromised on the quality parameters and may have engaged in unethical practices to index a poor quality journal. Publishers based in Australia and North America need to improve the quality of their journals significantly as both had recorded a high de-indexing percentage than the global average for journals.

Less than 50 percent of countries across the world have indexed their research journals in Scopus, while the remaining half, despite running their own publishing journals, are not indexed in Scopus. Understandably, quality is the sole reason which acts as an impediment in the path of indexing a journal in Scopus or any other popular index. Journal indexing and publishing is being seen in proportion to the research results produced across a continent. Notably, Europe is the home of more than one-third of countries engaged in journal publications, closely followed by Asia and Africa. These three continents are collectively home to nearly 80 percent of countries that have Scopus-indexed journals and are actively publishing. Nigeria, Japan, Australia, the UK, the US, and Brazil are the leading countries where most journals were de-indexed, while the US has also the distinction of being the leading country in the world to have the most number of journals de-indexed. Understandably, the higher the number of journals published across the country, the higher the number of journals de-indexed will be. However, at the country level, of the total journals indexed across Sweden, 40.70 percent have been de-indexed, which is the highest percentage of journal de-indexing faced by any country at the macro level. The percentage of research journals de-indexed at the country level, continental level, and the world as a whole is alarming, somewhere raising the question mark over the quality of the research journals published in the field of Medicine and how medical researchers have so far failed to the check the subpar standard maintained by the journal publishers and the researchers who choose such substandard medical journals to publish their research findings.

The discussion on standardization of publishing practices would be incomplete if it does not speak about the havoc the predatory journals have caused in the academic and research world (Kumar 2022; Otike, Bouaamri, and Hajdu Barát 2022) and the need thereof to curb this menace. In the first place, with each passing day, it is becoming increasingly challenging to identify predatory journals, as a good number of predatory journals have also been found indexed in good indexes (Richtig et al. 2018). Accordingly, Darbyshire et al. (2017) while emphasizing the need to have a good index are of the view that Beall's list should be used as a blacklist of predatory journals, while indexes like Scopus and WoS be used as a white list of journals To maintain these lists, certain criteria have been laid down by the researchers from time to time to evaluate the quality of journals (Cobey et al. 2018). The authors of the current study however are of the view that laid down journal evaluation criteria should lean towards objectivity rather than subjectivity, as the latter tends to introduce more doubt and uncertainty. Article processing charges (APC) or manuscript handling charges levied by mainstream and recognized publishers for publishing research articles in Open Access form have further escalated the problem of predatory publishing. It is being observed that publishers charge anything from $180 to $1595 as APC per manuscript from researchers (PLOS 2022; Rupp et al. 2018; Shen and Björk 2015)**.** The willingness of researchers to pay publishers APC has somewhere boosted the market of predatory publishing, whereby predatory publishers entice researchers with different offers, such as offering lower APC, fast track peer review process, acceptance of articles within a few days of submission, publishing articles in online issue ahead of print to lure the budding researchers, and so as seasoned researchers sometimes fall prey of such marketing tactics of predatory publishers. It is advisable for researchers to consistently refer to journal whitelist for publishing their research findings and hence, it is the responsibility of indexes like Scopus and WoS to guarantee that every new journal indexed meets all the laid down standard publishing parameters. Regular assessments of a journal's publishing performance are essential to prevent publishers from sidestepping the prescribed norms. Journals published beyond the scope of Scopus and WoS should be approached with a degree of skepticism, as there is a possibility they might be dubious or of predatory. Adhering to these practices can help a great deal in avoiding publishing in substandard research journals.

CONCLUSIONS

Research information seekers in general and researchers, in particular, should avoid forming the misconception that the research journals indexed in Scopus or WoS are perpetually standardized and of high quality. The fact remains that even the good journals indexed in reputable indexes can, over time, experience a decline in their publishing standards. Consequently, such journals might eventually face the possibility of being de-indexed. Publishers must understand that indexing a journal marks the start of a journey rather than its conclusion. Any complacency or failure to uphold established publishing practices can inevitably result in the deterioration of the journal's quality and the consequence of the journal being de-indexed.

Quality enhancement is a perpetual process, where each day, a new quality bar is set and it is only those who are adept at changes and challenges that survive. The outcomes of the study reveal a steady decline in the number of de-indexed journals on annual basis especially after the year 2010. The US and Sweden being the two leading countries to record the highest number and percentage of journals de-indexing respectively should take this problem seriously and work toward rectifying it. Additionally, publishers, editors,

reviewers, and researchers within the field of medicine should address the significant proportion of medical journal de-indexing as a matter of urgency. There is also a need to sensitize the global medical community about the existing problem and the need thereof to rectify the ailing system.

Standardization in journal publishing is an ongoing continuous and perpetual journey, whereby the existing quality standards is pushed to a new heights, and sustaining that quality bar is an equally formidable challenge. Given the fact, the declining publishing standards over time is widespread, depicting that standardization oscillates between its two poles of excellence and decline. The rise and fall of a research journal can be understood through the lens of its indexing and de-indexing activities. When a research journal adheres to the best practices in the research publishing and other established norms, it experiences an ascent in the form of inclusion in prestigious databases like Scopus or WoS. This recognition by the global research and scientific community designates it as an authoritative source of scholarly communication. However, the moment the same journal becomes complacent and deviates from the prescribed norms, it inevitably encounters the consequences of being de-indexed. At the same time, it is also a reality that many high-quality journals published by individuals, associations, and institutions might not effectively capture the attention of the global research and scientific community, leading to their downfall and encounter challenges in sustaining themselves. Although indexing helps a research journal to gain more popularity, but that alone does not guarantee for its survival if quality is compromised or the content produced is not properly marketed to reach the end users.

It is a valid conclusion that many high-quality journals might not achieve popularity within the scientific community, causing them to face challenges in their survival. Readers should understand that de-indexing can occur for two main reasons. Firstly, if journals fail to adhere to quality parameters or uphold poor publishing standards, they might result in being de-indexed. Secondly, journals might cease publication for a variety of reasons, which also result in de-indexing. Of the two reasons, the former deserves more attention and is an area of concern, which is the central focus of the present study. However, researchers are not in a position to ascertain the number of journals that were de-indexed due to subpar publishing practices and those that were de-indexed because they ceased publication voluntarily. Furthermore, a good number of journals have undergone transformations by rebranding, renaming and relaunching to gain more recognition among the research and scientific community.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest regarding the publication of this paper.

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