International Journal of Information Science and Management
Vol. 23, No. 4, 2025, 209-229
DOI: https://doi.org/10.22034/ijism.2025.2043967.1626 / DOR: https://dor.isc.ac/dor/20.1001.1.20088302.2025.23.4.10.0

Original Research

Analysis of Retracted Open Access Publications by Indian Authors: Insights from Scopus Database

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Received: 22 October 2024
Reviewed: O2 November 2024
Accepted: 31 May 2025

Abstract

Retracting scientific papers helps maintain the integrity of scientific literature by preventing flawed research from being considered credible in the future. This study seeks to understand better the factors leading to the retraction of open-access academic articles by Indian researchers. The Scopus database was searched between 2010 and 2023 to extract the open-access retractions. The *Retraction Watch* database was consulted to determine the reason for the retractions. The present study categorized retraction causes into eight distinct categories. The findings indicate that the year 2022 had the highest number of retractions (*N*=778, 66.04%). The most prevalent grounds for retraction were peer review manipulation (64%, *N* = 754), duplication (12.81%, *N* = 151), and plagiarism (8.99%, *N* = 106). The findings reveal that retracted papers with 2–6 authors were more likely to be withdrawn owing to peer review manipulation, duplication, and plagiarism. The retraction process for data duplication, falsification/and fabrication took approximately four years. Retracted articles were published in 317 unique journals; 237 had impact factors ranging from 0.1 to 96.2. Nineteen journals retracted a total of 795 (67.48%) papers. Most open-access retractions were issued to co-authored papers (N=1129, 95.84%). Nine publishers issued (*N*=1111, 94.31%) total retractions. Springer Nature issued the highest number of retractions (*N*=718, 60.95%), followed by IOP Publishing Ltd. (N=238, 20.20%) and Wiley issued (*N*=72, 6.11%) retraction notices.

Keywords: Misconduct, Retractions, Plagiarism, Fake Peer Review, Open Access.

Introduction

Concerns over traditional subscription-based journal access restrictions prompted the emergence of alternative publishing models, ultimately leading to the open access (OA) movement. According to Heller, Moshiri, and Bhargava (2013), open access is a publication model that enables unrestricted online dissemination of scholarly content, removing financial and legal barriers to knowledge access by offering free and unconditional access to scholarly publications over the internet. The Open-Access model achieved widespread acceptance within

the academic community, profoundly transforming scholarly communication and revolutionizing the dissemination of scientific knowledge (Singson, Joy, Thiyagarajan, & Dkhar, 2015). The growth of open-access journals (OAJs) can be attributed to several key benefits, including improved cooperation, elevated citation rates, and broader public engagement, as evidenced by numerous studies (Liu & Li, 2018; Demeter, Jele & Major, 2021; Shah et al., 2021). However, the rapid growth of Open Access (OA) journals has sparked concerns about quality control, with research suggesting that rapid expansion may compromise peer review rigor (Gilbert, 2009; Wang, Xing, Wang & Chen, 2019) while also posing additional risks, including diminished quality control, financial constraints, and peer review vulnerabilities that collectively threaten the integrity of scientific record's (Barreiro, 2013). If left unaddressed, these bottlenecks can have deleterious consequences for the scientific community. Therefore, to address the alarming growth, various researchers have investigated open-access retracted papers, which were primarily confined to biomedical research fields using PubMed, MEDLINE, and Embase datasets (Peterson, 2013; Wang et al., 2019; O'Kelly, Fernandez & Koyle, 2019). However, other studies have expanded by investigating open access retractions using data from Incites, Web of Science (WoS), and Retraction Watch (Shah et al., 2021; Zheng & Fu, 2024). Despite existing studies, a comprehensive examination of the specific characteristics of retracted open-access articles in the Scopus database is lacking. Moreover, the literature lacks nuanced insight into country-specific trends, particularly for India, on the factors associated with retractions in open-access scholarly publications.

Retractions have gained significant attention in academic circles in recent years due to their direct effects on academic integrity, the confidence of the public and the research community in research findings, and the legitimacy of scientific literature. A thorough grasp of the reasons and effects of retraction is necessary, as evidenced by the increased number of retractions that have caught the attention of scholars and decision-makers. In addition, retraction studies can provide valuable insights for improving peer review procedures and editorial policies, thereby enhancing the quality, trustworthiness, and integrity of open-access scholarly communication. Open-access publications are generally more accessible, potentially significantly influencing both the scientific community and the public. This study examines open-access retractions in the Scopus database to uncover key factors behind these cases. The findings highlight challenges in scholarly publishing and bolster academic integrity, essential for advancing knowledge. In light of the above, the study aims to address the following questions:

1). What are the leading causes of retractions in open-access scholarly publications?

2). What are the characteristics of retracted papers i.e., type of open access, authorship patterns, retracting publishers and journals?

3). Is there a relationship between the frequency of open-access papers and journal impact factors, and do high-impact-factor journals have different retraction rates compared to those with lower impact factors?

4). What is the time interval between publication and retraction for open-access articles, and are there significant variances in retraction reasons?

Literature Review

The retraction of scholarly publications provides an essential mechanism for safeguarding the integrity and validity of scientific research, assuring the accuracy and reliability of the academic literature. Extensive studies have been performed globally to explore the features and

determinants of article retractions, establishing a considerable body of literature. In particular, the biological field and its allied fields have been the prominent focus of retraction research, with many investigations examining the incidence, causes, and effects of retractions within these fields.

Reasons for retractions

Reasons responsible for the retraction of scientific articles have been documented by various researchers (Wager & Williams, 2011; Williams & Wager, 2013; Aspura, Noorhidawati & Abrizah, 2018; Elango, Kozak & Rajendran, 2019; Shepperd & Yousefi, 2023; Bakker et al., 2024). The frequency of papers containing flawed results or errors or any manipulations (misconduct) has increased and been retracted regularly (Noorden, 2011; Damineni, Sardiwal, Waghle & Dakshyani, 2015; Chambers, Michener & Falcone, 2019; Ortega, 2021). The majority of the studies on retractions have found misconduct as the primary factor for article retractions (Fang, Steen & Casadevall, 2012; Yan, MacDonald, Baisi, Evaniew, Bhandari & Ghert, 2016; Lei & Zhang, 2018; Campos-Varela & Ruano-Raviña, 2019). Regarding retractions in social science subjects, scientific misconduct stands out as the leading cause (Basumatary & Verma, 2024). Retraction of a scientific paper is also warranted in cases of plagiarism, duplicate publication, fraud, authorship issues, ethical issues, and errors, among other forms of research misconduct (Redman, Yarandi & Merz, 2008; Corbyn, 2012; Liu & Chen, 2018; Kamali, Abadi & Rahimi, 2020). Moreover, predatory journals, which are not indexed in bibliographical databases and compromise on rigorous peer review, are often more susceptible to plagiarism (Misra, Ravindran, Wakhlu, Sharma, Agarwal & Negi, 2017). Plagiarism is a common issue and a primary reason attributed to misconduct in low-income and non-English-speaking nations (Amos, 2014; Grieneisen & Zhang, 2012; Stretton et al., 2012) and is more prominent in countries with low established research standards and is mainly found in journals with much lower impact factors (Fang et al., 2012). Research on scientific retractions indicates that plagiarism is a noteworthy factor. Resnik and Dinse (2013) report that 10.9% of 119 retraction notices have been attributed to plagiarism across journals with different impact factors. Additional reasons for plagiarism in scientific publications include lack of writing skills and the non-existence of anti-plagiarism policies (Baždarić, Bilić-Zulle, Brumini & Petrovečki, 2012). Furthermore, the language barrier plays an important role, as authors who are non-native English speakers are more likely to indulge in plagiarism and duplicate publications (Zhang & Zhu, 2016). Nevertheless, retractions due to plagiarism and duplication, according to Amos (2014), prevail all across the globe, and "the most striking illustration of unethical publishing practices can be found by considering plagiarism and duplicate publication together" (p.89).

Over the decades of scientific publishing, peer review has become a crucial factor in the field of academic publishing. It is unique to science publishing and central to the evidence-based construction of knowledge (Bakker & Traniello, 2019), through which research undergoes scrutiny under expert supervision before publication. The peer review mechanism is critical to ensuring the quality and integrity of the academic publishing process; however, based on observations, it needs to improve its effectiveness. A retrospective cross-sectional study by Moylan and Kowalczuk (2016) from 2000 to 2015 found that 134 articles, representing a colossal 33%, were retracted due to compromised peer review. Often, fake peer reviews compromise the integrity of the peer-review process, a concern flagged by Misra, Ravindran, and Agarwal (2018), showing that Asian countries' research papers are disproportionately

withdrawn due to this issue. Similarly, analysing the characteristics of retractions in the urological field, Mena, Ndoye, Cohen, Kamal & Breyer (2019) found that 20% of retractions were due to fake peer reviews. The lack of rigorous peer review may have significant implications since unpublished or unrefined research may lead to fraudulent claims, poor methodologies, and possibly harmful applications. This suggests a thorough review and overhaul to address these critical issues and regain trust in this process. Studies have also identified error as a significant retraction factor (Budd, Sievert & Schultz, 1998). Nath, Marcus, and Druss's (2006) findings suggest that 61.8% of retracted papers in MEDLINE (1982-2002) resulted from unintentional errors. Furthermore, Wager and Williams (2011) highlighted honest errors and non-replicable findings as leading reasons for retraction.

Dynamics of collaboration and retractions

Collaboration is essential in modern research, enhancing both productivity and impact. It can take various forms: internal partnership (within the same organization), domestic collaboration (within the same country), and international collaboration -between countries (Jeong, Choi & Kim, 2014). In recent decades, the scientific community has experienced a notable surge in collaborative efforts, which has been recognized as a significant contributor to the production of high-quality research (Zhou & Glänzel,2010; Gazni, Sugimoto & Didegah, 2012; Scarazzati & Wang, 2019; Dua, Singh & Lathabai, 2023). The underlying factors driving these collaborations include the complexity and cost of large-scale scientific endeavors. This trend is reflected in an increase in the number of authors per scientific paper, which has risen from 1.9 to 3.5 over the past few decades (Wuchty, Jones & Uzzi, 2007) and is accompanied by a corresponding increase in citation advantages for collaborative works (Larivière, Gingras, Sugimoto & Tsou, 2015). International collaboration across multiple levels has been found to result in more significant citation impact and readership, as well as increased funding opportunities for the authors involved (Grubbs, Glass & Kilmarx, 2019). Nevertheless, extramural collaboration has significant benefits, including greater prestige and visibility at global levels, improved scientific productivity, and higher citation rates (Lee & Bozeman, 2005; Rosenkrantz, Parikh & Duszak Jr, 2018). However, working in a collaborative research environment necessitates trust and faith in one another's work. Some authors may dilute the responsibility entrusted to them, which can prove to be a double-edged sword and may give rise to ethical challenges (Anderson, Kot, Shaw, Lepkowski & De Vries, 2011). In collaborative scientific environments, the reputation of each team member affects the entire group, meaning any fraud committed by one person will impact the whole team (Sharma & Mukherjee,2024). Similarly, Retractions tend to be more common for articles produced by small teams (2-5 authors) compared to those authored by a single individual (Tang, Hu, Sui, Yang & Cao, 2020; Palla, Singson & Thiyagarajan, 2020; Sharma, 2021; Palla, Singson & Thiyagarajan, 2023; Shimray, 2023).

Impact Factor paradox and retractions

Journals published by prestigious and well-established publishing firms are often believed to maintain high standards of intellectual excellence, ascribed to their severe quality control procedures and rigorous editorial review processes. However, this is not always the case, as high-impact factor journals published by reputed publishing firms have also retracted articles (Trikalinos, Evangelou & Ioannidis, 2008; Redman et al., 2008; Steen, 2010; Nature, 2014;

Bilbrey, O'Dell & Creamer, 2014). Research has shown that duplication and plagiarism are commonly found in lower-impact journals (Fang et al., 2012). Khademizadeh, Danesh, Esmaeili, Lund and Santos-d'Amorim (2023), using the Scopus dataset from 2016 to 2020, reported that journals with impact factors ranging from 1.8 to 5.6 issued most of the retractions in medical fields. Campos-Varela, Villaverde-Castañeda & Ruano-Raviña (2020) found that retractions are found in both low- and high-impact journals; however, misconduct-related retractions are more prevalent in higher-impact factor journals. Analysis by Khurana, Sharma, and Uddin (2024) revealed that a significant number of retractions took place in high-impact (Q1) journals, emphasizing the necessity for rigorous review processes and robust quality control in prestigious publications. This phenomenon, according to He (2013) and Fang and Casadevall (2011), may also be attributed to the broader readership and scrutiny in higher impact factor journals, which are therefore likely to detect and report fraudulent activities. However, Lei and Zhang (2018) reported that retractions due to fake peer reviews mainly formed part of low-impact journals, while a very low percentage (i.e., 5 out of 100 articles) were published in journals having an impact factor greater than 3. Al-Ghareeb et al. (2018) reviewed nursing and midwifery retracted publications. They found that journals with a lower impact factor retract more articles in the field, thus raising concerns about the reliability of research published in such journals.

Therefore, it is concluded that numerous studies have predominantly utilized data from Medline, PubMed, and Web of Science, focusing on retractions primarily within biomedical literature, to ascertain causes and monitor trends over time. Additionally, some studies provided context for these retractions based on a specific country or region. However, these studies offer only a limited perspective because of their restricted journal coverage and subject focus. There is a notable gap in the analysis of open-access retracted publications by Indian researchers, which warrants further investigation.

Materials and Methods

The data used in the study were obtained from Scopus using the advanced search TITLE (retract*) AND AFFILCOUNTRY (India), covering the period from 2010 to 2023. The literature search was performed on 04 March 2024, and the database yielded a total of 2000 records. The collected data were descriptively summarized. Unrelated and non-retracted records, such as those using the term "retract, retraction, retracted" in a different context, were manually verified and removed. A total of 1178 records met the inclusion criteria. IAP and MS both examined all of the retraction notices independently and determined the characteristics of retraction through consensus.

Furthermore, retractions were classified into eight (8) broad categories according to the apparent underlying reasons for the retraction, as highlighted in Figure 1. The reason for retractions, date of the publication, and retraction notice were extracted using The Retraction Watch Database[1]. The time taken for retraction was recorded in months. The retracted articles were published in a total of 317 unique journals, with 237 of them having impact factors ranging from 0.1 to 96.2. The journal impact factor was collected from the Journal Citation Report (JCR, 2023) published by Clarivate Analytics. Descriptive data analysis was performed, which included percentage tests using MS-Excel and SPSS.

[1] . http://retractiondatabase.org/RetractionSearch.aspx

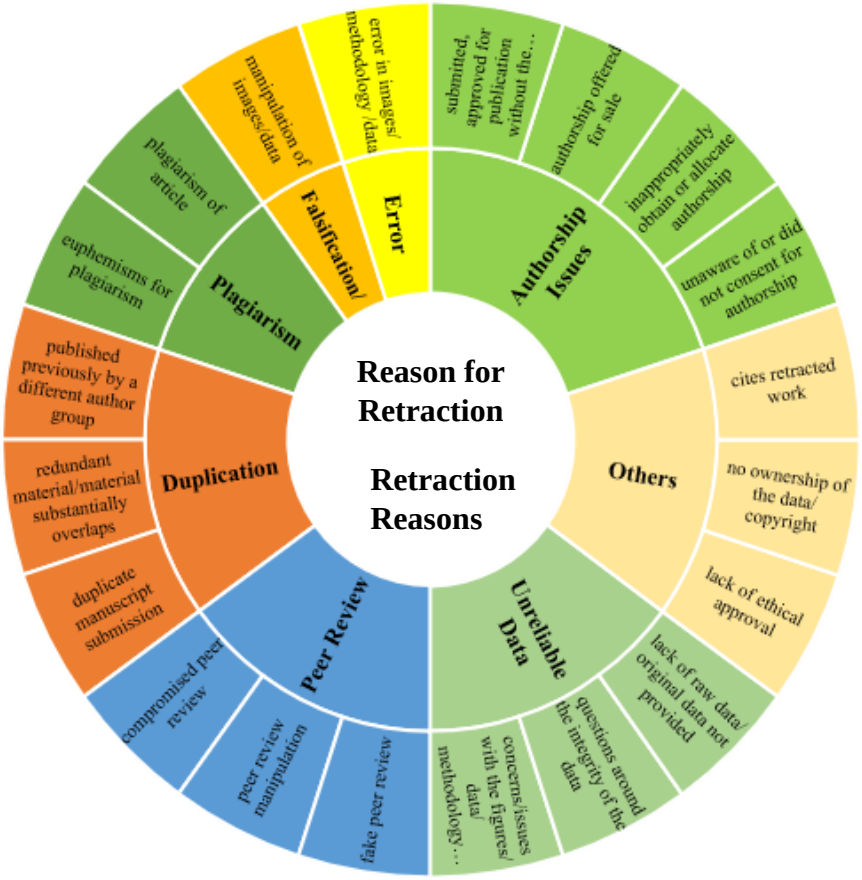

Figure 1: Retraction reasons

1. Authorship Issues 2. Duplication 3. Error 4. Falsification/ Fabrication
5. Peer Review 6. Plagiarism 7. Unreliable Data 8. Others

Results

The retraction rate of academic articles increased by 1311% from 55 in 2021 to 778 in 2022, but then declined by 83% to 133 in 2023, showing a net 141% rise over the two years (Figure 2).

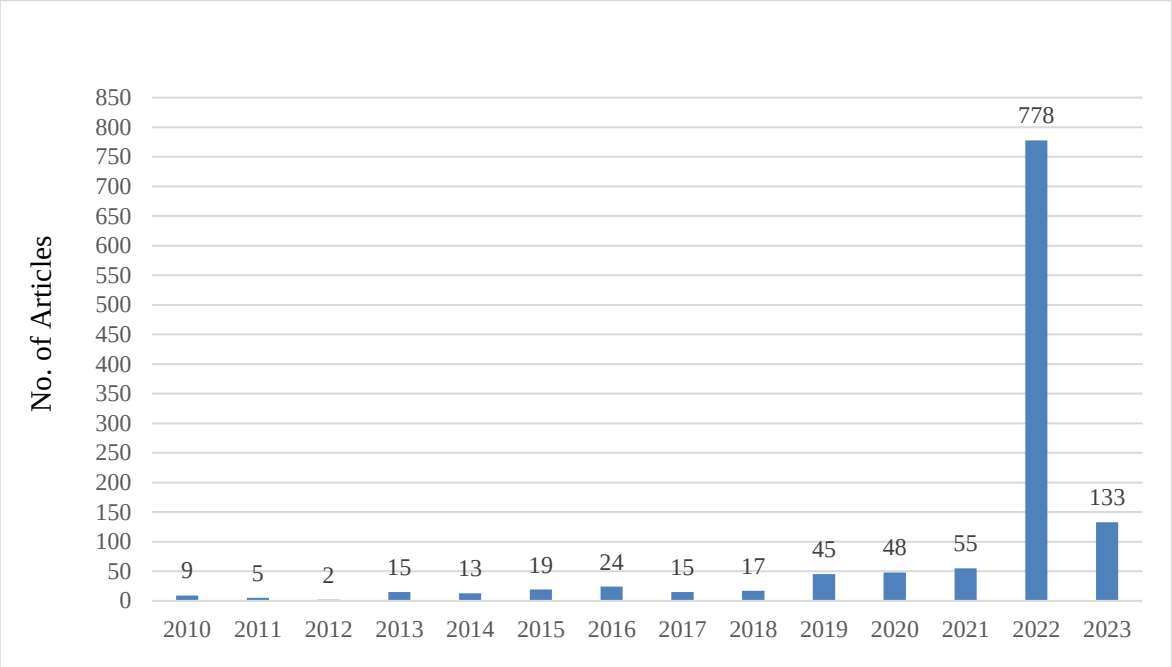

Figure 2: Yearly growth in retractions published per year

Characteristics of retractions

Figure 3 illustrates the distribution of reasons for open access article retractions: peer review manipulation (754, 63.95%), duplication (151, 12.80%), plagiarism (106, 9.1%), unreliable data (66, 5.7%), error (44, 3.8%), authorship issues (18, 1.5%), falsification/fabrication (17, 1.5%), and other (22, 1.9%).

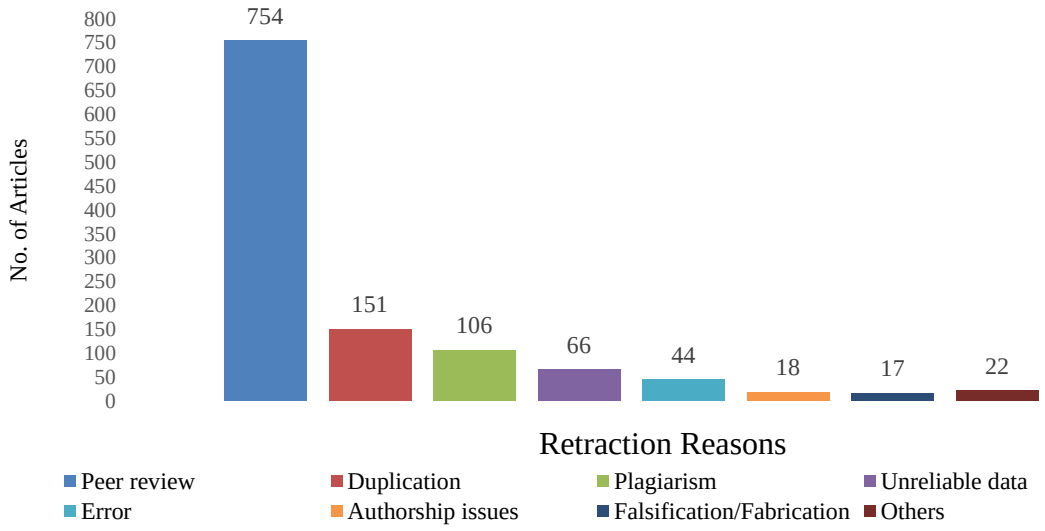

Figure 3: Characteristics of retractions

Designation of open-access retracted articles

The distribution of open access retracted articles is dominated by the Bronze OA category, accounting for 83.61% (N=985) of all retractions, followed by Gold (14.68%, N=173), Green (0.93%, N=11), and Hybrid Gold Open Access (0.76%, N=9) (Figure 4).

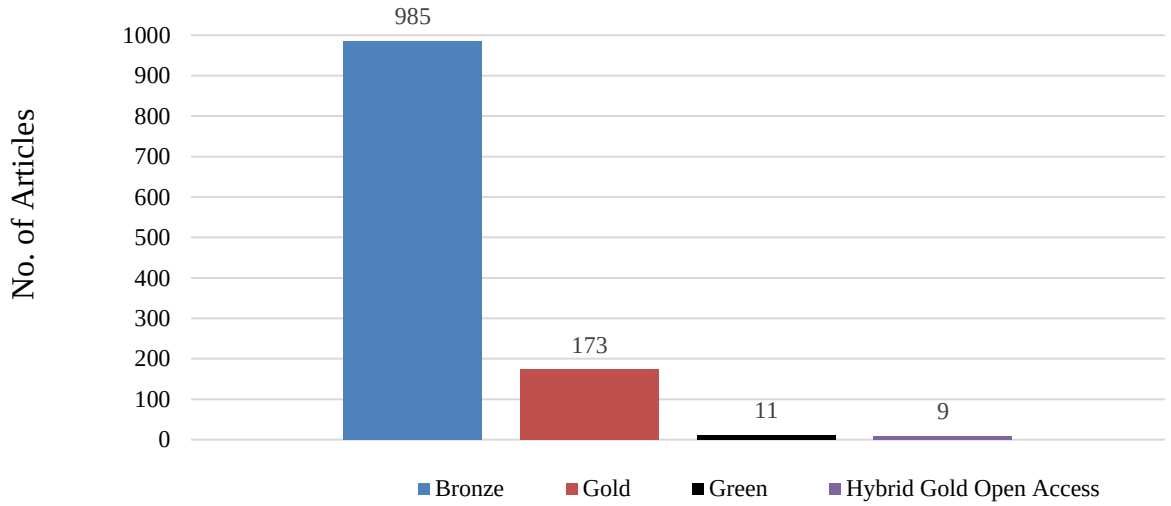

Figure 4: Retracted articles in different open-access designations

Time interval from publication to retraction

The examination of article retractions suggests a diverse timing for withdrawal as shown in Table 1. Notably, 7.64% of publications are retracted within 6 months, while a considerable 27.59% are removed between 7 and 12 months. The bulk of retractions (52.97%) occur within 1-2 years, with 25.38% occurring between 13 and 24 months, and 24.28% between 25 and 48 months. However, 15.11% of articles take more than 4 years to retract. The quartile analysis indicates that 25% of publications are retracted within 10 months (Q1), 50% within 22 months (Q2), and 75% within 29 months (Q3), with an interquartile range (IQR) of 19 months. These data suggest that although some papers are withdrawn immediately, others may take longer, exposing possible flaws with peer review, publishing procedures, and post-publication monitoring.

Table 1
Distribution of time-to-retraction for open-access articles

S. No	Articles Retracted within	No. of articles	Frequency %
1	1-6 months	90	7.64
2	7-12 months	325	27.59
3	13-24 months	299	25.38
4	25-48 months	286	24.28
5	>48 months	178	15.11
Total		1178	100%
Quartiles: Q_1 --> 10 Q_2 --> 22 Q_3 --> 29			Interquartile Range (IQR)= 19

Time interval from publication to retraction based on the impact factor of the journal

Table 2 outlines the time intervals for retraction in relation to the impact factors of various journals. Journals with a higher impact factor (>5) take nearly four years to retract the paper, while journals falling in an impact factor of 3 to 4 take 47.02 average months. The mean time for journals with no impact factor takes approximately two years to retract a paper.

Table 2
Retraction analysis by journal impact factor: Descriptive statistics

Impact Factor Range	No. of articles	Mean time to retraction (in months)	Median time to retraction (in months)	Interquartile Range (IQR)
No Impact Factor	766	22.04	22	16
0.1 to 1	27	27.62	21	48
1 to 2	92	25.54	18	27
2 to 3	92	39.98	28	37.5
3 to 4	138	47.02	37.5	41
4 to 5	19	34.36	25	36
Above 5	44	47.36	28.5	54.5
Total	1178			

Retractions across different journal impact factors

Figure 5 shows the data on the frequency of misconduct identified in scientific journals based on the journal's impact factor. The study found 412 retracted articles published in 237 unique source titles with the impact factor ranging from 0.1 to 96.2. A total of 368 (89.32%) retractions were published in journals with impact factors ranging from 0.1 to 5. Journals with lower impact factors (0.1-1) had the fewest retractions (27 papers), whereas those with higher impact factors (3-4) had the most retractions (138 papers). Notably, journals with impact factors over 5 had a large number of retractions (44 papers), demonstrating that even top-tier journals are not immune to errors or misconduct.

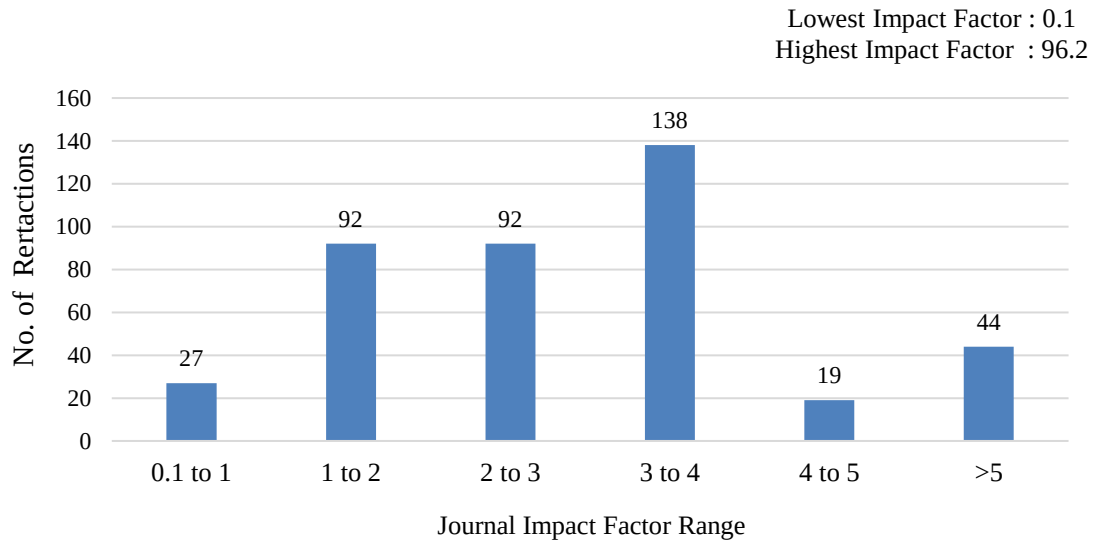

Figure 5: Journal impact factor and the number of retractions

Time interval from publication to retraction per category

Table 3 analyses the reasons for article retractions and their corresponding time-to-retraction. Peer review manipulation accounted for the majority (754/1178) of retractions, with a mean time-to-retraction of 23.09 months. Other notable reasons included duplication (151

articles, 45.18 months), plagiarism (106 articles, 27.65 months), and unreliable data (66 articles, 40.46 months). Falsification/fabrication had the longest mean time-to-retraction (42.82 months). The Kruskal-Wallis test revealed significant differences in time-to-retraction across reasons ($\chi 2=28.282$, df=7, p<.001), indicating that the time-to-retraction varies depending on the reason for retraction. Specifically, duplication and falsification/fabrication showed significantly longer times-to-retraction compared to peer review manipulation and authorship issues.

Table 3

Retraction reasons and associated retraction timelines: Non-parametric analysis

S. No	Reasons for Retractions	No. of articles	Mean time to retraction (in months)	Kruskal-Wallis Test
				Mean rank
1	Peer review	754	23.09	587.44
2	Duplication	151	45.18	669.99
3	Plagiarism	106	27.65	522.94
4	Unreliable data	66	40.46	605.12
5	Error	44	31.09	578.41
6	Authorship issues	18	22.44	438.42
7	Falsification/Fabrication	17	42.82	762.94
8	Others	22	25.63	393.34
Total		1178		
Test Statistics				
Chi-Square		Months		
		28.282		
df		7		
Asymp. Sig.		.000		

Authorship pattern of retracted articles

Figure 6 highlights the authorship pattern of retracted papers by Indian authors. The majority of the retracted papers, i.e., 393, accounting for 33.36%, were found to have two authors. This was followed by 219 retracted papers, accounting for 18.59% and involving three authors, and 205 papers (17.40%) written by four authors. However, the number of retractions by single-authored papers was only 49 (4.16%).

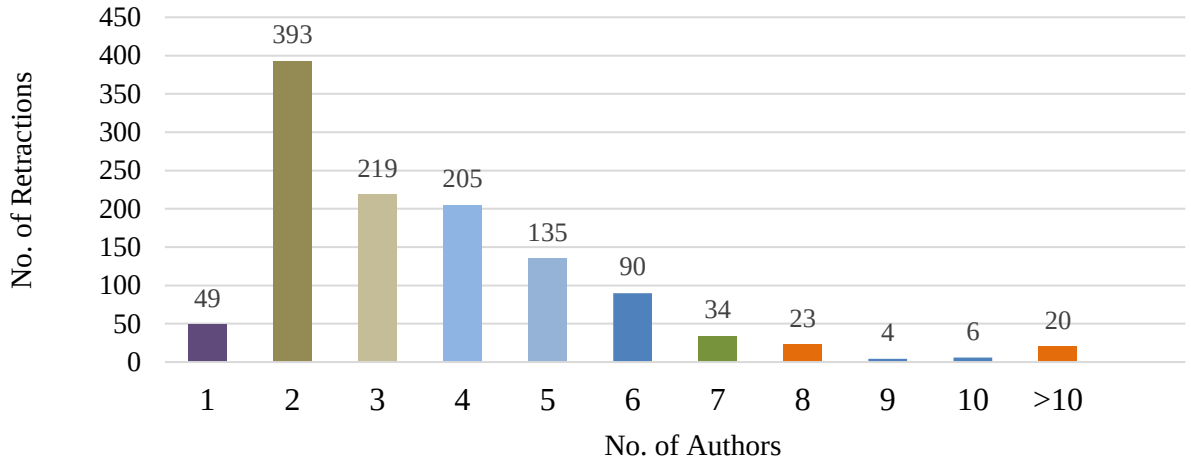

Figure 6: Total number of retractions and the number of authors

Authorship pattern vs reasons for retraction

The examination of the retracted manuscript by rationale and number of authors suggests diverse trends. Peer review misconduct, the most prevalent cause for retraction (754/1178), was related mainly to single-authored (17) or two-authored (310) articles. Duplication (151) and plagiarism (106) retractions generally included 2-3 authors. In contrast, unreliable data (66) and falsification/fabrication (17) retractions are likely to include smaller teams (1-3 authors). Authorship disputes (18) were often linked with 3-4 authors. Notably, 49 articles had just one author, whereas 20 articles had more than 10 authors. The distribution shows that collaborative research could increase the chance of certain sorts of mistakes or misbehaviour, whereas solo authors may be more sensitive to peer review misconduct (Table 4).

Table 4
Distribution of retracted articles by reason and number of authors

Reasons for Retractions	No. of authors											No. of articles
	1	2	3	4	5	6	7	8	9	10	>10	
Peer review	17	310	119	144	94	48	10	8	1	1	2	754
Duplication	13	28	48	15	16	11	6	7	1	2	4	151
Plagiarism	12	34	22	17	5	10	2	2	0	0	2	106
Unreliable data	3	8	14	13	5	12	6	1	0	0	4	66
Error	1	6	10	6	5	5	4	2	1	0	4	44
Authorship issues	0	0	2	4	2	3	3	0	1	2	1	18
Falsification/Fabrication	2	2	1	3	5	0	2	2	0	0	0	17
Others	1	5	3	3	3	1	1	1	0	1	3	22
Total	49	393	219	205	135	90	34	23	4	6	20	1178

Correlation Analysis of Journal Impact Factor and Number of Authors

Figure 7 shows that there is a statistically insignificant relationship between the Journal Impact Factor and the number of authors, with a Pearson correlation coefficient of 0.013 (p=0.799, N=412). This shows that the impact factor of a journal is not considerably impacted by the number of authors contributing to an article. Thus, the present study indicates that journals with higher impact factors do have more authors, and conversely, journals with fewer authors do not have lower impact factors. This study shows that other criteria, such as research quality, journal reputation, and citation practice, have a more substantial influence on determining a journal's impact factor.

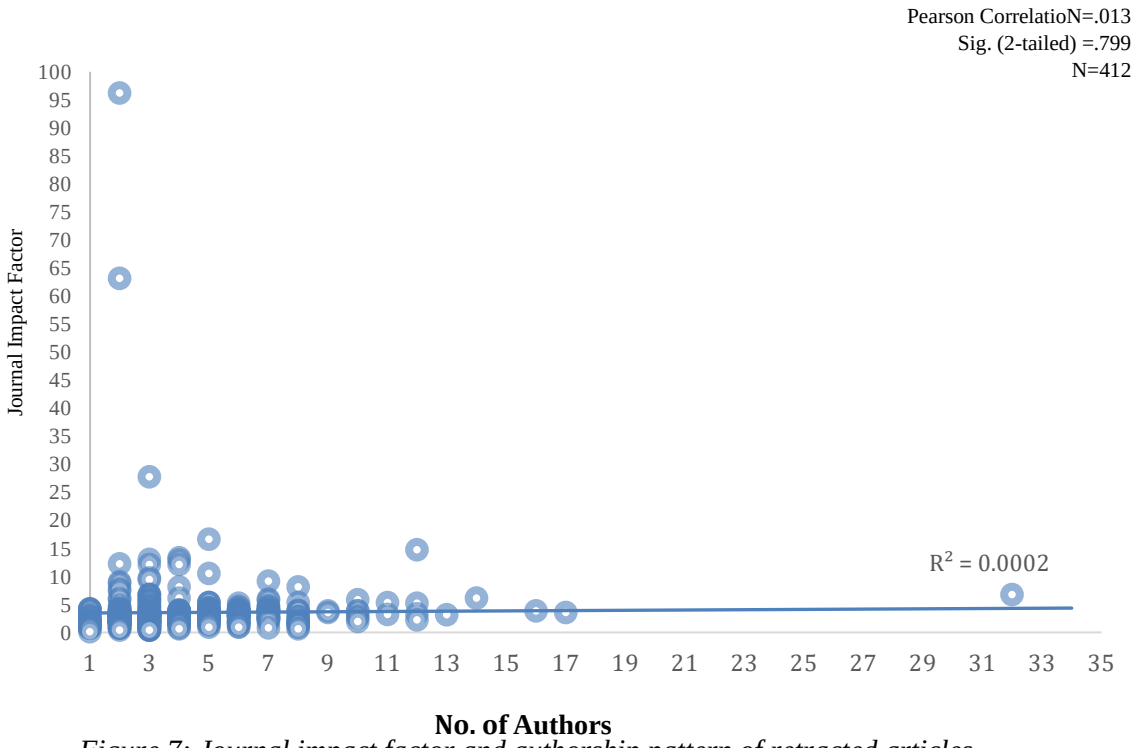

Figure 7: Journal impact factor and authorship pattern of retracted articles

Journals with the highest number of retracted articles

Table 5 ranks the top published journals for OA retractions. In particular, *Journal of Ambient Intelligence and Humanized Computing* and *Journal of Physics: Conference Series* top the list, having retracted 344 and 245 open-access manuscripts, respectively, which account for 49% of the total articles in the dataset. Furthermore, *Cluster Computing* retracted 31 publications, *Soft Computing* retracted 23 articles, while *Journal of Materials Science: Materials in Electronics* and *Multimedia Tools and Applications* both retracted 22 articles. Collectively, the top 19 journals reported in Table 5 are responsible for 67.48% of all retractions.

Table 5
Retraction analysis of top journals: Distribution of reasons for retraction

S.No	Source Title(s)	No. of Retractions	Reasons for Retractions							
			Peer review	Duplication	Plagiarism	Unreliable data	Error	Authorship issues	Falsification /Fabrication Fabrication	Others
1	Journal of Ambient Intelligence and Humanized Computing	344	343	1	0	0	0	0	0	0
2	Journal of Physics: Conference Series	235	231	0	3	0	1	0	0	0
3	Cluster Computing	31	31	0	0	0	0	0	0	0
4	Soft Computing	23	21	1	0	0	0	0	0	1
5	Journal of Materials Science: Materials in Electronics	22	0	8	1	11	1	0	0	1
6	Multimedia Tools and Applications	22	21	0	1	0	0	0	0	0
7	Wireless Personal Communications	19	15	2	2	0	0	0	0	0
8	Applied Nanoscience (Switzerland)	15	13	1	0	0	0	0	0	1
9	RSC Advances	13	0	1	2	3	4	0	2	1
10	Scientific Reports	13	0	5	0	3	4	0	0	1
11	Neural Computing and Applications	11	9	0	2	0	0	0	0	0
12	Journal of Supercomputing	8	7	0	0	1	0	0	0	0
13	BMC Complementary Medicine and Therapies	6	0	3	0	3	0	0	0	0
14	Journal of Parasitic Diseases	6	0	2	3	0	0	0	0	1
15	Optik	6	0	0	0	5	0	0	1	0
16	Peer-to-Peer Networking and Applications	6	6	0	0	0	0	0	0	0
17	International Journal of Speech Technology	5	5	0	0	0	0	0	0	0
18	Journal of Medical Systems	5	5	0	0	0	0	0	0	0
19	Plant Cell, Tissue and Organ Culture	5	0	1	0	1	2	1	0	0
Total		795	707	25	14	27	12	1	3	6

Top retracting publishers

Figure 8 shows the number of retractions exercised by publishers with more than five retractions. Results reveal that nine publishers were responsible for 94.31% of the total retractions. Among these publishers, Springer Nature issued the highest number of overall retractions (N=718, 60.95%), followed by IOP Publishing Ltd. (N=238, 20.20%) and Wiley

(N=72, 6.11%).

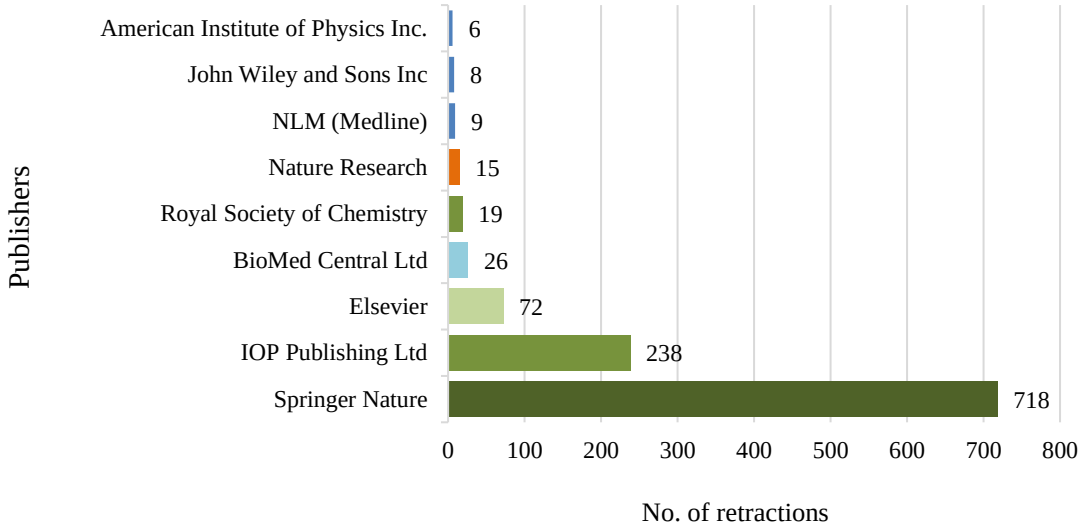

Figure 8: Publishers' wise retraction of articles

Discussion

Research on scientific misconduct can lead to the development of better policies and regulations to prevent and address unethical behaviour in research, ultimately enhancing and upholding the integrity of the scientific process. Scholarly journals have been known to retract articles when serious flaws in the data or results are discovered. The present study was undertaken to examine the retractions in open access using the Scopus Database. The study results reveal that the retractions in open access are on the rise, as are the global rates of retraction (Kamali et al., 2020; Candal-Pedreira, Ross, Ruano-Ravina, Egilman, Fernández & Pérez-Ríos, 2022). Similarly, the study results reveal that the majority of the papers were retracted due to peer review manipulation (63.95%) followed by duplication and plagiarism which accounted for a (12.80%) and 5.59%) total open access paper retractions respectively and our results are consistent with previous studies (Huh, Kim & Cho, 2016; King et al., 2018; Kamali et al., 2020). The findings of our investigation highlighted serious flaws in the publishing system's peer review process, demonstrating how it failed to function as it should.

Additionally, retractions due to duplication and plagiarism were the second and third underlying reasons in our study. The investigation indicates a significant trend in authorship characteristics of retracted open-access papers. Single-authored papers represent a minority (n = 49, 4.15%) of retractions, indicating the prevalence of collaborative research in open access. In contrast, our results demonstrate that retractions are disproportionately prevalent among papers authored by smaller teams of 2-6 individuals (n = 1042, 88.45%). This observation is consistent with earlier research as well (Foo, 2011; Campos-Varela & Ruano-Raviña, 2019; Tang et al., 2020; Palla et al., 2020; Sharma, 2021), which also indicated higher retraction rates in publications featuring smaller teams of authorship.

The present study also explored the trends: **a**) reasons for retractions in comparisons with

authorship patterns, **b**) time elapsed between publication and retraction per retracted category, **c**) impact factor (IF) of the journal, and the number of retractions issued. This study examines retraction reasons in relation to authorship patterns, revealing that articles authored by smaller teams of 2-6 individuals are more likely to experience retraction due to issues such as peer review issues, duplication, and plagiarism. The temporal analysis of retraction timelines reveals significant variations among retraction categories. Data duplication necessitates the most extended retraction period (M = 45.18 months), followed by falsification/fabrication (M = 42.82 months) and unreliable data (M = 40.46 months). Likewise, the time interval from original publication to retraction was analysed, suggesting that only 35.23%) articles are retracted within the first twelve months from the date of the original publication. The retraction timeline indicated that approximately a quarter of the articles (N=299, 25.38%) were retracted within 13-24 months, followed by a similar proportion (N=286, 24.28%) within 25-48 months and a smaller fraction (N=178, 15%) after 48 months.

Nevertheless, in recent years, a noteworthy development in scientific communication is the decreasing time for retraction. Journals now take less than two years to identify and retract, which, in this study, suggests that this trend is more pronounced in publications involving authorship disputes and fraudulent peer reviews. Finally, the study correlation between journal impact factor and retraction frequency supports the idea that higher-impact journals conform to more stringent editorial and peer review standards, thereby reducing the likelihood of errors and misconduct. This finding is consistent with previous studies (Lei & Zhang, 2018; Al-Ghareeb, 2018), which suggest that journals with higher impact factors tend to demonstrate greater research integrity.

Conclusion

The retraction of scientific publications plays a vital role in upholding the integrity, credibility, and impartiality of knowledge in the academic landscape. Given the growth of research output in a country like India, addressing the knowledge gap surrounding publication ethics, retraction guidelines, and their scale is essential in fostering the culture of research excellence and objectivity. The study's findings indicate that manipulation of peer review, duplication, and plagiarism were the core reasons for the retraction of open-access articles. The increasing frequency of retractions raises concerns in the scientific community regarding the level of responsibility assumed by co-authors, reviewers, and editors of scientific journals. Traditionally, peer review is considered the benchmark for scientific validation. Therefore, fostering participation from reviewers in the burgeoning scientific communities worldwide is crucial to ensuring their dedication to the peer review process is sustained and valued. This inclusive approach enriches the process and reinforces the global standard of excellence in research (Bakker & Traniello, 2019).

Furthermore, an editor's responsibility in establishing systemic preventive and corrective mechanisms necessitates increased attention to data integrity and the consistency of research findings. Through this systematic analysis and appraisal of retracted publications, educators and researchers can develop targeted strategies to address this pressing ethical issue. They can leverage these cases as evidence of optimal research practices and cautionary examples of the consequences of unethical behaviour. To address the issues raised by the rise in retractions, the study offers three significant recommendations. Firstly, researchers must receive immediate training in ethical conduct matters because empirical evidence suggests that researchers often

appear unaware of the difference between plagiarism and proper citation (Zhang, 2010).

Furthermore, universities can impose substantial ramifications against individuals found guilty of research misconduct, including, but not limited to, publication bans and suspensions or terminations from teaching positions (Retraction Watch, 2014). Finally, since open-access scholarly publications have a greater audience and broader readership, it becomes even more important for the editors of such journals to have more robust procedures in place. Hence, vigilant monitoring is recommended to prevent future literature from being built on invalid and fraudulent research.

This study has a few limitations. It primarily focuses on open-access scholarly publications indexed in the Scopus database, though its coverage is limited. It is important to note that different databases have varying scopes. Future research could include the Web of Science and Retraction Watch databases. Additionally, researchers interested in retractions might find it helpful to conduct citation analyses of open-access articles, which could help address issues like the lack of context in citation metrics and differences in citation practices across academic fields.

Acknowledgements

Ishfaq Ahmad Palla is working as a Post-Doctoral Fellow under the Indian Council of Social Science Research (ICSSR) and acknowledges the organisation for post-doctoral scholarship and financial support.

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