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Original Article

Pharmacology Section

Journals' Characteristics and Factors Associated with Retraction among Pharmacology, Toxicology and Pharmaceutics Journals: An Observational Study Based on Scimago Journal and Country Rank and Retraction Watch Databases

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ABSTRACT

Introduction: Retraction is a corrective practice intended to address serious research mistakes and violations of research ethics. Most studies on retraction describe the characteristics of retracted papers, the attributes of retraction notices, the reasons for retraction, and/or the rates/patterns of retraction geographically or chronologically. Some studies have addressed postretraction issues, such as how retracted papers are cited after being retracted. To our knowledge, no study has focused specifically on the characteristics of the journals that issue retractions.

Aim: To describe the characteristics of journals and patterns of retraction, as well as to determine the factors associated with retraction occurrences among pharmacology, toxicology and pharmaceutics journals.

Materials and Methods: This was an observational study examining the metrics and retraction history of journals based on the Scimago Journal and Country Rank and the Retraction Watch databases. Descriptive and comparative analyses were conducted. Student's t-test, One-way Analysis of Variance (ANOVA) and the Chi-square test or Fisher's exact test were used, when appropriate, to test for significant differences. Logistic regression analysis was performed, and adjusted Odds Ratios (ORs) with 95% Confidence Intervals (CIs) were computed. A p-value of <0.05 was considered as statistical significance.

Results: Out of 116 journals in the subject category "Pharmacology, Toxicology and Pharmaceutics (Miscellaneous)", 50 journals (43.1%) were indexed in Web of Science (WoS), 61 (52.6%) were open access and 106 (91.4%) were still classified as "active" under Scopus as of January 2025. Overall, there were retractions in 29 journals (25%), including 192 retracted articles. The maximum number of retracted articles was 110, with an average of 1.66 retracted articles per journal. Journals that were WoS-indexed and those in quartiles Q1 and Q2 were significantly more likely than their counterparts to have at least one retraction. Journals from Western Europe, North America, and the Pacific region were significantly more likely to have at least one retraction compared to other geographic regions. In this context, journals with at least one retraction had higher metrics than those without any retractions, including the H-index, total number of documents (2023), total number of documents (3 years), total number of references, total citations (3 years), and number of citable documents. Being WoS-indexed and the H-index were found to be significant independent predictors of retraction in the logistic regression model.

Conclusion: The findings of the present study revealed that higher-quality journals (Q1 and Q2 journals, those with higher metrics and those indexed in WoS) experienced more occasions of retraction.

Keywords: Open access, Publicly accessible databases, Scimago journal and country rank quartile, Scopus indexing, World of science indexing

INTRODUCTION

Retraction is a corrective practice intended to respond to serious research mistakes and violations of research ethics that call into question the quality and validity of published articles. This practice is accomplished by increasing readers' awareness of such articles through the publication of retraction notices [1]. The main purpose of these practices is to protect the literature and science from fraud, misleading information and incorrect or inconclusive conclusions, rather than to punish researchers. However, the impact of retraction events on researchers whose work has been retracted can be harmful, as it may be perceived by the scientific community as a source of shame or stigma [2].

According to a study conducted by Budd JM et al., 81% of retracted papers were retracted by some or all of the authors, while only 19% were retracted by a person or organisation other than the authors, such as institutional investigating committees or deans, journal editors, or legal counsels [3]. In addition, Baskin PK et al., highlighted a suggestion by a researcher from Stanford, Daniele Fanelli, to create a system that allows authors to retract and republish articles facing honest errors on a voluntary basis [4].

The Committee on Publication Ethics (COPE) advises editors to retract a publication in any of the following situations: 1) miscalculation, fabrication, or manipulation of an image or data; 2) plagiarism; 3) redundant publication; 4) unauthorised use of materials or data; 5) violation of copyright; 6) conducting unethical research; 7) publication following a compromised or manipulated peer review process; and 8) failing to disclose a major competing interest [1].

Another practice that may overlap with retractions is the correction notice posted by some journals to address inadvertent mistakes in data, figures, or information, such as typos. If these mistakes are not corrected, they may affect the interpretation or application of study findings, although they may not necessarily impact the overall conclusions of a study [5]. This type of correction might be referred to as an erratum or corrigendum. The reason for the overlap is that the editor may decide to retract an article facing a similar problem

if the major defects require extensive corrections and if posting a correction note does not resolve the issue [5].

Kocyigit BF et al., reported three major reasons for retraction: fake-biased peer review, plagiarism and duplication [6]. According to a study conducted by Budd JM et al., the leading cause of retraction was error, which included mistakes in methods or analysis, problems with the data, and issues with the sample [3]. This was followed by misconduct or presumed misconduct. Some papers were also retracted because the author(s) were unable to replicate their results.

The SCImago Journal and Country Rank (SJR) is a publicly available portal that provides scientific indicators for journals and countries based on information contained in the Scopus® database [7]. Retraction Watch, which is currently part of Crossref, regularly collects information on retractions from journal websites [8]. To date, there are more than 55,000 retractions in the retraction watch database. Both databases, SJR and retraction watch, have been widely used as sources of data in studies [6,9-16].

Most studies in the literature on retraction have focused on describing the characteristics of retracted papers [3,6,11], the characteristics of retraction notices and reasons for retraction [10,17-20], and/or the retraction rates and patterns geographically or chronologically [11,21]. Some studies have also addressed postretraction issues, such as how retracted papers are cited after retraction [22,23]. To our knowledge, no study has specifically focused on the characteristics of the journals that retract papers, although Candal-Pedreira C et al., briefly touched on this area when they studied retracted papers originating from paper mills [16]. They reported on the characteristics of the journals that published such papers.

Therefore, this study was conducted to describe the characteristics of the journals and patterns of retraction, as well as to determine the factors associated with retraction occurrences among pharmacology, toxicology and pharmaceutics journals based on the SJR classification and the use of the retraction watch database. Specifically, this study aimed to determine whether retraction is influenced by journal indexing and ranking.

MATERIALS AND METHODS

The current study was an observational analysis of the metrics and retraction history of journals based on the SJR rank and the retraction watch databases. The study was conducted at the College of Pharmacy, Taif University, Taif, Makkah, Saudi Arabia from January 23, 2025, to February 23, 2025.

Data source and collection procedure: On January 23, 2025, all available data from the journals under the subject category "Pharmacology, Toxicology, and Pharmaceutics (miscellaneous)" were downloaded from the SJR website (https://www.scimagojr.com/journalrank.php) [7]. This yielded a total of 116 journals. The journal list was for the year 2023, and the available metrics were based on Scopus data as of March 2024. This data was downloaded as an Excel sheet.

The SJR website provides an option to select only open access journals and only WoS journals; therefore, this website was used to identify the status of the 116 journals, determining whether they were WoS or not, and whether they were open access. This was accomplished by downloading the two lists and matching them with the complete list of the 116 journals.

The retraction history of all 116 journals was retrieved from the retraction watch database (website: https://retractiondatabase.org/RetractionSearch.aspx#?jou%3d) during the period from January 28, 2025, to February 11, 2025. Each journal was examined individually on the website, and the available information for each journal was saved as a PDF file for documentation and careful checks [8]. According to the user guide posted on the retraction watch website [24], searches must include criteria entered in at least one of the available fields, such as author, title, journal, publisher, affiliation(s), country(s), article type(s), original paper date ranges, retraction or other notices date ranges, and PMID or DOI for either the original paper, notice, or both. In this research, only the field "journal" was used to display the necessary information.

After all 116 journals in the Retraction Watch database were checked; the entire list of reviewed journals on the SJR website was checked again and printed on February 11, 2025, to confirm that there had been no changes since the beginning of the review on January 23, 2025. No changes were found in the listed journals. On February 12, 2025, a list of all journals indexed in Scopus was downloaded (last updated in January 2025) to verify the current status of the 116 journals, determining whether they were still considered active or inactive according to the terminology used by Scopus.

In accordance with the Retraction Watch user guide [24], searches return not only retractions but also corrections and expressions of concern in the database. Therefore, in the present study, each retracted paper mentioned in the journal profiles was checked on the website itself to confirm that the action was a true retraction and not simply a correction or an expression of concern.

Important definitions: The following journal metrics were covered in this study and can be defined according to the Scimago official website [25] as follows:

(1) 'H' index: "The 'h' index expresses the journal's number of articles (h) that have received at least 'h' citations. It quantifies both the journal's scientific productivity and scientific impact and is also applicable to scientists, countries, etc.,"

(2) Total documents (2023): "Output of the selected period. All types of documents are considered, including citable and non citable documents".

(3) Total documents (3 years): "Published documents in the three previous years (documents from the selected year are excluded). When year 'X' is selected, documents published in years 'X-1','X-2', and 'X-3' are retrieved. All types of documents are considered, including citable and non citable documents."

(4) Total references: "This includes all the bibliographical references in a journal during the selected period."

(5) Total cites (3 years): "This refers to the number of citations received in the selected year by a journal for the documents published in the three previous years; for example, citations received in year 'X' for documents published in years 'X-1', 'X-2', and 'X-3'. All types of documents are considered".

(6) Citable documents (3 years): "This is the number of citable documents published by a journal in the three previous years (documents from the selected year are excluded). Only articles, reviews, and conference papers are considered".

Metrics were available for each journal on the SJR website. For the purpose of this study, their means and standard deviations were calculated, and they were compared for journals with retractions against those without retractions.

STATISTICAL ANALYSIS

Data and metrics for the journals were downloaded from the SJR website as an Excel sheet. Information on retractions (available or unavailable), the number of retracted papers, and journal status regarding WoS indexing, Scopus indexing, and open access ('yes' or 'no') was added to the same Excel sheet. The data were then exported to IBM Statistical Package for the Social Sciences (SPSS) version 22.0 [26], where descriptive and comparative analyses were conducted. Student's t-test, One-way ANOVA, and the Chi-square test or Fisher's exact test were used as appropriate to test for significant differences. Logistic regression analysis was performed, and adjusted ORs with 95% CIs were computed. A p-value of <0.05 was considered statistical significance.

RESULTS

Out of 116 journals under the subject category "Pharmacology, Toxicology and Pharmaceutics (miscellaneous)", 50 journals (43.1%) were indexed in WoS, 61 (52.6%) were open access, and 106 (91.4%) were still classified as "active" under Scopus as of January 2025. Overall, there were retractions in 29 journals (25%), which included a total of 224 retracted articles. This number was later corrected to 192 true retractions, as 32 were found to be corrections or expressions of concern upon closer examination. The maximum number of retracted articles was 110, with an average of 1.66 retracted articles per journal. [Table/Fig-1] shows the general characteristics of the 116 journals.

Item	Category	F (% out of 116)
Status of WoS indexing	No	66 (56.9)
	Yes	50 (43.1)
Status on Scopus by January 2025	Not active	10 (8.6)
	Active	106 (91.4)
Open access	No	55 (47.4)
	Yes	61 (52.6)
Availability of retraction	No	87 (75.0)
	Yes	29 (25.0)
Type of journal	Journal	114 (98.3)
	Trade journal	2 (1.7)
SJR quartile	Q1	29 (25.0)
	Q2	29 (25.0)
	Q3	28 (24.1)
	Q4	29 (25.0)
	No quartile	1 (0.9)
Origin of the journal (country)	India	17 (14.7)
	United States	13 (11.2)
	United Kingdom	12 (10.3)
	China	8 (6.9)
	Iran	7 (6.0)
	Germany	6 (5.2)
	Netherlands	5 (4.3)
	Brazil	5 (4.3)
	Other countries	43 (37.1)
Origin of the journal (geographic region)	Western Europe	30 (25.9)
	Asiatic region	30 (25.9)
	Eastern Europe	14 (12.1)
	Middle east	14 (12.1)
	Northern America	13 (11.2)
	Latin America	8 (6.9)
	Pacific region	6 (5.2)
	Africa	1 (0.9)

[Table/Fig-1]: General characteristics of 116 journals under the subject category "Pharmacology, Toxicology and Pharmaceutics (miscellaneous)" in the Scimago Journal & Country Rank database.
WoS: Web of science; SJR: Scimago journal and country rank

A comparison between journals with at least one retraction and those without any retraction based on journal characteristics is presented in [Table/Fig-2]. Journals that were WoS-indexed and those in quartiles Q1 and Q2 were significantly more likely than their counterparts to have at least one retraction. Journals from Western Europe, North America, and the Pacific region were significantly more likely to have at least one retraction than those from other geographical regions. By country, no significant differences were observed, and there were no significant differences regarding being open access or not, or being active or inactive in Scopus as of January 2025. On the other hand, journals with better indexing status (WoS, Scopus, and Q1) and those that were open access experienced higher average numbers of retractions; however, these differences did not reach statistical significance [Table/Fig-3]. Similarly, journals originating from countries such as the United States, Iran, and the United Kingdom, as well as those from North America and the Pacific region, had higher average numbers of retractions; however, these differences were not statistically significant.

Variable	Category	Journals with No retraction (n=87) F (column %)	Journals with retraction (n=29) F (column %)	p-value
Being WoS indexed	No	60 (69.0)	6 (20.7)	<0.001
	Yes	27 (31.0)	23 (79.3)	
Being scopus active by January 2025	Not active	10 (11.5)	0	0.064
	Active	77 (88.5)	29 (100.0)	
Being open access	No	45 (51.7)	10 (34.5)	0.107
	Yes	42 (48.3)	19 (65.5)	
SJR quartile	Q1	12 (13.8)	17 (58.6)	<0.001*
	Q2	19 (21.8)	10 (34.5)	
	Q3	27 (31.0)	1 (3.4)	
	Q4	28 (32.2)	1 (3.4)	
	No quartile	1 (1.1)	0	
Origin of the journal (country)	India	14 (16.1)	3 (10.3)	0.281*
	United States	8 (9.2)	5 (17.2)	
	United Kingdom	6 (6.9)	6 (20.7)	
	China	7 (8.0)	1 (3.4)	
	Iran	5 (5.7)	2 (6.9)	
	Germany	4 (4.6)	2 (6.9)	
	Netherlands	3 (3.4)	2 (6.9)	
	Brazil	4 (4.6)	1 (3.4)	
	Other countries	36 (41.4)	7 (24.1)	
Origin of the journal (geographic region)	Western Europe	16 (18.4)	14 (48.3)	0.003 *
	Asiatic Region	26 (29.9)	4 (13.8)	
	Eastern Europe	14 (16.1)	0	
	Middle East	12 (13.8)	2 (6.9)	
	Northern America	8 (9.2)	5 (17.2)	
	Latin America	7 (8.0)	1 (3.4)	
	Pacific Region	3 (3.4)	3 (10.3)	
	Africa	1 (1.1)	0	

[Table/Fig-2]: Availability of retractions by journal characteristics via cross-tabulation with Chi-square or Fisher's exact*.
*Fisher's exact test instead of Chi-square test; WoS: Web of Science; SJR: Scimago Journal and Country rank

All the journals' metrics were significantly different between the two categories of journals- those with at least one retraction versus those without any retraction [Table/Fig-4]. Specifically, journals with at least one retraction had higher metrics than those without any retraction, including the H index, total number of documents (2023), total number of documents (3 years), total number of references, total cites (3 years), and number of citable documents.

When multivariate regression analysis was conducted using backward logistic regression, only three variables remained in the final model [Table/Fig-5]. Open access status, SJR quartile, total documents (2023), total documents (3 years), total references, total cites, citable documents (3 years), countries, and geographical regions were excluded from the final model. Only being WoS-indexed and the 'H' index were found to be significant independent predictors of retraction, with WoS-indexed journals (adjusted OR=3.315, 95% CI: 1.029-10.679) and those with a higher 'H' index (adjusted OR=1.036, 95% CI: 1.016-1.056) being more likely to experience retraction.

Variable		M±SD	p-value
Status of WoS indexing	No	0.26±1.19	0.149*
	Yes	3.50±15.62	
Status on Scopus by January 2025	Not active	0	0.599*
	Active	1.81±10.83	
Open access	No	0.38±1.06	0.189*
	Yes	2.8±14.21	
SJR quartile	Q1	5.38±20.29	0.266**
	Q2	1.17±2.99	
	Q3	0.04±0.19	
	Q4	0.03±0.19	
	No quartile	0	
Origin of the journal (country)	India	0.41±1.06	0.294**
	United States	9.92±30.25	
	United Kingdom	1.33±2.54	
	China	0.50±1.41	
	Iran	2.29±5.62	
	Germany	0.50±0.84	
	Netherlands	0.60±0.89	
	Brazil	0.20±0.45	
	Other countries	0.30±0.83	
Origin of the journal (geographic region)	Western Europe	0.87±1.70	0.216**
	Asiatic region	0.37±1.07	
	Eastern Europe	0	
	Middle east	1.14±3.99	
	Northern America	9.92±30.25	
	Latin America	0.13±0.35	
	Pacific region	1.50±1.76	
	Africa	0	

[Table/Fig-3]: Number of retractions by journal characteristics.
* Student's t-test; **One-way ANOVA; WoS: Web of science; SJR: Scimago journal and country rank

Metrics	Journals with no retraction N=87 M±SD	Journals with retraction N=29 M±SD	p-value
H index	22.77±26.46	70.10±48.18	<0.001
Total documents (2023)	114.61±168.59	272.14±344.18	0.024
Total documents (3 years)	341.30±491.80	881.69±1064.40	0.013
Total references	4534.29±6904.68	15276.17±23708.86	0.023
Total cites (3 years)	450.25±1206.66	3898.28±6590.71	0.009
Citable documents (3 years)	328.87±493.73	856.72±1060.71	0.014

[Table/Fig-4]: Journals metrics by availability of retraction ('No' versus 'Yes') using Student's t-test.

Variables	Adjusted OR (95% CI)	p-value
Being WoS indexed	3.315 (1.029-10.679)	0.045
Being Scopus active by January 2025	Cannot be computed	0.998
'H' index	1.036 (1.016-1.056)	<0.001
Constant	0.000	0.998

[Table/Fig-5]: Factors independently predicting retraction via backward logistic regression analysis.

DISCUSSION

The findings of the present study revealed that higher-quality journals (Q1 and Q2 journals, those with higher metrics, and those indexed in WoS) and journals originating from Western Europe, North America, and the Pacific region were more likely to experience retractions. Additionally, regression analysis indicated that being indexed in WoS and having a higher 'H' index significantly predicted the presence of at least one retraction.

Understanding the findings of this study requires answering two important preliminary questions. The first question is: Should the occurrence of a retraction be considered a positive or a negative sign of the quality of the journal experiencing the retraction? The second question is: What is the accepted rate of retraction per journal that the scientific community can agree upon?

Finding a satisfactory answer to the first question depends on understanding how a retraction occurs, whether it is likely to be initiated by the journal or by the authors, and what the common reasons for retractions are- whether due to failures on the part of the researchers or systemic issues within the editorial process. However, these issues are complicated and not straightforward. A retraction may reflect a good editorial system that closely monitors submissions, efficiently responds to issues, effectively communicates with authors, and is able to detect failures in research work even after papers have been published. It may also indicate better adherence to research and publication ethics.

The answer to the second question regarding the acceptable rate of retraction per journal helps provide a more comprehensive understanding of the first question. A dramatically high number of retractions would call into question the quality and rigor of the editorial and peer review processes. Thus, it can be assumed that if retractions occur within an acceptable rate and are not due to failures on the part of the journal (i.e., compromised peer review) and if they have been tracked by the journals themselves, they can be considered positive signs of the quality of the journals and/or the publishers.

Moreover, while retraction is often viewed as shameful for an author, some authors deserve respect when they voluntarily respond to correct inadvertent mistakes in their experiments. According to Baskin PK et al., and based on Daniele Fanelli's previously mentioned suggestion, "authors should be praised for acting with integrity in their efforts to correct the scientific literature" [4]. Vuong QH, concluded that promoting "heroic acts" (referring to retractions that are requested by the authors themselves before anyone else notices the defect) in science can positively change the current publishing culture [27]. He also noted that after reviewing more than 2,000 retracted papers in a study, limitations of retraction notices and the absence of study limitations in most of the retracted papers were highlighted.

According to Candal-Pedreira C et al., the highest proportion of papers retracted for originating from paper mills were published in Q2 of the Journal Citation Reports (JCR) quartile (44.8%), followed by Q1 (29.6%) and Q3 (21.0%). A very low proportion of the papers were published in Q4 (2.1%) and other journals with no impact factors (2.5%) [16]. A greater proportion of these journals were open access. This situation can be interpreted as a "dirty business" targeting high-quality journals to recruit more customers from academia and research institutes, while also targeting open access journals to justify collecting money from those customers. This requires extra effort from journal editors and publishers to protect the integrity of science by implementing clear policies and rigorous procedures in peer review.

Bosch X et al., studied the misconduct policies of 399 high-impact biomedical journals across 27 biomedical categories [28]. Procedures for responding to misconduct, including retraction (30.8%) and expressions of concern (16.3%), were clearly documented by fewer than 50% of the journals. On the other hand, Candal-Pedreira C et al., previously reported that the median time elapsed between publication and retraction was shorter in Q1 and Q2 journals than in Q3 and Q4 journals [16]. This finding may support the interpretation that higher-quality journals respond more effectively to situations requiring retractions.

Limitation(s)

To the knowledge of the authors, this was the first investigation to address the journal-related factors in retraction. However, the

study was based on publicly accessible databases: the Scimago Journal and Country Rank and Retraction Watch, and the number of variables covered was limited according to the Scimago journal metrics. It was not intended to cover all journal-related factors, such as the mode of peer review (open versus blind) and the contents of the retraction notices, which require further examination of the journals' websites and a detailed focus on each retracted paper. This can be investigated in future research.

The indexing of journals was restricted to WoS, open access and Scopus, which are widely recognised rankings. Other abstracting and indexing databases, such as Medline and PubMed, were not included. Furthermore, the study only covered journals under the Scimago subject category "Pharmacology, Toxicology, and Pharmaceutics (miscellaneous)," and thus the findings may not be generalisable to other subject categories. The findings of this study provide a basis for future research and other journal categories may be included in upcoming studies to confirm the current conclusions.

CONCLUSION(S)

The findings of the present study revealed that higher-quality journals (Q1 and Q2 journals, those with higher metrics and those indexed in WoS) were more likely to experience retractions. In addition, regression analysis indicated that being indexed in WoS and having a higher H index significantly predicted the presence of at least one retraction.

Authors contributions: A.I.F. collected data, conducted analysis, wrote the main manuscript text, prepared tables, reviewed and approved the manuscript.

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