Analysis of Retracted Articles in Pharmacology and Pharmacy

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Retraction is one of the most challenging issues raised when dealing with unethical cases. In accordance with the retraction guidelines published by the Committee on Publication Ethics (COPE), the main purpose of retraction is to correct literatures, in order to ensure that they are correct. Moreover, retraction is a mechanism used to inform readers about those kinds of articles with serious data defects and errors, and their results and conclusions are not reliable enough. In this guideline, it is clearly indicated that published articles with a serious unethical issue should be retracted by the editors of the journals as soon as possible. The timely and rapid publication of retraction can significantly reduce the citation of these kinds of publications and also prevent the diversion of future research.[1]

Therefore, it is clear that the publication of retraction notices is very important for the future of different research areas. The number of retracted articles has a growing trend, and the attention paid to them is increasing as well, particularly regarding the development of editorial policies as well as designing and arranging flowcharts. So, it can be stated that one of the important factors to identify reputable scientific publishers and journals as well as distinguishing them from predatory publishers and journals is to have editorial policies of retraction, clarification, and corrections, along with following COPE flowcharts and guidelines.

One of the challenging issues is identifying the reasons for which articles are retracted from journals. Obviously, finding these reasons of the retraction with the purposes of eliminating the shortcomings and avoiding the repetition of mistakes can cause a positive effect on future research. In a general classification, the reasons of retraction are categorized in the following two categories:

1. Error: making an error during the research process is one of the reasons of the retraction of articles. In some cases, the authors decide to publish their article in a journal without completely knowing the mistakes within it. Upon the notification of the publisher/journal and by explaining the problem, the authors request the retraction of published paper.

2. Fraud: Fraud (data manipulation) includes data fabrication and falsification and error includes plagiarism, duplication, scientific mistake, ethical issues, journal error (administrative and peer review), and no reason (unclear).[2]

Pharmacy and pharmacology are known as important fields in medical sciences. Drug discovery and development process could have a considerable effect on the management of diseases.[3] During COVID-19 pandemic, retraction of some articles changed the research integrity and correctness of scientific information.[4] Therefore, analysis of retracted articles can help to highlight the future articles containing seriously flawed or erroneous information for researchers and to avoid the unintentional errors by authors, which consequently lead to retraction.

Based on the main purpose stated in the COPE's retraction guidelines, in this study, all retractions indexed in the Web of Science (WOS) from 1983 to 2020 were searched by selecting the research areas of Pharmacology and Pharmacy and their combination with "retraction of", "retracted article", "retraction of Vol", "retraction notice".

The numbers of articles and retractions indexed in the subject category of WOS (from 1983 to 2020) were 1523802 and 357 (0.023%) papers, respectively. The increased relative frequency of the retractions (number of retraction/number of the articles) has been observed in pharmacology and pharmacy subject area (Figure 1). In recent decades, similar patterns in the analysis of retracted articles in other categories have been reported as well.[5-8]

According to Table 1, the reasons of retraction are divided into 11 main categories, some of which have a number of subcategories. The highest number of retractions was found to be due to the fraud (25.8%), followed by redundant articles (14.7%) that was the main reason for 353 retracted articles. The analysis of the reasons of the articles' retraction showed that they have not been always declared clearly. In the present study, no reason was stated in regard to refer to the retracted

article in 21 cases. Unfortunately, some journals continue to retract articles without mentioning any clear reason. However, according to the international standards for retraction, it should be explained why the article has been retracted.

Surprising issue is a citation of retracted article, so that 357 retrected articles had 564 citations after retraction. Most of the previous studies conducted in retraction area have focused on the issue of continuing citations, as articles are still cited even by passing a long time from their formal retraction.[9-11]

There may be various reasons and motives for citing the retracted articles. The authors may believe that despite the inclusion of the retracted article, methodology, findings or results of the retracted articles are correct and valid, whenever:

1. The retraction has occurred due to the manipulation of the figures/shapes, but the methodology is still considered as valid.
2. The results are still considered as valid.
3. The retraction has occurred due to ethical and legal issues, but the results or methodology is still considered as valid.
4. Self-citation of articles retracted by authors of the article due to any of the above-mentioned reasons, disagreement with the retraction of the article, or other unknown reasons.[12]

Common sense suggests that the retracted article should not be cited because this kind of citation spreads misinformation, especially if the retraction is due to fraud or scientific misconducts. Retraction of articles is a solution for the revision of published papers and available knowledge. In other words, this is a way of removing an article from the list of published articles. So, the citation of retracted articles indicates that the lifeline of removed or retracted articles is continuing. Accordingly, this can be considered a risk, especially citing the results of medical retracted articles can be more risky. Nowadays, journals, publishers, indexing, and archiving databases follow some methods such as removing the original article, inserting a watermark into the file, linking to the main article, and noticing the retraction on the website.[13] It also seems that solutions such as using software to identify retracted articles; using cross-mark by journal editors to ensure that researchers have used a reliable, new version of a scientific article; creating a databank for retracted articles; and the provision of instructions by the COPE to provide a strategy for editors/publishers in order

to address issues referenced in the retracted paper, are some of the methods that should be considered to prevent the citation of the retracted article.

Notably, 111 journals from 52 publishers, have published retractions. EUROPEAN REVIEW FOR MEDICAL AND PHARMACOLOGICAL SCIENCES with 25 retracted articles, CLINICAL THERAPEUTICS with 17 papers, and MOLECULAR PHARMACOLOGY with 14 retracted articles have the highest numbers of retraction articles. Of these papers, 44 journals (39.64%) have published only one retraction. In the publisher group, ERGAMON-ELSEVIER SCIENCE LTD with 31 articles, ELSEVIER SCIENCE BV with 29 articles, and ELSEVIER with 28 articles are ranked with the highest numbers of retracted articles, respectively. According to the results of the present study, major publishers such as ELSEVIER, WILEY, TAYLOR and FRANCIS, and SPRINGER are seen in the list of publishers with the largest numbers of retractions.

It is noteworthy that what makes a scientific method/approach unique, is the accuracy that it requires in performing all involved tasks. From observation stage to experiment, data recording, data analyzing, data tabulating, data reporting, and communicating the data to the expert/public audience stages, this principal should be considered. All these steps should be understandable, traceable, and reproducible by other scientists. Mistakes may possibly happen, and typo-graphical mistakes are among the most common mistakes in this regard. Therefore, there is a possibility to publish "erratum". Otherwise, in a bigger scale, retraction by author(s) may happen (mostly due to the lack of reproducibility). However, both fraud and plagiarism are among intentional deeds. The authors are responsible to inform the journal about the error and problems in their published work in terms of the COPE guideline. Journal's editors also have the responsibility to match scientific misconducts with the COPE and to adopt effective strategies.[1] Therefore, the retraction articles and informing should be facilitated by creating a transparent and flexible community, in order to report errors in the published articles. Thus, paying enough attention to the cause of retraction articles can be effective on modifying the published knowledge and avoiding citation in other types of research related to the scientific community in the future.

Availability of data and materials

All data (retracted articles) are available in Web of Science database and details of analyzed data during this study are included in this published article. More data are available from the corresponding author at the email address of sarajalalzadeh62@gmail.com

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

SJ, AS and FA contributed to the conception of the research. Search strategy was designed by FA, SA, AS. Data was searched and downloaded by FA. SJ, AS and FA analyzed data. Also AS reviewed all data as a subject specialist in Pharmacology and Pharmacy field. SA, AS and FA contributed in interpreting data, drafting and revising, and approving the final version for submitting in journal.

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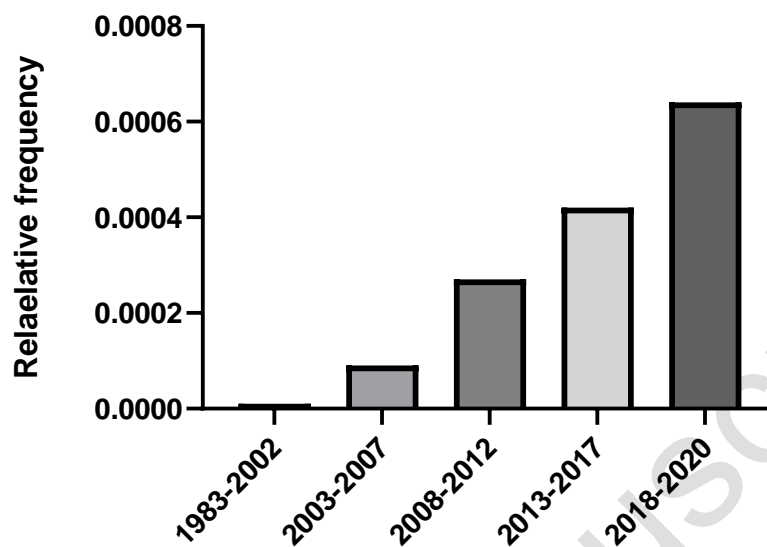
Figure 1. Relative frequency of the retractions (number of retraction / number of the articles) in pharmacology and pharmacy subject category of WOS (1983- 2020)

Table 1. The reasons for retracted articles

	Reason	Sub-category	records	%
1	Fraud	Fabricated data/Figure Falsified data	91	25.8
2	Redundant articles (The same authors, self-plagiarism)	- complete (i.e., duplicate/ triplicate publication) - partial (i.e., overlapping publications)	52	14.7
3	Honest error (Request of authors)	(a) based on incorrect/fraudulent* data/inaccurate data/	11	13.6
		(b) research error (e.g., wrong cell line)	18	
		(c) calculation (errors in the processing and evaluation of data) error	6	
		(d) other	13	
4	Plagiarism	- Amount unspecified - total (i.e., whole paper copied) - partial	44	12.5
5	Inaccurate/misleading/ reporting/careless data/incorrect data		39	11.0
6	No reason/unclear		21	5.9
7	Data used without permission/author dispute (discrepancy in authorship)/ Copyright/licenses/ without obtaining clearance from the Office of Research		20	5.7
8	Journal (administrative and peer review) error		16	4.5
9	Misconduct (unspecified)		15	4.2

10	Ethical problems with research (e.g. pending organizational management approval from the authors' institution)	5	1.4
11	Related to Conflict of Interest	2	0.6
	Total	353	100