**Title: Evaluation of retracted publications in Dentistry: an empirical research**

**Abstract:**

**Background:** Publication retraction aims to maintain the integrity of science by taking actions against flawed research. Retractions in dental literature have been on the rise in recent years. Hence this research aimed to evaluate retracted articles related to dentistry.

**Methods:** A descriptive cross-sectional survey was carried out on retracted articles in dental literature till 31st March 20120 from PubMed were scrutinized by two independent reviewers.

**Results:** Total 143 retracted articles were identified, first paper getting published in 1998. Redundant publication (35%) was most common reason for retraction followed by plagiarism (30.1%) and data manipulation (29.4%). There were 7% cases of image plagiarism and 5.6% cases of image manipulation. Among article type, original articles (70.6%) were most common type of articles getting retracted. As many as 27.3% of the retracted articles received funding. Around 5.6% of the articles were single authored and 80.5% of the articles belonged to authors from a single nation. Around 1300 papers were cited post-retraction. Duration of retraction post publication was more for funded articles (23 months) as compared to non-funded articles (16 months). Duration of retraction was more for articles with data manipulation (52.2 months) than with other type of misconduct. As many as 21 journals and nine authors were identified with multiple retractions. Majority of the authors were from Asian countries, with India having highest no of authors (37%).

**Conclusion:** Misconduct in dental publications has been on the rise which is reflected by amount of retraction in funded as well as non-funded research.

**Key-words:** Dentistry;Fraud;Plagiarism;Retraction of publication; Scientific misconduct.

**Introduction**

The fundamental purpose of research publication is to disseminate the research findings which validate existing information and/or add new knowledge to the literature. However, in this era of “Publish or Perish”, healthcare professionals are getting forced to publish more and more articles regardless of their scientific credibility (1). The race for publications has caused rise in scientific misconduct in research. The fraudulent publication is serious threat to the scientific world with far reaching consequence of false scientific evidence, Patients harm, wastage of resources/funds, erode trust in research, and damage reputation of authors and institutions (2). To curtail this problem, intentional fraud or unintentional error when diagnosed in the publication is dealt with correction or retraction depending on the magnitude of problem (3). The publication is retracted if there is convincing reliable evidence of any major unintentional editorial/experimental error or the intentional research misconduct such as redundant publication, plagiarism, fake peer review, reuse of information without permission, copyright violation, unethical research, and/or undisclosed competing interest (3). Timely retraction of publication will alert the readers about any error or misconduct which will prevent them from utilising the flawed/unreliable information in future.

The rise in retraction of publications is observed in every field including Dentistry. It is necessary to evaluate the characteristics of retracted publications for deeper understanding its causes, to raise awareness among readers and formulating future editorial strategies to tackle this issue. Several surveys have evaluated the retracted publications in different specialities and helped readers in understanding the reasons behind it (4-6). The retracted articles related to dentistry was also evaluated in 2018 (7). However, this research intends to more detailed evaluation of all the dental subject related retracted publications.

**Methodology**

A descriptive cross-sectional survey was carried out to study the characteristic of dental subject related retracted publications. All the articles were searched in Medline database using the PubMed search engine. The search term “dental” was used with application of filters “retracted publications” and “retraction of publications”. Retraction notices were searched and data extracted till March 31st 2020.

Two reviewers independently performed data extraction to minimise errors. Any disagreements between the authors on the cause of retraction were resolved through discussion and came to a consensus. All the unrelated article such as non-dental subject publications and non-retracted articles were excluded. Full text of all the selected articles’ retraction notices were downloaded and screened independently by two authors. The reason for retraction was identified from screening of the retraction notice in PubMed and on the publisher’s website. Reasons for retractions were categorized under the following types: redundant/duplicate publication, plagiarism, data manipulation, authorship disputes, unethical reasons, undisclosed conflict of interest, breach of copyright, fake peer review, and unknown reasons. We have sub-categorised few retraction reasons such as plagiarism into unspecified or text plagiarism, data plagiarism, image plagiarism; data manipulation into data fabrication, data falsification and image manipulation; authorship disputes into author not listed, author listed without consent and other disputes. Publications with multiple reasons for retraction were considered in multiple suitable categories. Total citations and post publication citations of every publication was assessed through Google Scholar.

Following data was extracted from original publication: Type of article (Original, Review, Case report/series and others), number of authors, country and affiliation of authors, journal name, year and month of publication and retraction for assessment of time lag between them (Duration for retraction), and funding information. We have also identified the journals which retracted the multiple publications and authors with multiple retractions. Statistical analysis was performed using SPSS Version 16 SPSS, Chicago,IL). Descriptive statistics employed to estimate the frequencies, percentages, Inter-quartile range (IQR), median and mean (standard deviation).

**Results**

Overall 205 retraction notices were retrieved from the Medline database. Among them only 143 articles included after excluding publications which. Of the 143 retraction notices, 10% notices didn’t report any specific reasons for retractions. The most common causes for retraction were redundant publication (35%), Plagiarism (30%) and data manipulation (29.4%). Among the 43 plagiarised publication, 13 publication attributed to images plagiarism. Data manipulation was observed in 29.4% articles which includes Data fabrication (19%), Data falsification (5%), and Image manipulation (5.6%). Authorship issues and unethical reasons resulted in retraction of 6.3% and 2.1% publications respectively. Conflict of interest and breach of copyright are the reasons behind retraction of two articles each. Nearly, 10% articles didn’t report any reasons for the retraction. (Table1)

The results showed that most of them were original articles (70%) and 27% (n = 39) retracted publications received funding. The median duration for retraction (i.e time lag between article publication and retraction) was 17 months and the median citations for the retracted publications were 9. (Table 2) The majority of the funded articles were retracted due to data manipulation (38.4%) while majority of non-funded articles retracted mainly because of redundant publication (39%). Duration for retraction of funded publications (23 months) was more than the non-funded (16 months). The plagiarism complain was high in non-funded (36.7%) publications than the funded (15%). (Table 3) Among all the scientific misconducts, data manipulation publications took more time to get retracted and also received more citations. Publications with authorship conflicts were retracted in less duration (8 months) compared to other scientific misconducts. (Table4)

On detailed evaluation, it is observed that nearly 21 journals retracted multiple publications and six journals retracted multiple publications of a same author. There were about nine authors who were associated with multiple publications that were retracted. Surprisingly, about 10 publications belonging to the same author were retracted. There were as many 21 journals with multiple retraction found in present study, out of which one journal had IF < 2, six journal had IF ≥ 2 and 13 journals had no impact factor. (Table 5) Most of the authors in the retracted publications were from India (37%) followed by Japan (9%), Spain (8.2%), USA (6.6%) and China (7%). (Table 6)

**Discussion**

In recent years, retraction of scientific articles has been on the rise. But it remains uncertain whether this increase is because of increase in instances of intentional misconduct or results of improved detection of flawed publications. Still, many of the unreliable publications go unnoticed and undetected (8). In this study, the major reasons for retraction were redundant publication, plagiarism and data manipulation. Redundant publication is the cause of about the 35% of dental retractions. Redundant publications are relatively easiest form of misconduct and may result from pressure created on researchers/academicians due to current academic reward system (9). Redundant publication can be considered as an umbrella of scientific misconduct which can constitute plagiarism, data fabrication, and breach of copyright. Authors came across one such scandalous research while evaluating redundant publications where a researcher rejected a manuscript which was sent to her for peer-review from a journal and later published the same manuscript in another journal by her name (10). Redundant publications may lead to over-estimations in meta-analysis and thus generate false evidence (11,12). Plagiarism is the another common type of research misconduct and about 30% of the retracted articles in the present study were plagiarised. Plagiarism includes copying text, images, graphs and tables without permission and cross-referencing (13). There are several software available to detect the plagiarism; however, most of them are able to detect only text plagiarism, but it becomes challenging to detect the image plagiarism. In this study, authors found that about 9% articles were retracted because of plagiarised the images. Poor language proficiency (Non-English speaking countries), inadequate skills of scientific writing, rising open access to literature and pressure to publish more articles, the inability to purchase authentic plagiarism detection software among authors of low income countries are considered major reasons behind the plagiarism practice (14,15).

Data manipulation which includes both falsification and fabrication is considered most egregious type of research misconduct. Data manipulation is more difficult to detect because its less visible and less subjected to public/peer scrutiny. Usually the cases of data manipulation were less detected in other research but nearly 30% publications were retracted because of data manipulation in the present study (5,16,17). Our study also revealed that the publication with data manipulation took more time to get retract (31 months) and received more citations (13 Citations) compared to publications retracted because of other reasons. This might be attributed to the fact that data manipulation is more difficult to identify and it takes more time to confirm such kind of misconduct. It is also observed that data manipulation was most common among the funded publications than the non–funded. However, non-funded research was mostly retracted because of plagiarism and redundant publication. This indicates that the researchers of funded research are clever enough to avoid the plagiarism and duplication which are easily detectable but engage in data manipulation which is rather difficult to estimate. The authorship dispute is the reason for retraction of nearly nine (6.3%) publications in this study. COPE guidelines don’t support the retraction of publication on the ground of authorship dispute when there is sufficient evidence supporting the validity and reliability of the data in the publication (3). Editors should resolve these disputes by publishing correction to the author list if there is sufficient evidence that such a change is justified (3). One of the distinguishing reasons for the retractions found was patient withdrawing the consent after publication of case report in one of the articles. However, upon accessing the retraction notice, no reason was mentioned as to why the patient had requested to withdraw the consent after publication.

Our investigation also found that most of the retractions resulted from original articles/research which consisted of in-vitro and in-vivo studies, followed by case reports/case series and review articles. Similar findings were observed in other studies conducted (18,19). Original articles are more retracted which might be related to high number of publication of this article type or it can be seen that experimental studies have more potential of committing scientific misconduct than any other type. Regarding the number of authors, this study found out around 5.6% single author studies. This is consistent with previous studies where single author studies represented 5% and 6.6% retractions respectively (2,20). This might be attributed to the fact that a single researcher has usually less tendency to indulge into such misconduct and there is no or less pressure from others to accomplish the goal. It was also found that majority of the articles (80.5%) retracted belonged to authors representing a single country. Similar findings were seen in previous research conducted which reported around 65% articles retracted had single nation authorship (21). It is unfortunate that retraction does not always put full stop on the life of a publication. This can be seen from post-retraction citation data from the present study where retracted articles were cited 1300 times in the coming years following the retraction notice. It is the responsibility of the authors to properly check and scrutinize each and every article for its authenticity before citing it in their work to avoid basing their work on untrustworthy data. It is also the responsibility of journal editors to inform about the retracted literature on their journal website, by putting a retraction note and clearly identifying the articles as retracted by putting a watermark on the same. In the present study, 8 articles did not have any such retraction note mentioned on the journal website. Hence, it is recommended that journal editors should scrutinize every reference in the submitted article to avoid reference citing retracted article, in order to reduce errors in future publications.

It can be seen that most of the retracted articles (54 articles) belonged to renowned journals (having Journal Citation Reports IF) especially those with those journals having IF≥2. It should also be noted that journals with lesser or no impact factor value were also no exception to fraudulence. This can be explained by the fact that journal with high impact factor are considered as prestigious and having high standard; hence attracting more number of submissions. One more interesting feature which was seen in the study was authors with multiple retractions to their name. Similar results were seen in a study conducted by Katavik V which reported 14 authors having multiple retractions (22). It may be believed that with the introduction of new journals every day, it would not be easy to identify misconduct across numerous journals. Hence, authors may dare to commit such misconduct thinking that their deeds might escape or go unnoticed. Another trend which was seen in the present study is that no. of retracted publications belonged to the same author and the same journal. This might be attributed to the fact that an author who has already published an article with a particular journal may have an unexpressed and intangible benefit where the journal authorities and peer-reviewers consider the author as an expert and qualified in the field and is less likely to perform misconduct (20). Similar results were reported by Foo JY where 21 authors had more than two publications retracted from the same journal(s) (20). Lastly, it was also seen that majority of the retracted publications were form low income countries such as India, Nepal, Pakistan, Srilanka, Kenya, Brazil and Iran. These findings are similar to previous studies conducted by Amos and Faggion et al. who reported highest retractions (37% and 33% respectively) from Indian authors (7,23). It is not clear but there is some data which suggests that a definite pressure for publishing in those countries might play a role (24,25).

**Conclusion:**

Findings of this research gives deeper insights into the reasons and characteristics of retracted publications. Plagiarism, redundant publication and data manipulation accounted for majority of the retractions. The large fraction of retractions also showed Image manipulation/plagiarism which is quite difficult to detect. Funded publications were majorly retracted because of data manipulation and also took more time to get retracted. Retraction of publication is not the ultimate solution for the identified fraudulent publications but proper dissemination of retraction notices is crucial to halt the impact of these publications. The detail understandings of retractions will help journal editors to develop new strategies to detect and tackle the fraudulent research.

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**Tables:**

**Table 1: Prevalence of scientific misconducts in retracted publications**

|  |  |  |
| --- | --- | --- |
| **Variable** | **N** | **%** |
| **Plagiarism** |  |  |
| Plagiarism (text plagiarism or unspecified) | 30 | 21.0 |
| Image Plagiarism | 10 | 7.0 |
| Text, Image, Data Plagiarism | 3 | 2.1 |
| Total | 43 | 30.1 |
|  |  |  |
| **Redundant Publication (Duplication)** | 50 | 35.0 |
|  |  |  |
| **Data Manipulation** |  |  |
| Data Fabrication | 27 | 18.9 |
| Data Falsification | 8 | 5.6 |
| Image Manipulation | 8 | 5.6 |
| Error in experiment or miscalculation | 3 | 2.1 |
| Total | 42 | 29.4 |
| **Authorship disputes** |  |  |
| All authors are not listed | 4 | 2.8 |
| Author listed without consent | 3 | 2.1 |
| Not Specified | 2 | 1.4 |
| Total | 9 | 6.3 |
| **Ethical Reasons** |  |  |
| No ethical clearance | 1 | .7 |
| Withdrawn consent after publication | 1 | .7 |
| No Informed consent obtained | 1 | .7 |
| Total | 3 | 2.1 |
| **Copyright breach** | 2 | 1.4 |
| **COI** | 2 | 1.4 |
| **Fake Peer Review** | 0 | 0 |
| **Unknown reasons** | 15 | 10.5 |
| **No free access to retraction notice** | 5 | 3.5 |

**\*The percentages add up to more than 100% because some of the publications had more than one type of misconduct**

**Table 2: Characteristics of retracted publications**

|  |  |  |
| --- | --- | --- |
| **Variable** | **N** | **%** |
| **Article Type** |  |  |
| Original Article | 101 | 70.6 |
| Review Article | 15 | 10.5 |
| Case Report/Case series | 27 | 18.9 |
| **Funding** |  |  |
| No | 87 | 60.8 |
| Yes | 39 | 27.3 |
| Could not find | 17 | 11.9 |
| **Authors country in each publication** |  |  |
| Single nation | 115 | 80.5 |
| Multi-national | 25 | 17.5 |
| Could not find | 3 | 2.1 |
| **Institutional affiliation of authors** |  |  |
| Single | 70 | 49 |
| Multiple | 70 | 49.0 |
| Could not find | 3 | 2.1 |
|  | **Mean (SD)** | **Median (IQR)** |
| **Duration for retraction (Months)** | 31.5 (37) | 17 (6 to 41) |
| **Total citation** | 19.4 (23) | 9 (3 to 27) |
| **Post retraction citation** | 9.3 (13) | 5 (2 to 12) |

**Table 3: Scientific misconduct among funded & non-funded publications and Duration for retraction and total citations of publications with scientific misconduct**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Type of misconduct** | **Funding** | | | **Duration for Retraction (Months)** | | | **Total Citations** | | |
| **Yes (N=39)** | **No (N=87)** | **Mean (SD)** | | **Median** | **Mean (SD)** | | **Median** |
| **Plagiarism** | 6  (15%) | 32 (36.7%) | 30.31 (32.1) | | 18 | 19.3 (29) | | 8 |
| **Redundant Publication** | 12 (30.7%) | 34 (39%) | 21.77 (25.5) | | 15 | 15.9 (16) | | 8 |
| **Data manipulation** | 15 (38.4%) | 26 (29.8%) | 52.2 (45.8) | | 31 | 23.3 (23) | | 13 |
| **Authorship disputes** | 2 (5.1%) | 4 (4.5%) | 10  (7) | | 8 | 2.67 (2.69) | | 2 |
| **Duration for retraction among funded & non-funded articles (Median)** | 23 Months | 16 Months | -- | | -- | -- | |  |

**Table 4: Details of Journal IF and Multiple retractions**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Category** | **Number** | **Range (Min-Max)** |
| **Journal Impact factor** | **Zero** | 30 | -- |
| **<2** | 20 | -- |
| **≥2** | 31 | -- |
| **Journals with multiple retraction** | **--** | 21 | 2-9 |
| **Journals with Multiple retractions of a same author** | **--** | 06 | 2-9 |
| **Authors with multiple retractions** | **--** | 09 | 2-10 |
| **Journal with multiple retractions a/c to IF** | **Zero** | 13 | 2-6 |
| **<2** | 1 | -- |
| **≥2** | 7 | 2-9 |

**Table 5: Country-wise distributions of authors of retracted publications**

|  |  |  |
| --- | --- | --- |
| **Country** | **Authors** | |
| **N** | **%** |
| India | 224 | 37 |
| Japan | 54 | 9 |
| Spain | 50 | 8.2 |
| USA | 40 | 6.6 |
| China | 43 | 7 |
| Brazil | 36 | 6 |
| Iran | 25 | 4 |
| Italy | 15 | 2.5 |
| Korea | 21 | 3.5 |
| Pakistan | 12 | 2 |
| Egypt | 11 | 1.8 |
| Saudi arabia | 7 | 1.2 |
| Uk | 7 | 1.2 |
| Greece | 8 | 1.3 |
| Turkey | 7 | 1.2 |
| Taiwan | 9 | 1.2 |
| Nepal | 3 | 0.5 |