An analysis of retractions of dental publications

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An analysis of retractions of dental publications**Abstract**

Objectives: To comprehensively report on the characteristics of retracted publications in the field of dentistry.

Methods: We searched MEDLINE (via PubMed), PubMed Central, Web of Science and Google Scholar databases for dental retracted articles from database inception to 02 July 2018. In addition, we scanned the search engine, Google Scholar, and the website, Retraction Watch (www.retractionwatch.com), for retracted dental studies. Two researchers independently screened titles, abstracts and full text of search results. Descriptive data was collected on each retracted article including reason for retraction, study type, journal impact factor, and time

between publication and retraction. Regression models were used to evaluate the association between journal impact factor and retraction characteristics.

Results: A total of 138 dental retracted studies were included. Reasons for retraction were misconduct (N=100, 72.5%), with the most frequently reported misconduct being overlap/plagiarism (N=53, 38.4%). *In vitro* (28.3%), case reports (21.0%) and narrative reviews (13.8%) were study design most frequently identified in retracted studies. The median time between article publication and date of retraction notice was 1 year (interquartile-range [IQR]=0 to 2 years). More than half of the retracted articles (n=82, 59.4%) were cited post-retraction. A retracted article reporting a randomized controlled trial was more likely to appear in journal with higher impact factor than a retracted case report (mean difference [MD]=2.2; 95% confidence interval [CI]=1.2,3.1. Articles retracted after 2012 were likely to appear in journals with a lower impact factor (MD=-1.3; 95%CI=-1.8, 0.8).

Conclusions: Research misconduct is the main reason for retraction of dental articles. A substantial proportion of these articles were still being cited after their retraction.

Clinical Significance: This report of dental retraction studies informs that more transparency is needed with data reporting in dentistry to improve writing practices in dentistry. A more complete report of retractions and their causes would provide more accurate information to inform researchers and editors to avoid or reduce future cases of retractions. More complete and accurate reporting would increase the overall trust in dental research.

Key-words: Ethics; retracted publication; retraction of publication; conflict of interest

Introduction

The retraction of a scientific article may occur for a wide variety of reasons that range from plagiarism to data fabrication resulting in the publication of erroneous or irreproducible data

and subsequent invalidation of the overall study findings [1,2,3]. An earlier meta-analysis suggested that 2% of scientist admitted to having fabricated, falsified or modified data or results at least once in their careers, and up to 33.7% admitted to other questionable research practices [4]. Thus, it is likely misconduct has occurred across the entire health care field.

The impact of a retracted article can be significant given the ongoing production of erroneous data can result in spurious clinical decision making that can affect patient care [5]. Conversely, the impact of misappropriating the work of others without acknowledging the original source in text form as seen with plagiarism or the presentation of unreliable findings due to significant methodological processes often linked to honest experimental errors can often be attributed to poor scholarship or absence of knowledge or be difficult to prove [6].

Recent studies have attempted to characterize retraction notices, retracted publications and the role of misconduct in order to gain a more thorough understanding of the impact of retractions and the true extent of misconduct in scholarly research. However, many of these studies have not included articles from the field of dentistry. From within the discipline itself, a number of dental retraction studies have been underpinned by sampling biases (i.e. small sample size) thereby limiting our ability to draw significant conclusions from their result findings [7,8].

Therefore, the aim of this study was to comprehensively report on the characteristics of retracted publications in the field of dentistry. In addition, we aimed to identify the association between retraction characteristics with journal impact factor.

Materials and methods

Data sources and search strategy

Two authors (CMF; JW) independently searched MEDLINE (via PubMed), PubMed Central (PMC) and Web of Science for retracted articles published in the field of dentistry from database inception to 02 July 2018. In MEDLINE, we applied the Medical Subject Heading (MeSH) term “dentistry” and the retraction filters, “retraction of publication” and “retracted

publication". In addition to the databases searched, we scanned the search engine, Google Scholar, and the website Retraction Watch (www.retractionwatch.com) for retracted dental studies. The methods for this review were informed by previous retraction studies [9-14], along with the Cochrane Handbook for Systematic Reviews [15].

Study selection criteria and procedure

The inclusion criteria were: (a) retracted studies that made reference to teeth and/or the oral-maxillofacial subjects; (b) involved any clinical setting; (c) used any study designs; (d) non-English citations that may have included an English abstract and; (e) retraction notices, with or without accompanying text, to give an overview of the proportion of retracted articles with and without full-text availability.

The reasons for retraction were based on author and journal perspectives as previous published retraction studies [9,16] and included:

1) From the author's perspective:

- Misconduct: which included data fabrication or falsification, fraud, plagiarism, overlap (i.e. duplication of text or images in different publications without appropriate citation) or duplicate publication (i.e. an article published twice as a result of author misconduct in different publications).
- Honest scientific error: defined as mistakes on the part of the author in sampling, methodological procedure or data analysis leading to the publication of erroneous or irreproducible data. Authors, however, had no deliberate intention to report fraudulent information.
- Others: authorship disputes, copyright infringement; peer-review misconduct (for example, using the info as peer reviewer, rejecting the manuscript, and publishing a similar manuscript in another journal).
- Unknown or unclear: where it was not possible to distinguish from misconduct, honest scientific error or other reasons.

2) *From the journal's perspective:*

- Published in error: defined as the accidental duplicate publication as a result of publishing error.
- Unknown or unclear: where the reason for retraction was non-informative, poorly defined or not clearly stated.

We evaluated the data from two perspectives (author and journal) to provide clear information on which party played the active role in the misconduct or error. Two authors (CMF; JW) independently screened and reviewed the titles and abstracts against the inclusion criteria. Full-text articles were retrieved and reviewed independently in duplicate by two authors (CMF; JW) for potentially eligible studies. Discrepancies were resolved with consensus by a third author (NB).

Data extraction and collection

Two authors (CMF; JW) extracted data variables relevant to author demographics (e.g. primary author surname, date of publication, authors country of origin including national income levels), study characteristics (e.g. study design, type of intervention, total number of studies), journal and retraction features (e.g. reason for retraction, journal name, 5-year journal impact factor (IF), article and retraction notice availability, presence of watermark identifying the article as retracted, date of retraction notice, persons/parties responsible for the retraction notice and the number of article citations in Google Scholar). National income level of the country of origin was determined by identifying the country with which the first author of the retracted article was affiliated. World Bank criteria for classifying low-, middle-, and high-income economies were used [17]. The journal IF was determined using the ISI Web of Knowledge (Thomson Reuters) 'Journal Citations Reports. We included the journal IF as a variable because others had found a strong correlation between frequency of retraction and journal IF [18].

Data analysis

Descriptive statistics for continuous and categorical variables were presented as median with interquartile range (IQR) and frequency (percentage), respectively. The frequency of each retracted publication characteristics was also calculated. In addition, we calculated the median time from publication to retraction from the article's retraction date to the most recent year in which the article was cited. A univariable linear regression model was also used to investigate the association between retracted article characteristics and journal quality as assessed by the 5-year IF. Effect estimates were presented as mean differences (MD) and 95% confidence intervals (95%CI). All analyses were performed using Stata Statistical Software v.14.0 (StataCorp, College Station, TX, USA).

Results

The search in Medline retrieved 157 publications, and 88 were retracted articles. Nineteen retracted articles were found in the PMC, ten in Google Scholar, and three in Web of Science databases. Our manual search of Google and retraction watch websites resulted in 18 more retracted articles. Thus, the final sample of retracted dental articles comprised 138 publications. The list of retracted articles is reported in the supplementary material.

Study characteristics

The study characteristics of the retracted studies are shown in Table 1. Most retracted studies were published between 2001 and 2016, with a total of 79 (57.2%) retracted from 2012. In terms of geographic distribution by continent, most retracted research was conducted in Asia (n=97, 70.3%). A large range of study designs from *in vitro* (n= 39, 28.3%), case reports (n= 29, 21%) to narrative reviews (n= 19, 13.8%) were identified in the retracted studies. The median number of authors contributing to the original study before retraction was four (IQR 3 to 5).

Retraction features

The retraction characteristics of the included studies are shown in Table 2. More than half of the studies (n=100, 72.5%) were retracted due to misconduct, where overlap/plagiarism

(N=53, 38.4%) and inaccurate or falsified conducting or reporting of data (N=24, 17%) were the most prevalent form of misconduct. Only eight studies (5.8%) were published in error by the journal. The median number of year/s from date of journal publication to date of retraction notice was 1 year (IQR: 0 to 2 years). The largest proportion of retraction notices were issued by journal editors (N=118, 85.5%) followed by authors (N=14, 10.1%).

Almost all retracted studies (N=112, 81.2%) had notification of their retraction freely available as full text through the PubMed database, with remaining notifications available on other databases (i.e. Science Direct) or journal websites. Of these available studies, 79 (70.5%) had an obvious watermark indicating that the article was retracted. Analysis of citations revealed the identified retracted studies were cited 2110 times in the biomedical literature, with 82 studies (59.4%) cited post-retraction.

Table 3 reports the association between characteristics of retracted articles and IF. When the association between study characteristics and journal quality was investigated, *in-vitro* (MD=1.9; 95%CI=1.2,2.6) and randomized studies (MD=2.2; 95%CI=1.2,3.1) were more likely to be retracted from journals with higher IF than case reports. Table 4 reports the association between retraction-related study characteristics and IF. Articles retracted after 2012 were likely to appear in a journal with a lower IF (MD=-1.3; 95%CI = -1.8,-0.8). Retracted articles withdrawn by authors were published in journals with higher IF than articles withdrawn by editors (MD=1.3; 95%CI=0.4,2.2). Furthermore, authors coming from high income countries were more likely to be retracted from journals with higher IFs (MD=1.5; 95%CI=1.0,2.1).

Discussion

The aim of this study was to comprehensively report on the characteristics of retracted publications in the field of dentistry. Our findings showed that misconduct in the form of overlap and plagiarism accounted for 72.5% of retracted studies followed closely by 9.4% for publications involving authorship disputes, copyright infringement or peer-review misconduct

and 3.6% for honest scientific error. In addition, we were unable to account for reasons of retraction in 12 studies (8.7%). Most of the retracted studies were still being hosted online and freely available via PubMed, but with a watermark stamped over each page. Whilst the median number of year/s from date of journal publication to date of retraction notice was 1 year, analysis of citations before and after retraction revealed that 82 studies (59.4%) continued to be cited post-retraction.

Our results were in keeping with other retraction-based studies, which showed that the majority of retractions were a result of misconduct, with rates varying from 59% to 72% [9,10,12,13,16,19]. The additional finding that 8.7% of studies could not be allocated a retraction category was also seen in studies with rates reported from 4.9% to 22% [20,21]. Hesselman et al. [22] suggested that this knowledge gap in retraction studies was largely due in part to journals providing inconsistent or ambiguous information.

However, our findings differed from other dental retraction studies. In the study by Nogueira et al (2017), the authors reported on 72 retracted articles and attributed the rate to redundant publication (20.8%) and plagiarism (18.1%) and less so with misconduct (13.8%) or overlap (13.6%). These differences may have stemmed from the variations seen sample sizes and retraction definitions. In the second study by Shamim (2018) [8], the small sample size of 15 studies precluded us from undertaking any formal comparisons; however, the author cited duplicate publication, plagiarism and authorship disputes as the major causes for the retracted studies.

The median number of year/s from date of journal publication to date of retraction notice was 1 year as seen with previous studies [23]. Wang et al. [13] suggested that this retraction lag represented a significant delay in the identification of invalid studies, and was in direct opposition to the Committee on Publication Ethics (COPE) guidelines, which proposed the urgent need to publish retraction notices in order to help minimise the harmful effects from misleading publications. More importantly, this time period could have been delayed even

further given the protracted delays seen in PubMed ranging from 6-35 months with time to MeSH indexing [24].

In terms of geographic distribution by continent, most retracted research from overlap/plagiarism [25,26] was conducted in Asia. More specifically, authors from India represented one-third of all retracted studies for either overlap/plagiarism. These findings were similar to Amos 2014 [20] who also reported the slightly higher rate of 37% from India authors. We also observed that articles published in journals with lower IF were commonly retracted because of overlap/plagiarism. However, the most common reason for retraction among articles published in journals with higher IF was inaccurate or falsified conducting or reporting. These results were in line with a previous study [10] that found fraud or suspected fraud as the main reason for retraction in journals with higher IF, and plagiarism/duplication as the primary reason for retraction in journals with lower IF.

Analysis of citations after retraction revealed that 60% of articles continued to be cited after retraction as noted previously by others [27-28]. In the study by Budd et al. 1999 [27], the authors found 235 retracted studies to have 2034 post-retraction citations. Further analysis of these citations revealed that most authors did not critique or comment on its retraction status). In a second study by Neale et al. 2010 [28], the authors showed that a sample of 102 studies affected by misconduct was still able to report an average rate of 26 citations. Along with our citations results, these findings inferred that many readers might not have been exposed to the retraction notification or details.

The study also had a number of strengths. First, our systematic result findings continued to raise the awareness of this topic for readers, collaborators or investigators who may use or cite these works. Second, our sample consisted of retracted dental articles from various publication sources. Third, we were able to explore the association between retraction characteristics and journal IF. We were also mindful of our study limitations. First, the study was restricted by the small sample size, which limited our ability to draw significant conclusions from our results.

Second, almost 9% of studies were not available online thereby restricting our ability to confirm the specific reason for retraction. Third, the time delays present with the indexation of studies and retraction notices in PubMed may have missed potentially relevant studies.

Our sample of 138 retracted articles suggests that the number of retracted articles represents a minor part of dental articles published over the years. However, this number might be underestimated by the difficulty to identify retracted articles in the published literature. Some of articles published in journals indexed in PubMed and Web of Science databases were not identified by using the specific filters in these databases. The lack of sensitivity of these filters suggests the need for the development of specific search strategies for comprehensively identifying retracted articles.

Methods to date by scientific journals to better identify and report cases of retraction have included the use of software to identify plagiarism [29], the submission of “raw data” [30] is thoroughly analyzed by editors and reviewers. This measure would urge cautionary behavior in authors contemplating the fabrication of data. Finally, as suggested by the COPE guidelines [1], editors should also provide more comprehensive reporting on the reasons for retraction. The retraction note should explicitly state the reason for retraction. The note should also be added as an extension to the retracted manuscript (i.e., incorporated into the watermarked article).

Conclusions

Acknowledgements

Authors of this study have no conflict of interest

Our study identified that methodological misconduct was the most commonly known reason for dental retractions. Although our sample size showcased how rare this event was within the published literature, it is recommended that dental journals, editors, and professional bodies improve writing practices, highlight retraction notifications and foster the uptake of publication and research ethics. These measures would help minimise the potential impact retracted studies may have on clinical practice and research outcomes.

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Table 1. Characteristics of 138 retracted articles

Characteristic	Frequency (%)
Date of publication	
Up to 2012	85 (61.6)
After 2012	53 (38.4)
Continent of first author	
Asia	97 (70.3)
Other	33 (23.9)
Unknown	8 (5.8)
Study design	
Case report	29 (21.0)
Case-series	9 (6.5)
Cross-sectional	12 (8.7)
Case-control	1 (0.7)
Randomized trial	12 (8.7)
Narrative review	19 (13.8)
Letter to the editor	1 (0.7)
In-vitro	39 (28.3)
Animal study	3 (2.2)
Not stated	13 (9.4)
Type of journal	
Medical	50 (36.2)
Dental	88 (63.8)

Table 2. Retraction-related study characteristics of 138 retracted articles

Retraction characteristics	Frequency (%)
Date of retraction	
Up to 2012	59 (42.8)
After 2012	79 (57.2)
Reason for retraction	
<i>Author perspective:</i>	
Misconduct	100 (72.5)
Scientific error	5 (3.6)
Others*	13 (9.4)
Unknown or unclear	12 (8.7)
<i>Journal perspective:</i>	
Duplicate publication	8 (5.8)
Unknown or unclear*	0 (0.0)
Who retracted	
Editor	118 (85.5)
Author	14 (10.1)
Not stated	6 (4.4)
Watermark	
Yes	79 (57.3)
No	33 (23.9)
NA*	26 (18.8)
Full-text available	
Yes	112 (81.2)
No	26 (18.8)
Income	
Low Income	2 (1.5)
Middle income	90 (69.2)
High income	38 (29.2)
Number of citations	
Median (IQR)/article	7 (2-16)
Time from publication to retraction (years)	
Median (IQR)	1 (0-2)

IQR: interquartile range

Others*: includes authorship disputes, copyright infringement; peer-review misconduct (for example, using the info as peer reviewer, rejecting the manuscript, and publishing a similar manuscript in another journal)

NA*: watermark was not counted because the full-text was not available

Unknown or unclear*: when there was no or unclear information on the reason for retraction

Table 3. Association between characteristics of retracted articles and impact factor

	Impact Factor Mean (SD)	Mean difference (95% CI)
Date of publication		
Up to 2012	2.0 (1.8)	ref.
After 2012	1.0 (1.2)	-1.0 (-1.6, -0.5)
Continent of first author		
Asia	1.3 (1.5)	ref.
Other	2.5 (1.5)	1.2 (0.6, 1.8)
Unknown	2.6 (2.3)	1.3 (0.2, 2.5)
Study design		
Case report	0.6 (0.9)	ref.
Case-series	0.3 (0.7)	-0.3 (-1.4, 0.7)
Cross-sectional	0.8 (1.3)	0.1 (-0.9, 1.1)
Case-control	1.4	0.8 (-2.1, 3.7)
Randomized trial	2.8 (2.1)	2.2 (1.2, 3.1)
Narrative review	1.4 (1.9)	0.7 (-0.1, 1.6)
Letter to the editor	4.5	3.9 (1.0, 6.8)
In-vitro	2.5 (1.5)	1.9 (1.2, 2.6)
Animal study	2.1 (0.5)	1.4 (-0.3, 3.1)
Not stated	1.8 (1.3)	1.2 (0.3, 2.2)
Type of journal		
Medical	1.5 (1.7)	ref.
Dental	1.8 (1.6)	0.3 (-0.3, 0.9)

SD: standard deviation

CI: confidence interval

ref.: reference

Table 4. Association between retraction-related study characteristics and impact factor

	Impact factor Mean (SD)	Mean difference (95% CI)
Date of retraction		
Up to 2012	2.4 (1.9)	ref.
After 2012	1.1 (1.2)	-1.3 (-1.8, -0.8)
Reason for retraction		
<i>Author perspective:</i>		
Misconduct	1.7 (1.8)	ref.
Scientific error	2.6 (1.8)	1.0 (-0.5, 2.5)
Others*	1.1 (1.1)	-0.5 (-1.5, 0.4)
Unknown or unclear	1.7 (1.1)	0.0 (-1.0, 1.0)
<i>Journal perspective:</i>		
Duplicate publication	1.5 (1.3)	-0.2 (-1.4, 1.0)
Unknown or unclear*	n/a	n/a
Who retracted		
Editor	1.5 (1.6)	ref.
Author	2.8 (1.8)	1.3 (0.4, 2.2)
Not stated	1.8 (0.9)	0.3 (-1.0, 1.6)
Watermark		
Yes	1.4 (1.6)	ref.
No	1.9 (1.7)	0.5 (-0.2, 1.2)
NA*	1.2 (1.4)	-0.2 (-1.0, 0.7)
Full-text available		
Yes	1.7 (1.7)	ref.
No	1.2 (1.4)	-0.5 (-1.2, 0.2)
Income		
Low Income	0.0	-1.2 (-3.2, 0.9)
Middle income	1.2 (1.3)	ref.
High income	2.7 (1.7)	1.5 (1.0, 2.1)
Number of citations		
Median (IQR)/article		0.04 (0.03, 0.06)
Time from publication to retraction (years)		
Median (IQR)		0.19 (0.06, 0.32)

SD: standard deviation

CI: confidence interval

ref.: reference

n/a: not applicable as no events in unknown/unclear category

IQR: interquartile range

Others*: includes authorship disputes, copyright infringement; peer-review misconduct (for example, using the info as peer reviewer, rejecting the manuscript, and publishing a similar manuscript in another journal)

NA*: watermark was not counted because the full-text was not available

Unknown or unclear*: when there was no or unclear information on the reason for retraction

References of included retracted dental articles (N=138) (when available, retraction notice (or withdrawal) citation is reported together with the article citation)

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