

# Exploratory Analysis of Retracted Cardiovascular Diseases Publications

Hisham Badreldin (✉ [hishamahmed87@gmail.com](mailto:hishamahmed87@gmail.com))

King Saud bin Abdulaziz University for Health Sciences College of Medicine <https://orcid.org/0000-0001-7182-4347>

Yazeed Ghawaa

King Saud University College of Pharmacy

Abdulmajeed Alshehri

King Saud bin Abdulaziz University for Health Sciences College of Medicine

Mohammed Alzahrani

King Saud bin Abdulaziz University for Health Sciences

Abdulaziz Almubarak

King Saud bin Abdulaziz University for Health Sciences

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## Research

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# Abstract

**Background** There is a lack of studies that examine the nature of retraction in the discipline of cardiovascular diseases. The objective of this research was, therefore, to report comprehensively on the nature and trend of retracted cardiovascular disease publications.

**Methods** Medline (PubMed), Cochrane Library, Web of Science, EMBASE, and Retraction Watch databases were utilized to identify retracted publications on cardiovascular diseases from a database-specific inception date to June 10, 2019.

**Results** A total of 568 publications met our eligibility criteria. With regard to the first author's continent of affiliation, the majority of retracted publications 251 (44.1%) originated from Asia. In 2000, the number of retracted publications began to trend up, and it peaked in 2015, with 76 (13.4%) publications being retracted that year. The mean number of times a publication was cited prior to retraction was 37 times, with a standard deviation of 76. Basic science publications and animal studies represented almost 43% of the total retracted publications relating to cardiovascular disease. Misconduct was the main reason for retractions in 249 (43.3%) publications, followed by scientific error by authors, 215 (37.8%). Almost 61% of the retracted studies were present in their intact form, with no watermark indicating retraction.

**Conclusions** The trend of retracting publications within the field of cardiovascular diseases is increasing. Certain papers are still being cited even after retraction. Moreover, a significant number of retracted publications are still present with no watermark indicating retraction. The consequences of the continued usage of these retracted publications could be detrimental and harmful.

## Background

Globally, there were more than 400 million prevalent cases of cardiovascular diseases (CVDs) in 2015, and this continues to be on an uptrend(1). CVDs are a predominant cause of death, and they constitute a significant financial burden worldwide(2). With the increase in the number of affected individuals, one can expect a surge in the field of CVD research and information. Over the years, the number of cardiovascular journals has increased drastically, and according to the SCImago Journal and Country Ranking, more than 350 journals were classified under the disciplines of cardiology and cardiovascular diseases in 2018(3). In the fiscal year 2019, more than two billion dollars were spent funding CVD-related research projects. The unfortunate and significant development of erroneous research and information may result in spurious and inappropriate clinical decision-making that may impact patient care negatively(4). Peer-reviewed scientific medical journals find themselves obligated to withdraw or retract any erroneous research. The withdrawal or retraction of a scientific article may happen for a wide variety of reasons, such as unintentional human error during the process of collecting, analyzing, or reporting the data. Also, it could be due to intentional academic misconduct such as simultaneous submissions to multiple journals, conflicts of interest, fabrication of data, failure to comply with research protocols, plagiarism, or salami slicing(5). It has been estimated that retracted publications accounted for less than

1% of all National Institute of Health (NIH) funded research projects. That being said, it accounted for more than \$50 million of direct NIH financing over a 20-year period(6). Cokol et al. found that, over time, the frequency at which scientific publications are retracted is increasing (7). Several studies in multiple medical fields have sought to investigate and describe the trends, the global distribution, and the characteristics of these retractions to obtain a deeper understanding of the effect of retractions and the real magnitude of misconduct in medical research(8–13). For example, Bozzo et al. investigated the pattern of oncology publications retraction(8). They found an increasing trend of retractions in the oncology medical discipline. Close to 30% of the retracted publications were attributed to fraudulent acts. Rosenkrantz AB investigated the nature of retractions in the radiology field, and he found that almost 33% of the retracted publications were retracted due to methodological or results reporting errors(9). There is a lack of studies that describe the retraction nature in the field of CVDs. The objective of this research was, therefore, to report comprehensively on the trend and patterns of retracted CVD publications.

## Methods

### Search Strategy and Eligibility Criteria

The method that was used to conduct this research has been utilized in similar research projects(8–13). Two investigators (MA and ABS) performed separate exploratory searches on MEDLINE (via PubMed), PubMed Central (PMC), Embase, Cochrane Library, and Web of Science for eligible retracted publications that had been released in the field of CVDs from the inception of each database until June 10, 2019. We also checked for retracted research on CVDs on the Retraction Watch website ([www.retractionwatch.com](http://www.retractionwatch.com)). Whenever a conflict regarding any publication's eligibility arose between MA and ABS, a third-party investigator (HB) evaluated that publication for eligibility. This study was carried out in compliance with the relevant guidelines in the Cochrane Handbook for Systematic Reviews of Interventions(14).

We used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement as a strategy for reporting retracted CVD publications(15).

We included any publication that had been published in the English language, with any study design, and on any clinical or non-clinical CVD subject that had been retracted. We excluded any retracted publications on non-CVD-related subjects. The detailed search strategy and the keywords that were utilized to conduct the research for each of the selected databases are detailed in (**Table 1**).

### Extracted Data

For each retracted paper, two authors (MA; ABS) extracted the following data, continent of the affiliation of the first author, country of the affiliation of the first author, year of publication, study design, reasons for retraction, presence of watermark, number of citations pre- and post-retraction, time from publication to retraction, sharing over social media channels, whether it was resubmitted following correction or not, type of journal (specialized cardiovascular or not), journal affiliation with medical societies, journal

impact factor, whether journals or authors requested retraction and reasons for retraction of publication. The ISI Web of Knowledge (Thomson Reuters) Journal Citations Reports was used to determine the journal impact factor. We used the Committee on Publication Ethics (COPE) retraction guidelines to classify the reason for retraction.

## Data Analysis

A descriptive analysis was used to analyze all of the extracted data in which the mean and standard deviation (SD) or median and interquartile range (IQR) were used, when appropriate, to describe continuous variables. Frequency and proportions were used to describe categorical variables. Authors utilized the MEDLINE database to outline the trend of retracted CVDs publications in which the total number of retracted publications were divided over the total CVDs publications appearing in the database in each year, from inception to June 10, 2019. Also, the annual number of retractions in CVDs papers was calculated and plotted in a histogram. All extracted data were stored in a secure electronic database, and no authors or journal identifiers were used in the final analysis. All variables were collected in Microsoft Excel worksheet, and all analyses were performed using SPSS Statistical Software v.14.0.

## Results

### Search Results

Our literature search yielded 10777 studies. All studies were screened for eligibility criteria. A total of 10209 (94.7%) studies were excluded based on our exclusion criteria. Of the excluded studies, 229 (2.22%) were duplicates, 9499 (93%) were not related to CVDs research, 12 (0.12%) were not in English, 141 (1.4%) were not retracted, 322 (3.2%) were not reported, and six (0.06%) studies were excluded for other reasons. A total of 568 (5.3%) studies met our eligibility criteria and were included in the final analysis (**Figure 1**).

### Global Distribution

Of the 568 studies that were included in the final analysis, 251 (44.2%) retracted studies originated from Asia, 163 (28.8%) from North America, 122 (21.5%) from Europe (**Table 2**). When examining the affiliation of the first author, 155 (27.3%) retracted studies originated from the United States, while 141 (24.8%) were from China. Together, the United States and China represented more than half of the total number of retractions (50.8%) according to the authors' affiliation (**Table 3**).

### Year of Publication and Trends

Of the 568 studies that were included in the final analysis, 35 studies (6.2%) were published between 1980–1999, while the remaining 533 studies (93.8%) were published from 2000 up until June 2019. Since 2000, the number of retracted studies kept trending up, and it peaked in 2015, with 76 (13.4%) papers being retracted that year.

When we examined the MEDLINE database to outline the trend of the total annual retracted CVDs publications to the total CVDs published articles, we found that the percentage kept trending up and reached 0.001% in 2019 (**Figure 5 – 6**). The median time for an article to get retracted after publication was 2.3 years, with an IQR of 0.8–5.1 years.

### **Types of Publications and Citations**

Retracted cardiovascular papers with different designs were identified. Of the 568 studies that were included in the final analysis, there were 144 (25.4) retracted in-vitro studies, 114 (20%) retracted (retrospective or prospective) observational studies, 99 (17.4%) retracted basic science studies, and 64 (11.3%) retracted randomized trials. Other types of retracted publications are illustrated in **Figure 4**.

Of the 568 studies that were included in the final analysis, three articles were cited more than 1,000 times prior to retraction. This skewed the data heavily, and they were excluded from the pre-retraction mean analysis. Thus, the mean number of times a study was cited prior to retraction was 37 citations (SD=76). Post retraction, 470 (82.8%) studies were never cited. However, 98 (17.2%) papers were cited multiple times post retraction.

Further analysis revealed one study that was cited 788 times post retraction and another article that was cited 304 times. These two studies were outliers in the data and were excluded from the post-retraction mean calculations. Thus, the mean number of times a study was cited after retraction for the remaining 96 papers was 20 citations (SD=36).

### **Types of Journals, Affiliation, and Impact Factor**

Of the 568 studies that were included in the final analysis, the majority of retracted publications 406 (71.48%) were published in non-specialized cardiovascular journals, while 162 (28.5%) publications were published in specialized cardiovascular journals. The majority of the retracted publications 459 (80.8%) were published in journals that were not affiliated with scientific or medical societies. Eighteen studies were published in journals with no impact factors. The remaining retracted studies were published in journals with a median impact factor of 3.56 and IQR of 2.06–6.34.

### **Nature for Retractions**

Of the 568 studies included in the final analysis, 249 (43.3%) were retracted due to an act of misconduct, while 215 (37.8%) were retracted due to scientific error from the authors. These two reasons represented 81.1% of overall retractions. When it comes to journals' perspectives, 84 retractions (14.7%) were due to duplicate publications. The exact reason for retraction was not clear or unknown in twenty papers (3.5%).

The retraction process was initiated by journals or editors in 442 papers (77.8%), compared to authors who requested retracting their publications in 121 papers (21.3%). Data regarding who requested retraction were missing in five papers (0.9%). In terms of the presence of retraction watermarks, only 165 articles (29%) have retraction watermarks in the original study, while 345 (60.8%) studies were present in

their intact form with no watermark indicating retraction. Data regarding watermarks were unclear in 58 papers (10.2%). When it comes to sharing articles through social media platforms, 178 retracted studies (31.1%) have been shared through social media channels, while 341 papers (60%) have not been shared. Articles' metrics for the remaining studies (49 studies) were not available on the journals' website. Following retractions, only 22 studies (3.8%) were resubmitted following correction, and the remaining were permanently retracted with no further prospect for resubmission.

## Discussion

The purpose of this study was to investigate the current trends of retracted CVDs publications comprehensively. In addition to affirming an increase in retracted publications in cardiovascular diseases, this paper has purely explored the causes and characteristics of these retractions. Methodologically, this study was conducted in a similar approach to other studies that reported on the nature of the retracted papers in medical fields like dentistry, surgery, urology, and oncology. We were able to identify 568 retracted CVDs publications in which 533 (93.8%) publications were retracted from the literature after 2000 until the mid of 2019. This shows the enormous increase in the number of retractions in the past 20 years. There was a difference between our study findings in terms of the major reasons for retraction than what has been reported in the literature in other medical fields. Our study demonstrated that research misconduct and errors from the authors were the main reasons for 43.3% and 37.8% of the total retractions, which is lower than what has been reported in other medical fields. For example, a study in biomedicine and the biological sciences that was conducted by Fang and his colleagues showed that 67.4% and 21.3% of retractions resulted from misconduct in research and error, respectively (16). Another analysis was done by Bozzo, and his team found that 61% of retractions in the field of oncology were associated with research misconduct (8). Our findings showed that it takes about 2.3 years on average for a CVD-related article to get retracted after publication, which is similar to what has been reported in the literature in other medical fields. This long period shows how hard it is to detect any act of misconduct or error. We suggest that empowering easy access to published articles, such as adopting open-access publishing policies and sharing the study findings over social media channels, may expedite the process of identifying any scientific error or misconduct in these publications and reducing the lag time from publication to retraction. Also, our findings showed that the majority of retracted CVD studies (406 or 71.48%) were published in non-specialized cardiovascular journals. We firmly believe that these types of journals should be more attentive when they receive any CVD paper for potential publication in their journal. This could be accomplished by requesting strict peer review by content experts who may be able to detect any acts of misconduct or any errors. Our findings also showed that the impact of retracted CVD publications does not stop at the retraction date, as a few of them are still being cited to date. We firmly believe that the results of this research can serve as a guide for both senior and junior researchers of CVDs. It is a reminder of the problems one should worry about when constructing a project, from

conceptualizing to disseminating their project. Despite the minimal number of retractions in the CVDs field, one should not neglect the potential negative impact of these retracted publications, even if the negative impact is difficult to measure or quantify. Depending on the reason for the retraction, these retracted publications might have severe consequences on investigator careers, patient care, funding institutions, and the overall cardiovascular scientific field. Our results highlight that research scientists, editors, and journals should carefully observe and detect research misconduct and other bad research practices. Moreover, our data underscore that there is a huge need for educational sessions and training for scientific researchers, peer-reviewers, and editors in the COPE and the International Committee of Medical Journal Editors (ICMJE) publishing ethics guidelines to avoid or reduce the risk of similar acts in the future. The significance of adhering to values should be emphasized by mentors and ethical commissions, thus preventing self-plagiarism, plagiarism, and information-making. Furthermore, the same people or committees should impose penalties on their faculty members or researchers who are discovered guilty of misconduct. The proposed recommendations could definitely have contributed to minimizing the number of CVD retracted publications and improve the quality and credibility of the published CVD research articles in the future. This study has obvious limitations. First of all, this study aimed to shed some light on the big picture of all retracted publications in CVDs. That being said, we were not able to investigate or quantify the financial and clinical burdens of these retractions. Second of all, there was a potential risk of not capturing all potential retracted CVD publications. This was mainly due to the fact that some databases are not designed to detect retracted publications. Databases' governing bodies are encouraged to design special and user-friendly filters to detect these kinds of publications. Third of all, we faced several challenges to detect the exact reason for retractions, especially when a publication was retracted due to an act of misconduct or error. Several journals do not provide further clarification. Moreover, we were unable to detect the reasons for retraction in 12 publications (8.7%). We firmly believe that journals should be more transparent in highlighting the detailed reasons for retraction. Despite these limitations, this research study provides the cardiovascular and medical communities with the first comprehensive exploratory study on retracted publications in the field of CVDs. This certainly will lead to have a good understanding of paper retractions in CVDs and figure out areas that can be improved.

## **Conclusion**

The outcomes of unreliable scientific CVDs data and publication retractions can be crucial. Our paper showed that retracted publications in CVDs are growing in the last decade. In addition to that, it demonstrated that the most frequently cited causes of retractions are research misconduct, scientific error from authors, and duplicate publications. The comprehensive assessment of articles and supplementary training for researchers is warranted to minimize these retractions and improve the quality of published papers.

## **Abbreviations**

CVDs  
Cardiovascular Diseases  
COPE  
Committee on Publication Ethics  
ICMJE  
International Committee of Medical Journal Editors

## Declarations

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**Availability of data and materials** The datasets analyzed during the current study are available from the corresponding author on reasonable request.

### Authors' contributions

Badreldin H was responsible for the conception of the research idea. Alshehri A, Alzaharani M performed the literature search, data extraction, and wrote several parts of the manuscript. Almubarak A performed the statistical analysis and wrote the results section. HB and YS wrote the majority of the manuscript. HB provided the overall guidance and edited the entire manuscript. All authors read and approved the final manuscript.

**Competing interests** The authors declare that they have no competing interests.

**Consent for publication** Not applicable.

**Ethics approval and consent to participate** Not applicable.

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## References

1. Roth GA, Johnson C, Abajobir A, Abd-Allah F, Abera SF, Abyu G, et al. Global, Regional, and National Burden of Cardiovascular Diseases for 10 Causes, 1990 to 2015. *J Am Coll Cardiol.* 2017;70(1):1–25. Epub 2017/05/22.
2. Gheorghe A, Griffiths U, Murphy A, Legido-Quigley H, Lamptey P, Perel P. The economic burden of cardiovascular disease and hypertension in low- and middle-income countries: A systematic review. *BMC Public Health.* 2018;18(1):975. Epub 2018/08/08.
- 3.

Scopus. Scimago Journal & Country Rank. 2018.

4.

Gupta A. Fraud and misconduct in clinical research: A concern. *Perspectives in clinical research*. 2013;4(2):144–7. Epub 2013/07/09.

5.

Atlas MC. Retraction policies of high-impact biomedical journals. *Journal of the Medical Library Association: JMLA*. 2004;92(2):242–50. Epub 2004/04/21.

6.

Stern AM, Casadevall A, Steen RG, Fang FC. Financial costs and personal consequences of research misconduct resulting in retracted publications. *eLife*. 2014;3:e02956. Epub 2014/08/16.

7.

Cokol M, Ozbay F, Rodriguez-Esteban R. Retraction rates are on the rise. *EMBO Rep*. 2008;9(1):2. Epub 2008/01/05.

8.

Bozzo A, Bali K, Evaniew N, Ghert M. Retractions in cancer research: a systematic survey. *Research integrity peer review*. 2017;2:5. Epub 2018/02/17.

9.

Rosenkrantz AB. Retracted Publications Within Radiology Journals. *AJR American journal of roentgenology*. 2016;206(2):231–5. Epub 2016/01/23.

10.

Nogueira TE, Goncalves AS, Leles CR, Batista AC, Costa LR. A survey of retracted articles in dentistry. *BMC Res Notes*. 2017;10(1):253. Epub 2017/07/08.

11.

Cassao BD, Herbella FAM, Schlottmann F, Patti MG. Retracted articles in surgery journals. What are surgeons doing wrong? *Surgery*. 2018;163(6):1201–6. Epub 2018/03/12.

12.

Samp JC, Schumock GT, Pickard AS. Retracted publications in the drug literature. *Pharmacotherapy*. 2012;32(7):586–95. Epub 2012/05/15.

13.

Mena JD, Ndoeye M, Cohen AJ, Kamal P, Breyer BN. The landscape of urological retractions: the prevalence of reported research misconduct. *BJU Int*. 2019;124(1):174–9. Epub 2019/02/13.

14.

Higgins JPTTJ, Chandler J, Cumpston M, Li T, Page MJ, Welch VA *Cochrane Handbook for Systematic Reviews of Interventions version 6.0 (updated July 2019)*. Cochrane. 2019.

15.

Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Ann Intern Med*. 2009;151(4):264–9. W64. Epub 2009/07/23.

16.

Fang FC, Steen RG, Casadevall A. Misconduct accounts for the majority of retracted scientific publications. *Proc Natl Acad Sci USA*. 2012;109(42):17028–33. Epub 2012/10/03.

# Tables

**Table1:** Search Strategy and Keywords

Search Engine/Database	Keywords
Medline (PubMed)	<i>Medical Subject Heading</i> (MeSH) heading: "Cardiovascular Disease" and all subheadings were used AND Retracted Publication
Cochrane	"Cardiovascular Disease" in title, abstract, OR as keyword AND Retract anywhere in text
Web of Science	Topic: (Cardiovascular diseases) Refined by: Document Types: (Retraction OR Retracted Publication)
EMBASE	Cardiovascular disease AND Retracted article or retraction
Retraction Watch website	Manual search for Cardiovascular disease AND Retract

**Table.2** Continent of Affiliation of the First Author of the Retracted Cardiovascular Disease Publications

Continent	Number (Percentage,%) of Retracted Publication (n=568)
Asia	251 (44.2)
North America	163 (28.7)
Europe	122 (21.5)
Australia	17 (3)
South America	10 (1.7)
Africa	5 (0.9)

**Table.3** Country of Affiliation of the First Author of the Retracted Cardiovascular Disease Publications

Country	Number (Percentage,%) of Retracted Publication (n=568)
United States	155 (27.3)
China	141 (24.8)
Japan	52 (9.2)
Germany	35 (6.2)
Italy	23 (4.1)
United Kingdom	18 (3.2)
Australia	17 (3)
Canada	13 (2.3)
India	11 (1.9)
Korea, South	10 (1.8)
Spain	10 (1.8)
Turkey	8 (1.4)
Taiwan	7 (1.2)
Netherlands	7 (1.2)
Iran	6 (1.1)
Brazil	6 (1.1)
Israel	5 (0.9)
Singapore	5 (0.9)
France	4 (0.7)
Saudi Arabia	3 (0.5)
Poland	3 (0.5)
Egypt	3 (0.5)
Argentina	3 (0.5)
Hong Kong	2 (0.35)
Pakistan	2 (0.35)
United Arab Emirates	2 (0.35)
Belgium	2 (0.35)
Greece	2 (0.35)
Ireland	2 (0.35)
Serbia	2 (0.35)
Sweden	2 (0.35)
Switzerland	2 (0.35)
Hungary	1(0.17)
Romania	1 (0.17)
Slovakia	1(0.17)
South Africa	1(0.17)
Ethiopia	1(0.17)

## Figures

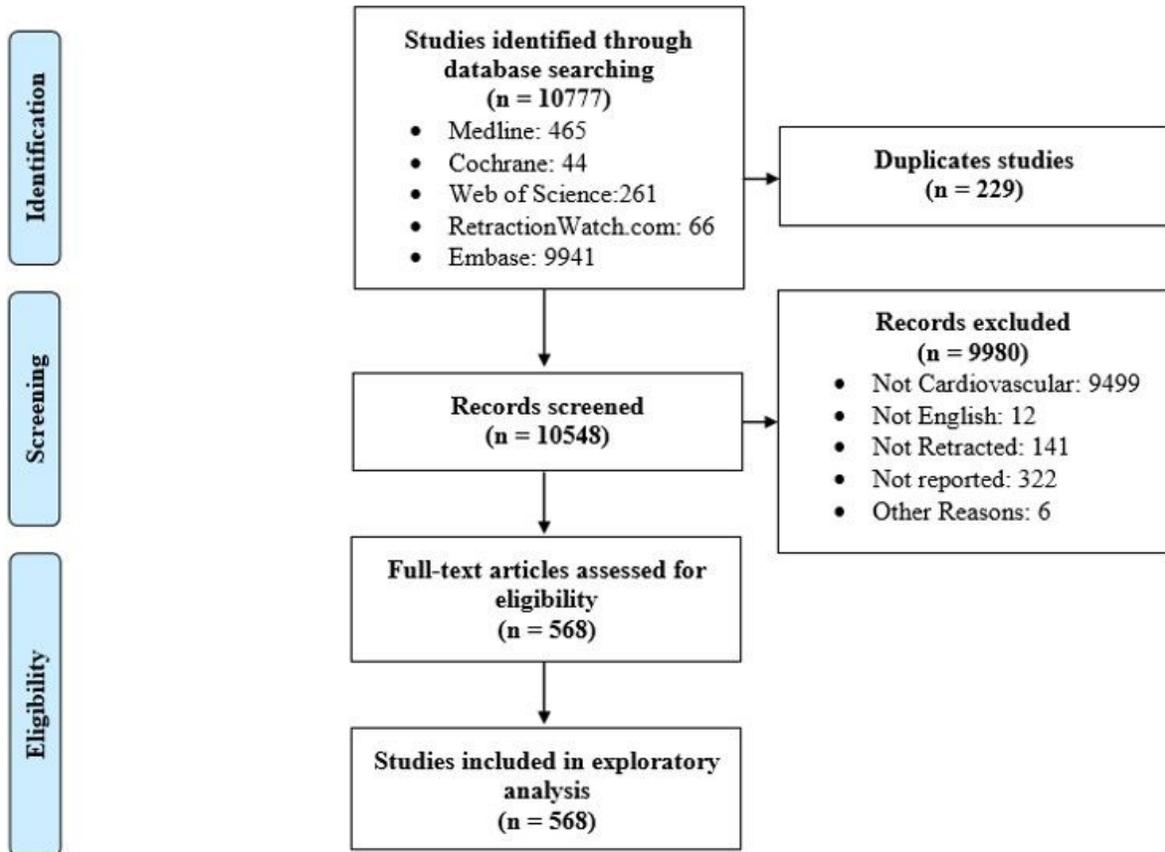
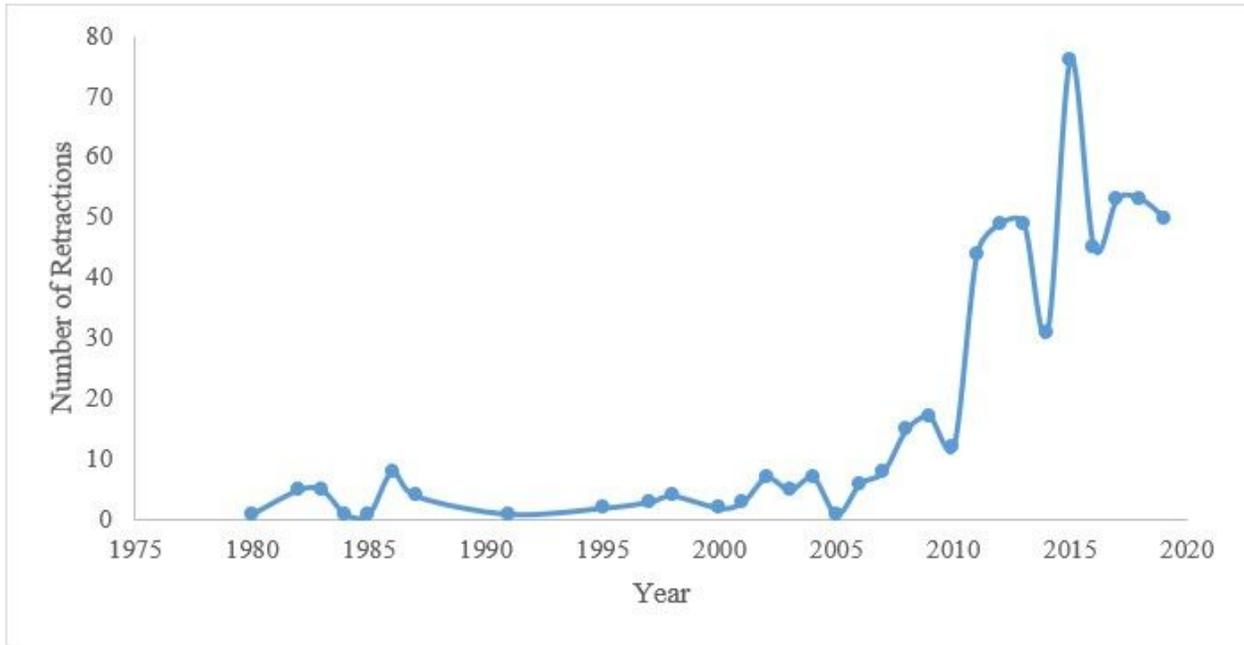


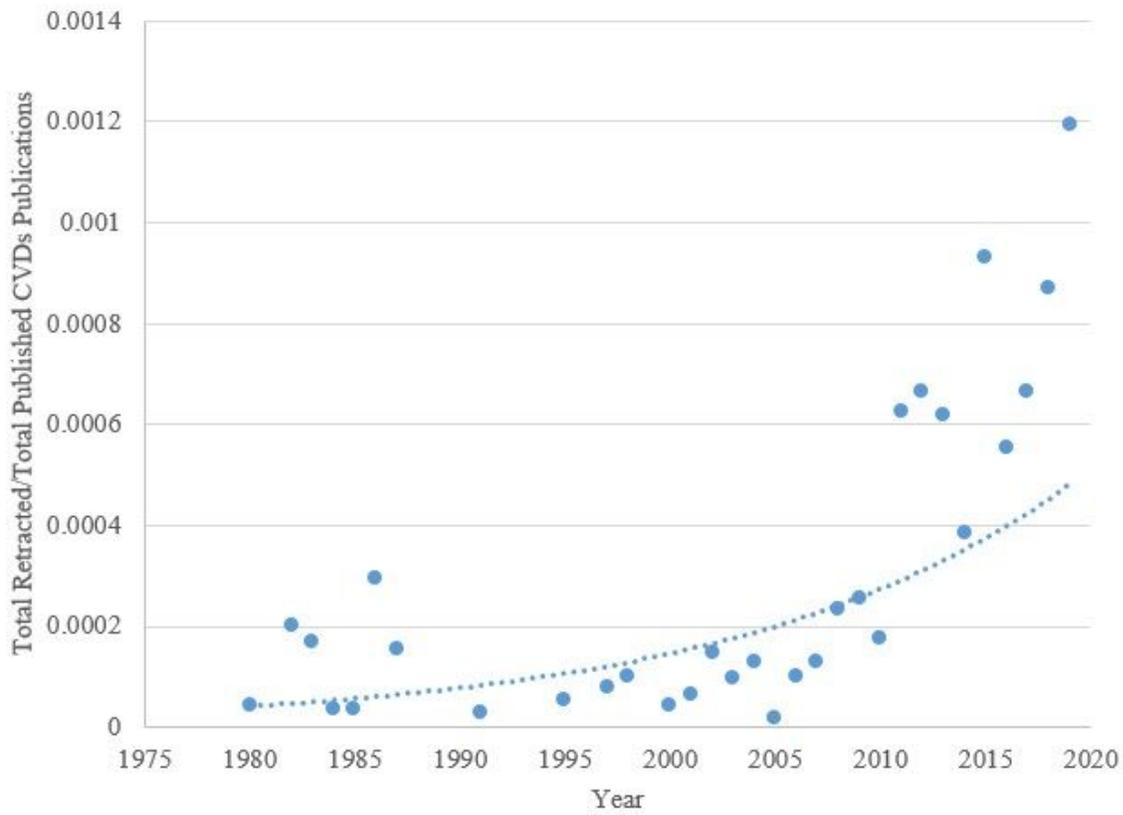
Figure 1

Flowchart detailing the study search strategy and included studies



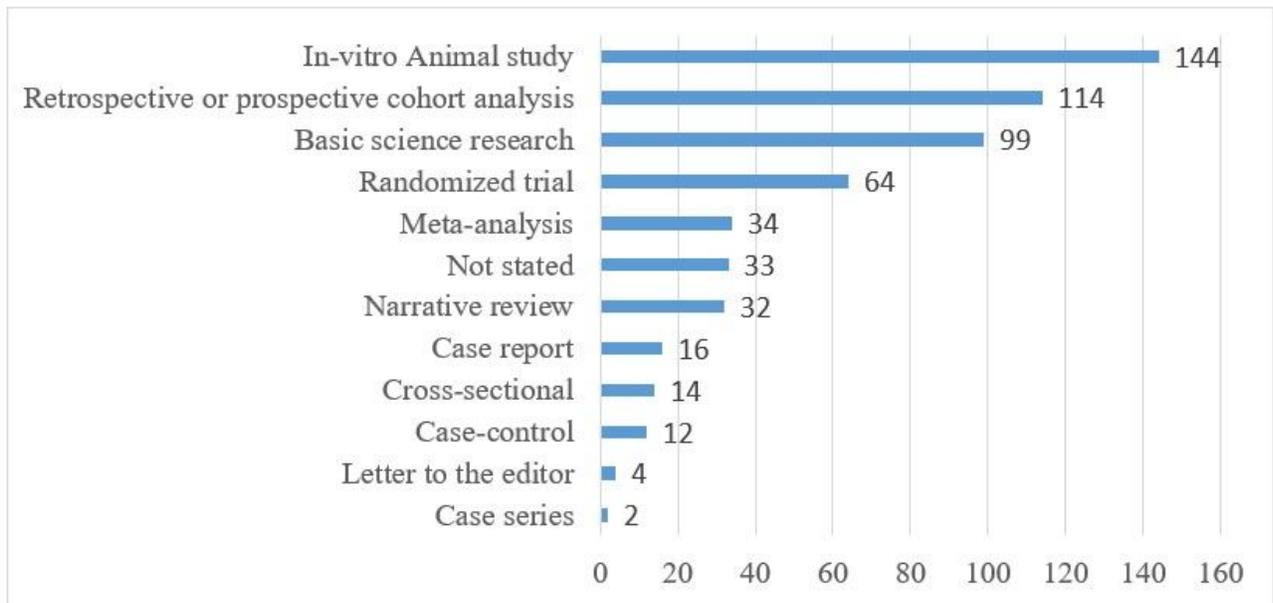
**Figure 2**

Trend of retracted cardiovascular disease publications. The number of retracted articles per year has rapidly increased and peaked in 2015



**Figure 3**

Cardiovascular diseases retracted publications in relation to total annual number of published cardiovascular diseases studies indexed MEDLINE database



**Figure 4**

Classification of Retracted Cardiovascular Diseases Publications

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