

Citation Analysis of Review Studies on Iranian Retracted Articles in Medical and Health Sciences in Scopus

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Abstract

The present study examined review articles in medical sciences and analyzed their citations of retracted Iranian papers. This was a quantitative and applied study using scientometrics and descriptive cross-sectional approaches. Review articles' citation trends of retracted studies were investigated using the quantitative method, and the status of the mentioned citations was determined using the descriptive method. The study population comprised 53 review studies that cited 28 retracted Iranian articles. The current study on review articles citing retracted papers revealed that most citations in 2019 were in the form of systematic reviews and meta-analyses by Iranian authors. These articles were occasionally published in journals with a high credibility and impact factor. Although the most frequent reasons for article retraction in the present study were scientific misconduct, most of the citing review articles did not mention this issue. Further research is required to determine the impact of referencing retracted articles on the results of review articles, especially systematic reviews, meta-analyses, and randomized clinical trials (RCTs), regarding the reasons for retraction.

Keywords: Scientific Misconduct, Article Retraction, Review Articles, Professional Misconduct, Plagiarism, Duplicate Publications.

Introduction

Many researchers worldwide publish their scientific findings in articles in various journals. Meanwhile, some others commit scientific misconduct for a variety of reasons. Therefore, scientific research reflects knowledge and a range of human behaviors such as talents, errors, and mistakes. In scientific behavior, the lack of honesty or diligence leads to violations and mistakes by researchers, thereby discrediting research (Vaux, 2016). When an article contradicts research norms, the author, publisher, or editor retracts it, thus minimizing the harm.

This phenomenon is called "retraction" (Tripathi, Dwivedi, Sonkar & Kumar, 2018).

There are numerous reasons for retracting articles, but violations, fraud, and honest errors are the most common (Nath, Marcus & Druss, 2006). Fraud entails many activities, e.g., misrepresenting results, falsifying or fabricating data, plagiarizing, and copying images, each of which results in the retraction of articles (Greitemeyer, 2014). On the other hand, even if these papers are retracted, they may still be cited, posing a severe challenge to today's scientific community. The constant exponential growth in citing retracted articles will almost certainly result in disseminating errors and misinformation as scientific facts (Campanario, 2000; Unger & Couzin, 2006). In some scientific disciplines, such as medicine, incorrect findings from this type of research can have severe implications (Steen, 2011).

Several studies have examined the characteristics of retracted scientific articles, which can be broadly divided into two categories (Fang, Steen & Casadevall, 2012). Studies in the first category focus on a single macro area. They typically attempt to answer questions such as how article retraction affects authors, organizations, scientific work, and the citation analysis of large-scale retracted articles (Heibi & Peroni, 2021). Numerous studies have been conducted for this purpose (Bar-Ilan & Halevi, 2018; Bordignon, 2020; Mott, Fairhurst & Torgerson, 2019). One or more popular cases are examined in the second category of studies, and the content of their citing articles is analyzed. The second category generally aims to extract a broad approach from the findings for use in a larger-scale set (9). Various studies have also considered this approach (Bar-Ilan & Halevi, 2017; Luwel & van Eck, 2018; Schneider, Ye, Hill & Whitehorn, 2020). Taking a closer look at the domain of medical sciences reveals that several studies have been carried out using this approach in dentistry (Nogueira, Gonçalves, Leles, Batista & Costa, 2017), radiology (Rosenkrantz, 2016), pharmacology (Samp, Schumock & Pickard, 2012), and biomedicine (Foo, 2011; Moradi & Janavi, 2018; Stretton et al., 2012).

If we consider retraction regarding the type of studies, one of the most important types is review studies. A review of previously published research might highlight inconsistencies in the literature, evaluate existing methodological approaches, or make recommendations for future works (Bahishti, 2021). Although there has been an increase in the number of review studies, particularly systematic reviews and meta-analyses, the quality of these studies has declined over the past decade (Fontelo & Liu, 2018). One of the most significant factors that reduce the quality of review studies and, as a result, clinical decisions is the use of retracted articles in such studies (Herrera-Peco, Santillán-García, Morán, Goodman-Casanova & Cuesta-Lozano, 2020). Therefore, health professionals and researchers should be conscious of the risks of selecting or even using retracted studies in their reviews, particularly systematic reviews and meta-analyses (Noyes, 2020).

To our knowledge, no study has been conducted on the citation of retracted papers in review articles. Iranian researchers are more concerned with examining retracted articles in databases such as the *Web of Science* (Moradi & Janavi, 2018; Moradi, Janavi & Kazemi, 2018) and *PubMed* (Masoomi & Amanollahi, 2018) in terms of their characteristics, causes of retraction, the number of authors, the interval from publication to retraction, validity, and occasionally, the number of citations received. Along with the significant growth in the number of Iranian papers over the last decade (Coghlan, 2011), research misbehavior has also increased (Holden, 2009; Stone, 2016), and assessments have shown that the quality of a large portion of Iranian research has deteriorated. The present study thus examined review articles in medical sciences and analyzed their citations of retracted Iranian papers.

Materials and Methods

This quantitative and applied study was carried out using scientometrics and descriptive cross-sectional approaches. Review articles' citation trends of retracted studies were investigated using the quantitative method, and the status of the mentioned citations was determined using the descriptive method.

First, the *Retraction Watch*¹ database, a tool for retrieving retracted studies, was searched, and the fields of *country*, *nature of notice*, and *subject* were limited to *Iran*, *retraction*, and *health sciences*, respectively. The retraction dates ranged from 2006 to the time of data collection (2019). After retrieving 229 studies, a researcher-made form was used to capture all the bibliographic information of the articles, the year of retraction, reasons for retraction, subject area, DOI of the retracted article, and DOI of the original paper.

Based on the first inclusion criterion, the DOI or title of the retracted papers was searched in *Scopus*. As a result, the research only contained papers indexed in this database. Only studies that received citations were included, and others were omitted based on the second criterion. Based on the third criterion, only review articles (by using the type of article filter) were included, and then citing papers were determined (using links to the citing articles). According to the given inclusion criteria, 67 retracted papers were identified, of which only those published after the cited article's retraction date were included.

The full text of 183 citing review articles with the features stated was acquired. After scanning the study's full text, non-review articles, articles whose full text was unavailable, those written in languages other than English and Persian, and narrative reviews were excluded from the study. Finally, 53 review studies that cited 28 retracted Iranian articles were selected. There was no sampling in the present study, and all the selected articles were reviewed and analyzed.

During the data analysis phase, the retracted publications were highlighted in their citing review articles' in-text citation and reference sections. Afterward, the location of the citation, the number of citations to the retracted articles, the implication of retraction by the citing review articles, and the reasons for retraction were evaluated. Finally, the data were interpreted using descriptive statistics, ranking, comparisons, tables, and graphs.

Results

Table 1 displays the bibliographic data of the review studies that cited at least one retracted Iranian study.

Table 1

Bibliographic information of Review articles with retracted references

Row	Title	First Author	Journal	Year	Frequency of citation to retracted references	Mention of retraction	Document Type
1	Fresh versus frozen embryo transfers in assisted reproduction	Tjitske Zaat	Cochrane Database of Systematic Reviews	2021	2	Yes	SR2
2	Fresh versus elective frozen embryo transfer in IVF/ICSI cycles: a systematic review and meta-analysis of	Matheus Roque	Human Reproduction Update	2019	2	Yes	SR; MA ³

Row	Title	First Author	Journal	Year	Frequency of citation to retracted references	Mention of retraction	Document Type
	reproductive outcomes						
3	Association Between Progesterone Elevation on the Day of Human Chronic Gonadotropin Trigger and Pregnancy Outcomes After Fresh Embryo Transfer in In Vitro Fertilization/Intracytoplasmic Sperm Injection Cycles	Sandro C. Esteves	Frontiers in endocrinology	2018	1	No	Systematized review
4	Fresh embryos versus freeze-all embryos - transfer strategies: Nuances of a meta-analysis	Felipe C Dieamant	JBRA Assisted Reproduction	2017	1	Yes	SR; MA
5	The role of telenursing in the management of diabetes : A systematic review and meta-analysis	Sa Yang	Public Health Nursing	2019	5	No	SR; MA
6	Exploring app features with outcomes in mHealth studies involving chronic respiratory diseases, diabetes, and hypertension: a targeted exploration of the literature	Sara Belle Donevant	Journal of the American Medical Informatics Association	2018	1	Yes	Systematized review
7	Factors associated with medication adherence among patients with diabetes in the Middle East and North Africa region	M. Jaam	Diabetes Research and Clinical Practice	2017	1	No	A systematic mixed studies review/ SR
8	A Systematic Review of Application and Effectiveness of mHealth Interventions for Obesity and Diabetes Treatment and Self-Management	Youfa Wang	Advances in Nutrition	2017	2	No	SR
9	The effectiveness of e-& mHealth interventions to promote physical activity and healthy diets in developing countries: A systematic review	Andre Matthias Müller	International Journal of Behavioral Nutrition and Physical Activity	2016	12	No	SR
10	Effect of Nigella sativa (black seed) supplementation on glycemic control: A systematic review and meta-analysis of clinical trials	Gholamreza Askari	Phytotherapy Research	2019	1	No	SR; MA
11	Nigella Sativa Improves Glucose Homeostasis and Serum Lipids in Type 2 Diabetes: A Systematic Review and Meta-analysis	Reza Daryabeygi-Khotbehsara	Complementary therapies in medicine	2017	2	No	SR; MA

Row	Title	First Author	Journal	Year	Frequency of citation to retracted references	Mention of retraction	Document Type
12	The effect of acute exercise on blood concentrations of brain-derived neurotrophic factor (BDNF) in healthy adults: A meta-analysis	Adam Dinoff	European Journal of Neuroscience	2017	1	No	MA
13	Challenges Establishing the Efficacy of Exercise as an Antidepressant Treatment: A Systematic Review and Meta-Analysis of Control Group Responses in Exercise Randomised Controlled Trials	Brendon Stubbs	Sports medicine	2016	3	No	SR; MA
14	Neurobiological effects of exercise on Major Depressive Disorder: A systematic review	Schuch, F.B.	Neuroscience and Biobehavioral Reviews	2015	6	No	SR
15	Dropout from exercise randomized controlled trials among people with depression: A meta-analysis and meta regression	Brendon Stubbs	Journal of Affective Disorders	2016	2	No	SR; MA; Meta regression
16	Exercise as a treatment for depression: A meta-analysis	Siri Kvam	Journal of affective disorders	2016	10	No	MA
17	Effect of Health Information Technologies on Glycemic Control for 1 Among Patients with Type 2 Diabetes	Yilin Yoshida	Current Diabetes Reports	2018	9	No	MA
18	Application of platelet-rich plasma and other platelet derivative products in Iranian studi	Seyed Ahmad Raeissadat	Koomesh	2019	1	No	Systematized review
19	Platelet-rich plasma to treat experimentally induced skin wounds in animals: A systematic review and meta-analysis	Adolfo Maria Tambella	PLoS One	2018	2	No	SR; MA
20	Neurogenic Sexual Dysfunction Treatment: A Systematic Review	Giulio Del Popolo	European Urology Focus	2020	1	No	SR
21	Management Of Sexual Dysfunction Due To Central Nervous System Disorders: A Systematic Review	Giuseppe Lombardi	BJU international	2015	7	No	SR
22	Treating Erectile Dysfunction and Central Neurological Diseases with Oral Phosphodiesterase Type 5 Inhibitors. Review of the Literature	Giuseppe Lombardi	The journal of sexual medicine	2012	1	No	Literature Review
23	Retracted publications and	Rapani A	Clinical and	2020	1	Yes	SR

Row	Title	First Author	Journal	Year	Frequency of citation to retracted references	Mention of retraction	Document Type
	their citation in dental literature: A systematic review		experimental dental research				
24	Which procedures and materials could be applied for full pulpotomy in permanent mature teeth? A systematic review	M. Zanini	Acta Odontologica Scandinavica	2019	9	No	SR
25	The Prevalence of Infectious Keratitis after Keratorefractive Surgery: A Systematic Review and Meta-Analysis Study	Afsharpaiman S	Journal of Ophthalmology	2020	1	No	SR; MA
26	Computer and mobile technology interventions to promote medication adherence and disease management in people with thalassemia	Sherif M Badawy	Cochrane Database of Systematic Reviews	2019	2	No	SR
27	A Literature Review on the Linear Elastic Material Properties Assigned in Finite Element Analyses in Dental Research	H. Kursat CELIK	Materials Today Communications	2021	10	No	Literature Review
28	comprehensive assessment of the Relationship Between microRNA-124 and the Prognostic Significance of cancer	Sun Y	Frontiers in Oncology	2018	3	No	MA
29	Prevalence of Chlamydia trachomatis in Pregnant Iranian Women: A Systematic Review and Meta-Analysis	Azami M	International journal of fertility & sterility	2018	8	No	SR; MA
30	Non-invasive postural assessment of the spine in the sagittal plane: a systematic review	Juliana Adami Sedrez	Motricidade	2016	4	No	SR
31	Photogrammetry as a tool for the postural evaluation of the spine: A systematic review	Tássia Silveira Furlanetto	World journal of orthopedics	2016	2	No	SR
32	Prevalence of depression in patients with cancer in Iran: a systematic review and meta-analysis	Aidin Aryankhesa	BMJ Supportive & Palliative Care	2019	2	No	SR; MA
33	Supportive Care of Breast Cancer Patients in Iran: A Systematic Review	Nasim Khosravi	International Journal of Cancer Management	2019	3	No	SR
34	Effect of oral L-citrulline on brachial and aortic blood pressure defined by resting status: evidence from randomized controlled trials	Yang HH	Nutrition & metabolism	2019	3	No	SR; MA

Row	Title	First Author	Journal	Year	Frequency of citation to retracted references	Mention of retraction	Document Type
35	The Prevalence of Shiga Toxin-producing Escherichia Coli in Patients with Gastroenteritis in Iran, Systematic Review and Meta-analysis	Nakysa Hooman	Iranian Journal of Kidney Diseases	2019	4	No	SR; MA
36	Electrocardiographic changes associated with epilepsy beyond heart rate and their utilization in future seizure detection and forecasting methods	Claire Ufongene	Clinical Neurophysiology	2020	1	No	Systematic literature review
37	Catastrophic healthcare expenditures among Iranian households: a systematic review and meta-analysis	Satar Rezaei	International Journal of Human Rights in Healthcare	2019	8	No	SR; MA
38	Catastrophic Health Expenditure in Iran: A Review Article	Aidin ARYANKHE SAL	Iranian journal of public health	2018	2	No	SR; MA
39	Efficacy of complete rings (MyoRing) in treatment of Keratoconus: a systematic review and meta-analysis	Leila Janani	International Ophthalmology	2019	1	No	SR; MA
40	Methodologies For Investigating Occupational Accidents and Their Use in Occupational Health and Safety Research. Literature Review	Francisco Salguero-Caparrós	Environmental Engineering & Management Journal	2019	1	No	Literature review
41	Astragalus in the Prevention of Upper Respiratory Tract Infection in Children with Nephrotic Syndrome: Evidence-Based Clinical Practice	Chuan Zou	Evidence-Based Complementary and Alternative Medicine	2013	1	No	Evidenced based review
42	Exclusive breastfeeding duration and its effect on the health of the children in Iran, a meta-analysis	Hosein Dalili	Journal of Pediatric Nursing	2019	1	No	SR; MA
43	Global and Historical Distribution of Clostridioides Difficile in the Human Diet (1981–2019): Systematic Review and Meta-Analysis of 21886 Samples Reveal Sources of Heterogeneity, High-Risk Foods, and Unexpected Higher Prevalence Toward the Tropic	Alexander Rodriguez-Palacios	Frontiers in medicine	2020	5	No	SR; MA
44	Prevalence of Legionella Species in Water Resources of Iran: A Systematic	Khaledi A	Iranian journal of medical sciences	2018	2	No	SR; MA

Row	Title	First Author	Journal	Year	Frequency of citation to retracted references	Mention of retraction	Document Type
	Review and Meta-Analysis						
45	Noninvasive Treatment Options for Peyronie's Disease	Jesse Ory	Sexual medicine reviews	2020	3	Yes	Systematized review
46	Review of Antidiabetic Fruits, Vegetables, Beverages, Oils and Spices commonly consumed in the Diet	Maliheh Najari Beidokhti	Journal of Ethnopharmacology	2017	1	No	Systematized review
47	Exercise for Depression in Older Adults – a Systematic Review and Meta-Analysis	Stephan Heinzl	GeroPsych	2015	1	No	Short Review; SR; MA
48	A Comparison of Literature from High and Low/Middle Income Countries	Haitham Abaza	Methods Inf Med	2017	-	-	Systematized review
49	MicroRNAs in the Progress of Diabetic Nephropathy: A Systematic Review and Meta-Analysis	Li-ping Wang	Evidence-based complementary and alternative medicine	2019	-	-	SR; MA
50	Microbiome Imbalances: An Overlooked Potential Mechanism in Chronic Nonhealing Wounds	Mengru Pang,	The International Journal of Lower Extremity Wounds	2019	1	No	Systematized review
51	An overview of platelet products (PRP, PRGF, PRF, etc.) in the Iranian studies	Seyed Ahmad Raeissadat	Future science	2017	1	No	Systematized review
52	Registered nurses' provision of end-of-life care to hospitalised adults: A mixed studies review	C. Karbasi	Nurse Education Today	2018	9	No	SR (Mixed study review)
53	Oral squamous cell carcinoma in patients twenty years of age or younger – Review and analysis of 186 reported cases	Lipa Bodner	Oral Oncology	2014	1	No	Literature review

The publication trends of the reviewed studies ranged from 2012 to 2021, with the majority of the studies (16 cases) citing retracted publications in 2019. The findings also showed eight types of citing studies, of which systematic review studies (35 cases) and meta-analyses (25 cases) had the highest number of articles. Moreover, four authors had the highest number of studies (each with two articles). Two authors had an Iranian affiliation to *Iran University of Medical Sciences* (articles 32 and 38 in Table 1) and *Shahid Beheshti University of Medical Sciences* (articles 15 and 51 in Table 1). The other two authors were affiliated with *King's College London* (articles 13 and 15 in Table 1) and *Italian Istituto Oncologico Veneto IOV – IRCCS* (articles 21 and 22 in Table 1).

Three journals had the highest number of citing articles (each with two studies), including the *Cochrane Database of Systematic Reviews*, *Evidence-Based Complementary and*

Alternative Medicine, and the *Journal of Affective Disorders*. With an impact factor of 9.266 indexed in *Scopus*, *ISI*, and *PubMed*, the first had a higher ranking than the others.

An assessment of article sections citing retracted papers demonstrated that citations were made in more sections in three review articles (in three sections of each article). The retracted articles were cited in the *Introduction*, *Findings*, and *Discussion* sections of two systematic reviews and meta-analyses (articles 29 and 37 in Table 1) and the *Methods*, *Findings*, and *Discussion* sections of one meta-analysis (article 16 in Table 1).

In most cases, the analysis of in-text citations of citing articles demonstrated no indication of the retraction of the cited papers. Only six articles (articles No. 1, 2, 4, 6, 23, and 45 in Table 1) referred to this case (seven times), with two indicating the reason for the retraction (articles No. 2 and 45 in Table 1), one mentioning the issuer (article No. 1 in Table 1), and four noting neither the reason nor the issuer (articles No. 1, 4, 6, and 23 in Table 1).

Figure 1 illustrates the number and percentage of in-text citations to retracted articles. The *Findings* (with 31 citations, 41%) and *Discussion* (with 20 citations, 28%) sections of review studies had the highest references to retracted papers. To increase the accuracy of the research, findings and discussion were separated from each other if they had been merged. In addition, three studies were considered in the diagram as *exceptions* due to in-text citation difficulties.

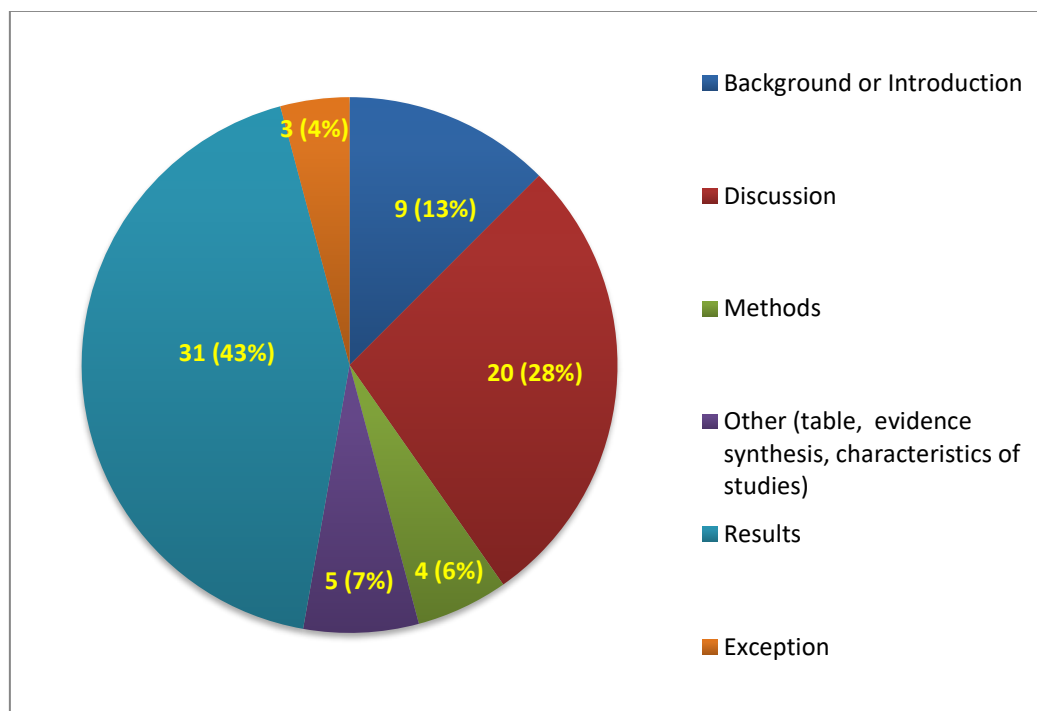


Figure 1: Number/ Percentage of in-text citations to Iranian retracted articles

Table 2 displays the bibliographic information of 28 retracted Iranian articles cited by the review articles in Table 1.

Table 2

Bibliographic information of retracted documents in Review Articles

Row	Title	First author	Journal	Year	Reason(s) for retraction	Subject	Number of Citation by (Table 1)
1	Can fresh embryo transfers be replaced by cryopreserved-thawed embryo transfers in assisted reproductive cycles? A randomized controlled trial	Abbas Aflatoonian	J Assist Reprod Genet	2010	<ul style="list-style-type: none"> • Duplication of Article • Error in Methods • Euphemisms for Duplication • Investigation by Journal/Publisher 	(HSC) Medicine - Obstetrics/Gynecology	1;2;3;4
2	The impact of nurse short message services and telephone follow-ups on diabetic adherence: Which one is more effective?	Zolfaghari M	Journal of Clinical Nursing	2012	Duplication of Article	<ul style="list-style-type: none"> • (HSC) Medicine - Diabetes; • (HSC) Medicine - Nursing; 	5;6;7;8;9;48
3	A double-blind placebo-controlled study of the efficacy and safety of pentoxifylline in early chronic Peyronie's disease	Safarinejad MR	BJU international	2009	<ul style="list-style-type: none"> • Error in Methods • Error in Results or Conclusions • Unreliable Results 	(HSC) Medicine - Drug Design;	45
4	Protective and antidiabetic effects of extract from <i>Nigella sativa</i> on blood glucose concentrations against streptozotocin (STZ)-induced diabetic in rats: An experimental study with histopathological evaluation	Samad Alimohammadi	Diagn Pathol.	2013	<ul style="list-style-type: none"> • Concerns/Issues About Authorship • False/Forged Authorship • Fake Peer Review • Investigation by Journal/Publisher • Misconduct by Author • Plagiarism of Text 	<ul style="list-style-type: none"> • (HSC) Medicine - Diabetes • (HSC) Medicine - Pathology; • (HSC) Veterinary Science; 	10;11;46
5	Electroconvulsive Therapy and Aerobic Exercise Training Increased BDNF and Ameliorated Depressive Symptoms in Patients Suffering From Treatment-resistant Major Depressive Disorder	Iraj Salehi	J Psychiatr Res	2014	<ul style="list-style-type: none"> • Error in Analyses • Error in Data • Unreliable Data • Unreliable Results 	<ul style="list-style-type: none"> • (HSC) Medicine - Psychiatry; • (HSC) Medicine - Rehabilitation/Therapy; 	12;13;14;15;16;47
6	Mobile phone text messaging and Telephone follow-up in type 2 diabetic patients for 3 months: A comparative study	Mirta Zolfaghari	J Diabetes Metab Disord	2012	Duplication of Article	<ul style="list-style-type: none"> • (HSC) Medicine - Diabetes; • (HSC) Public Health and Safety 	17
7	Effect of platelet-rich plasma on the healing of cutaneous defects exposed to acute to	Omid Ostvar	Diagn Pathol	2015	<ul style="list-style-type: none"> • Concerns/Issues About Authorship, • Fake Peer Review, 	• (HSC) Medicine - Dermatology;	18;19;50;51

Row	Title	First author	Journal	Year	Reason(s) for retraction	Subject	Number of Citation by (Table 1)
	chronic wounds: A clinico-histopathologic study in rabbits				<ul style="list-style-type: none"> • False/Forged Authorship, • Investigation by Journal/Publisher, • Misconduct by Author, • Plagiarism of Text 	• (HSC) Medicine - Pathology;	
8	Exploration of Iranian intensive care nurses' experience of end-of-life care: A qualitative study	Valiee S	Nursing in critical care	2012	<ul style="list-style-type: none"> • Error by Journal/Publisher, • Error in Text 	(HSC) Medicine - Nursing;	52
9	Safety and efficacy of sildenafil citrate in the treatment of Parkinson-emergent erectile dysfunction: A double-blind, placebo-controlled, randomized study	Safarinejad MR	International journal of impotence research	2010	Notice - Limited or No Information	<ul style="list-style-type: none"> • (HSC) Medicine - Obstetrics/Gynecology; • (HSC) Medicine - Urology/Nephrology; 	20;21;22
10	A clinical trial of pulpotomy vs. root canal therapy of mature molars	Asgary S	Journal of dental research	2010	Duplication of Article	(HSC) Medicine - Dentistry;	23;24
11	Effect of booklet and combined method on parents' awareness of children with β -thalassemia major disorder	Heydarnejad MS	Journal of the Pakistan Medical Association	2008	Notice - Limited or No Information	<ul style="list-style-type: none"> • (HSC) Medicine - Cardiovascular; • (HSC) Medicine - Pediatrics; 	25;26
12	A three-dimensional finite element analysis of the effects of restorative materials and post geometry on stress distribution in mandibular molar tooth restored with post-core crown	Mahmoudi M	Dental materials journal	2012	<ul style="list-style-type: none"> • Breach of Policy by Author, • Nonpayment of Fees/Refusal to Pay, • Notice - Limited or No Information 	(HSC) Medicine - Dentistry;	27
13	Down-regulated microRNA-124 expression as predictive biomarker and its prognostic significance with clinicopathological features in breast cancer patients	Ali Arabkheradmand	Diagn Pathol	2015	<ul style="list-style-type: none"> • Concerns/Issues About Authorship, • False/Forged Authorship, • Fake Peer Review, • Investigation by Journal/Publisher, • Misconduct by Author, • Plagiarism of Text 	<ul style="list-style-type: none"> • (HSC) Medicine - Oncology; • (HSC) Medicine - Pathology; • (HSC) Radiology/Imaging; 	28
14	Antimicrobial susceptibility patterns of <i>Ureaplasma urealyticum</i> and <i>Mycoplasma hominis</i> isolated from pregnant	Azizmohammadi S	Iranian Red Crescent Medical Journal	2015	<ul style="list-style-type: none"> • Criminal Proceedings, • False/Forged Authorship, • Fake Peer Review, • Investigation by 	<ul style="list-style-type: none"> • (HSC) Medicine - Immunology; • (HSC) Medicine - Infectious 	29

Row	Title	First author	Journal	Year	Reason(s) for retraction	Subject	Number of Citation by (Table 1)
	women				Company/Institution, • Investigation by Journal/Publisher, • Misconduct - Official Investigation/Finding, • Misconduct by Author	Disease; • (HSC) Medicine - Obstetrics/Gynecology;	
15	Reliability and validity of the AutoCAD software method in lumbar lordosis measurement	Amir Letafatkar	J Chiropr Med	2011	• Breach of Policy by Author, • Concerns/Issues about Referencing/Attributions, • Investigation by Journal/Publisher, • Plagiarism of Text	(HSC) Medicine - Orthopedics;	30;31
16	Depression and health related quality of life in breast cancer patients	Ardebil MD	The Journal of the Pakistan Medical Association	2013	Duplication of Article	• (HSC) Medicine - Obstetrics/Gynecology; • (HSC) Medicine - Oncology; • (HSC) Medicine - Psychiatry; • (HSC) Public Health and Safety;	32;33
17	Effect of l-citrulline supplementation on blood pressure: a systematic review and meta-analysis of randomized controlled trials	Mahboobi S	Journal of human hypertension	2018	• Error in data, • Error in results and/or conclusions	• (HSC) Medicine - Alternative; • (HSC) Medicine - Cardiovascular;	34
18	Upregulated Expression of Circulating MicroRNAs in Kidney Transplant Recipients With Interstitial Fibrosis and Tubular Atrophy	Vahed S Zununi	Iranian journal of kidney diseases	2017	• Duplication of article, • Error by journal/publisher, • Miscommunication by author, • Miscommunication by journal/publisher	• (HSC) Medicine - Immunology; • (HSC) Medicine - Surgery; • (HSC) Medicine - Urology/Nephrology;	49
19	Shiga toxigenic Escherichia coli in Iranian pediatric patients with and without diarrhea: O-serogroups, virulence factors and antimicrobial resistance	Banafshe Dormanesh	Iranian Red Crescent Medical Journal	2015	• Criminal Proceedings, • False/Forged Authorship, • Fake Peer Review, • Investigation by Company/Institution, • Investigation by	• (HSC) Medicine - Gastroenterology; • (HSC) Medicine - Infectious Disease; • (HSC)	35

Row	Title	First author	Journal	Year	Reason(s) for retraction	Subject	Number of Citation by (Table 1)
	properties				Journal/Publisher, • Misconduct - Official Investigation/Finding, • Misconduct by Author	Medicine - Pediatrics;	
20	A novel real-time patient-specific seizure diagnosis algorithm based on analysis of EEG and ECG signals using spectral and spatial features and improved particle swarm optimization classifier	Saadat Nasehi	Computers in Biology and Medicine	2012	• Concerns/Issues About Results, • Plagiarism of Data, • Plagiarism of Text	(HSC) Radiology/Imaging;	36
21	Squamous cell carcinoma of the tongue in a 13-year-old boy	Maryam Seyedmajidi	Archives of Iranian Medicine	2008	Plagiarism of Article	• (HSC) Medicine - Oncology; • (HSC) Medicine - Otorhinolaryngology;	53
22	Households encountering with catastrophic health expenditures in Ferdows, Iran	Javad Ghoddoosinejad	The Journal of the Egyptian Public Health Association	2014	• False/Forged Authorship, • Lack of Approval from Author	(HSC) Medicine - General;	37;38
23	Full-ring intracorneal implantation in corneas with pellucid marginal degeneration	Sahar Mojaled Nobari	Iranian Red Crescent Medical Journal	2015	• Criminal Proceedings, • False/Forged Authorship, • Fake Peer Review, • Investigation by Company/Institution, • Investigation by Journal/Publisher, • Misconduct - Official Investigation/Finding, • Misconduct by Author	• (HSC) Medicine - Ophthalmology; • (HSC) Medicine - Surgery;	39
24	FTA vs. Tripod-Beta, which seems better for the analysis of major accidents in process industries?	I Mohammadfam	Journal of Loss Prevention in the Process Industries	2012	Plagiarism of Article	(HSC) Occupational Health and Safety;	40
25	Clinical and laboratory findings and therapeutic responses in children with nephrotic syndrome	A A S L Safaei	Indian journal of nephrology	2010	Duplication of Article	• (HSC) Medicine - Pediatrics; • (HSC) Medicine - Urology/Nephrol	41

Row	Title	First author	Journal	Year	Reason(s) for retraction	Subject	Number of Citation by (Table 1)
						ogy;	
26	Effect of breast-feeding on the development of atopic dermatitis	Reza Ghaderi	Iranian Journal of Allergy, Asthma, and Immunology	2005	Notice - Unable to Access via current resources	<ul style="list-style-type: none"> • (HSC) Medicine - Dermatology; • (HSC) Medicine - Immunology; • (HSC) Medicine - Obstetrics/Gynecology; 	42
27	Prevalence, antibiotic resistance, and toxigenic gene profile of the <i>Clostridium difficile</i> isolated from molluscan shellfish	Farnaz Nayeypour	Journal of Food Safety	2018	Fake peer review	<ul style="list-style-type: none"> • (HSC) Medicine - Alternative; • (HSC) Medicine - Cardiovascular; 	43
28	Contamination of hospital water supplies in Gilan, Iran, with <i>Legionella pneumophila</i> , <i>Escherichia coli</i> , and <i>Pseudomonas aeruginosa</i>	Masoumeh Ahmadi Jalali Moghadam	Interdisciplinary Perspectives on Infectious Diseases	2015	Plagiarism of Article	(HSC) Public Health and Safety;	44

The publishing trend of the retracted studies was from 2005 to 2018, with the majority published in 2012 and 2015 (six articles each). In addition, Table 2 indicates that two authors (articles No. 2, 3, 6, and 9 in Table 2) had the highest number of studies (each with two articles) and were affiliated with the *Tehran University of Medical Sciences*. Two journals also had the highest number of cited articles (with three studies): *Diagnostic Pathology* and *Iranian Red Crescent Medical Journal*. With an impact factor of 2.644 indexed in *Scopus*, *ISI*, and *PubMed*, the former had a higher ranking than the latter.

Overall, the Iranian medical articles were retracted for 30 reasons, including 22 cases of authors' intentional mistakes (articles No. 1-7, 10, 12-15, 19, and 23 in Table 2), seven cases of reviewers' intentional mistakes (articles No. 4, 7, 13, 14, 19, 23, and 27 in Table 2), four cases of common intentional mistakes by authors and editors (articles No. 1, 9, 11, and 12 in Table 2), six cases of authors' honest errors (articles No. 1, 3, 5, 8, 17, and 18 in Table 2), and three cases of honest errors by journals, editors, or publishers (articles No. 8, 18, and 26 in Table 2). Nine other cases were also retracted for reasons other than scientific misconduct. Problems such as duplication of articles, false/forged authorship, fake peer review, and investigation by journal/publisher were the most common reasons for article retraction.

Among 26 health science sub-topics, obstetrics and gynecology (with five studies) had the highest number of retracted articles. Besides, among the studies mentioned, two were the most frequently cited by the articles in Table 1 (each with six papers). The first article (article No. 2 in Table 2), retracted due to duplicate publication, was cited in *Findings*, *Discussion*, and *Methods*. Only the retraction process was mentioned in the *Methods* section. The second article (article No. 5 in Table 2), retracted due to errors in data and analyses and unreliable data and

results, was cited in *Introduction, Methods, Results, and Discussion*. Note that none of the sections mentioned the invalidity of the study.

Discussion

The current study on review articles citing retracted papers revealed that most citations in 2019 were in the form of systematic reviews and meta-analyses by Iranian authors. Contrary to these results, Moradi et al. (Moradi et al., 2018), who conducted a comparative analysis of scientific misconduct in accused countries, including Iran, found that retracted Iranian articles were published in the *Web of Science* between 2010 and 2017 but were only cited 23 times. Likewise, in another scientometrics study Moradi and Janavi (2018) examined Iranian articles indexed in the *Web of Science* up to 2017. They found that out of 103 articles, only five had been cited, and each was only cited once. In other words, 98 articles received no citation. Despite the limitation of citing articles based on the inclusion criteria for the research community, the number of cases in the current study was significantly higher than the cases mentioned by Moradi et al. The study by Mansourzadeh, Ghazimirsaeid, Motamedi, Najafi, Abubakar and Dehdarirad (2021) also confirms the present study's findings. Their study on citations to retracted Iranian articles in *PubMed* demonstrated that up to 2017, 789 citations were made to these studies (11.6 citations per publication).

Moreover, these articles were occasionally published in journals with a high credibility and impact factor. For instance, the *Cochrane Systematic Review*, which published articles citing retracted papers, has an impact factor of 9.266. These studies were retracted for a variety of reasons, including intentional errors by authors or editors (e.g., duplication of the article, euphemisms for duplication, or notice/limited or no information), errors by authors (e.g., errors in methods), and other scientific misconducts (e.g., an investigation by the journal/publisher). Consequently, the journal's impact factor, ranking, and indexing in reputable scientific databases such as *Scopus*, *Web of Science*, and *PubMed* cannot be the only factors affecting the scientific quality of articles, mainly review articles.

Despite journals' high ratings, their articles may cite retracted papers that have been retracted for various reasons, including scientific misconduct, which has remained hidden from editors and reviewers. The results of the present study are in line with the research by Dong, Wang and Fan (2021). In the mentioned study, to investigate the relationship between the journal impact factor and the quality of articles, a computer-simulated model was adopted in which three dimensions of author, article, and publication were employed. The results indicated that the journal impact factor could be calculated more effectively using these dimensions, indicating the quality of articles compared to scientometric and bibliometric approaches. In a similar study, Abid, Abid, Alnofeye, Abid and Ratnani (2021) examined the quality of medical studies retracted during the COVID-19 pandemic indexed in *PubMed*. They showed that many of the retracted articles during this period were published in reputable and well-known journals, most of which (44.7%) were associated with *Elsevier* publications. The average impact factor of journals whose articles were retracted was 3 (2.1 to 4.8). Furthermore, the majority of the articles were retracted due to errors made by authors, journals, or publishers, including problems with the data, duplicate publication due to a journal/publisher error, error in the result and/or conclusion, plagiarism, failure to obtain agreement from the original author, and error in the method or analysis.

Most of the retracted Iranian articles affiliated with the *Tehran University of Medical*

Sciences were discredited mainly due to research misbehavior, including inadvertent and intentional errors of authors, journals, judges, publishers, or editors. The current study's results align with the research by Mansourzadeh et al. (2021), who found that *Tehran and Islamic Azad Universities of Medical Sciences* had the most retracted studies. The articles were mainly retracted due to problems related to authors, duplication, and plagiarism.

The present study showed that article retraction mainly occurred in obstetrics and gynecology. In contrast, the research by Abid et al. (2021) indicated that most of the retracted studies during the COVID-19 pandemic were related to therapeutics (23.4%), public health (11.7%), mental health (7.4%), and diagnosis (7.4%).

Although the most frequent reasons for article retraction in the present study were scientific misconduct, most of the citing review articles did not mention this issue. This could confirm the validity of retracted studies and might have consequences for the results of review articles and the process of patient care and treatment. The present study's findings align with previous studies such as Chambers, Michener and Falcone (2019) and Bennett et al. (2020). According to these authors, article retraction in obstetrics and gynecology has increased, leading to research misconduct such as plagiarism, duplicate publication, falsifying results or data, and misbehaviors in the peer-review process.

Conclusion

In conclusion, further research is required to determine the impact of referencing retracted articles on the results of review articles, especially systematic reviews, meta-analyses, and randomized clinical trials (RCTs), regarding the reasons for retraction. The current study makes the following recommendations to improve the citation process for retracted studies: Some studies are retracted for reasons other than research misconduct, e.g., nonpayment of fees/refusal to pay or disagreement between authors on authorship issues and the order of authors' names (concerns/authorship issues). Although such reasons for retracting an article appear legitimate, these studies have no scientific validity problems, and using them in review articles will not have any adverse consequences.

The automatic removal of such articles from review studies will also lead to bias in reporting the results. Thus, it is recommended that researchers publish the justification for integrating such research alongside their review study, considering the reason for the study's retraction. To overcome this problem, authors can contact the journal's editor before citing the retracted article to determine the exact causes of retraction. Also, they can use the *Retraction Watch* database⁴. Incorrect citations were sometimes made in the review studies, or in-text citations to the retracted articles were not made at all. Therefore, in-text citations, references, and their relevance should be considered when evaluating articles, mainly review papers.

The database listed articles citing the 2011 article for 2013 as well. Some articles on *Scopus* also contained more than one disclaimer but did not provide complete information. Moreover, some reference manager programs, such as *Endnote*, could not detect such studies. As a result, others could not be aware of their retraction and thus used these articles. Therefore, researchers can use strategies to identify retracted articles before citing them. For example, they can use the *PubChase* alert service connected to the *Retraction Watch* database.

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Endnotes

1. Retractionwatch.org
2. Systematic Review
3. Meta Analysis
4. <https://retractionwatch.com/retraction-watch-database-user-guide/retraction-watch-database-user-guide-appendix-b-reasons/>

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