



Reducing Quotation Errors in Scientific Manuscripts: A Novel Approach from the Global Andrology Forum

Asli Metin Mahmutoglu^{1,2,*}, Ashok Agarwal^{2,3,*}, Bahadır Sahin^{2,4}, Tomer-Avidor Reiss^{2,5,6}, Pallav Sengupta^{2,7,8}, Germar-Michael Pinggera^{2,9}, Hiva Alipour^{2,10}, Rossella Cannarella^{2,11,12}, Christine Wyns^{2,13,14}, Mohamed Arafa^{2,15,16,17}, Aldo E. Calogero^{2,11}, Taymour Mostafa^{2,17}, Eric Chung^{2,18}, Ala'a Farkouh^{2,19}, Ahmad Motawi^{2,17}, Amarnath Rambhatla^{2,20}, Ayad Palani^{2,21}, Giovanni M. Colpi^{2,22}, Murat Gül^{2,23,24}, Selahittin Çayan^{2,25}, Israel Maldonado Rosas^{2,26}, Taha Abo-Elmagd Abdel-Meguid Hamoda^{2,27,28}, Rupin Shah^{2,29}

¹Department of Medical Biology, Medical Faculty, Yozgat Bozok University, Yozgat, Türkiye, ²Global Andrology Forum, Moreland Hills, OH, USA, ³Cleveland Clinic, Cleveland, OH, USA, ⁴Urology Department, Marmara University School of Medicine, Istanbul, Türkiye, ⁵Department of Biological Sciences, University of Toledo, Toledo, OH, USA, ⁶Department of Urology, College of Medicine and Life Sciences, University of Toledo, Toledo, OH, USA, ⁷Department of Biomedical Sciences, College of Medicine, Gulf Medical University, Ajman, UAE, ⁸Basic Medical Sciences Department, College of Medicine, Ajman University, Ajman, UAE, ⁹Department of Urology, Innsbruck Medical University, Innsbruck, Austria, ¹⁰Department of Health Science and Technology, Aalborg University, Aalborg, Denmark, ¹¹Department of Clinical and Experimental Medicine, University of Catania, Catania, Italy, ¹²Glickman Urological & Kidney Institute, Cleveland Clinic Foundation, Cleveland, OH, USA, ¹³Laboratoire d'Andrologie, Pôle de Recherche en Physiologie de la Reproduction, Institut de Recherche Expérimentale et Clinique (IREC), Université Catholique de Louvain, Brussels, Belgium, ¹⁴Department of Gynecology-Andrology, Cliniques Universitaires Saint-Luc, Brussels, Belgium, ¹⁵Department of Urology, Hamad Medical Corporation, Doha, Qatar, ¹⁶Department of Urology, Weill Cornell Medical-Qatar, Doha, Qatar, ¹⁷Department of Andrology, Sexology & STIs, Faculty of Medicine, Cairo University, Cairo, Egypt, ¹⁸Department of Urology, Princess Alexandra Hospital, University of Queensland, Brisbane QLD, Australia, ¹⁹Department of Urology, Loma Linda University Health, Loma Linda, CA, USA, ²⁰Department of Urology, Henry Ford Health System, Vattikuti Urology Institute, Detroit, MI, USA, ²¹Research Centre, University of Garmian, Kalar, Iraq, ²²Andrology and IVF Center, Next Fertility Procrea, Lugano, Switzerland, ²³Department of Urology, Selcuk University School of Medicine, Konya, Türkiye, ²⁴Department of Andrology, Selcuk University School of Medicine, Konya, Türkiye, ²⁵Department of Urology, University of Mersin School of Medicine, Mersin, Türkiye, ²⁶IVF Laboratory, CITMER Reproductive Medicine, Mexico City, Mexico, ²⁷Department of Urology, King Abdulaziz University, Jeddah, Saudi Arabia, ²⁸Department of Urology, Faculty of Medicine, Minia University, El-Minia, Egypt, ²⁹Department of Urology, Lilavati Hospital and Research Centre, Mumbai, India

Purpose: This study investigated 1) the frequency of quotation errors in multi-authored medical manuscripts in andrology, 2) analyzed common types of quotation errors and the methods used to rectify them, and 3) evaluated their impact on manuscript accuracy, credibility, and research conclusions.

Materials and Methods: Twelve manuscripts written by the Global Andrology Forum (GAF) members between 2023 and 2024 were randomly selected for this study. The manuscripts and "Quotation Verification Sheets" were analyzed by senior GAF researchers to detect the number and types of quotation errors. The error rate was calculated by the total number of quotation errors and total number of all cited references in each manuscript. The impact on manuscript sections was assessed

Received: Oct 9, 2024 **Revised:** Oct 10, 2024 **Accepted:** Oct 31, 2024 **Published online** Jan 2, 2025

Correspondence to: Ashok Agarwal  <https://orcid.org/0000-0003-0585-1026>

Global Andrology Forum, 130 West Juniper Lane, Moreland Hills, OH 44022, USA.

Tel: +1-216-312-5829, **E-mail:** agarwa32099@outlook.com, **Website:** <https://www.globalandrologyforum.com>

The researchers contributing to this publication are members of the Global Andrology Forum (GAF), based in Moreland Hills, OH, USA. GAF operates under the Global Andrology Foundation, a non-profit organization registered in Innsbruck, Austria.

*These authors contributed equally to this work as co-first authors.

using a 0–4 grading scale. The Spearman correlation test was used to assess the correlation between scalar variables, and the Mann–Whitney U test was utilized to compare scalar variables between two groups.

Results: The median value of quotation errors was 10.3%. Factual inaccuracy was the most common type of error, and was observed in all twelve manuscripts at various rates. The number of errors was significantly associated with the number of references ($p=0.706$; $p=0.010$) and in-text citations ($p=0.636$; $p=0.026$). Factual inaccuracy ($p=0.588$; $p=0.044$) and factual interpretation ($p=0.861$; $p=0.013$) were also correlated with the total number of quotation errors. However, no significant associations were found between quotation errors and author numbers or their qualifications. The quotation errors adversely impacted the manuscript discussion, followed by the overall message.

Conclusions: Quotation errors are common in multi-authored medical manuscripts in andrology-related scientific articles. Journal editorial offices should incorporate quotation verification into the review process. Limiting references and in-text citations to only strictly necessary ones may help improve quotation accuracy. The quotation verification model proposed by GAF offers a practical and structured approach for detecting and correcting quotation errors.

Keywords: Andrology; Editorial policies; Health care; Medical writing; Research design; Quality assurance

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Accurate quotations and citations are fundamental components of scientific writing, serving multiple purposes that enhance the quality and credibility of research publications. Quoting the primary publication source is essential to scientific publications [1] and serves multiple functions. Literature references may support the author(s) hypothesis or statements, establishing credit to the publication. They may also be used to distinguish the novelty of the content, contrasting it with other scientific opinions. Finally, implementing literature references gives the reader structured and more transparent access to relevant literature for a specific topic [2].

Despite their critical role, citation and quotation inaccuracies are common in the medical literature [3]. A citation error results from mistake(s) in the publication's exact and unique bibliographic description, such as authors' names, year of the publication, title, volume, name of the journal, and page numbers. With the widespread use of commercially available or freeware reference managing software (e.g., EndNote, Mendeley, RefWorks, Papers, JabRef, or Zotero), citation errors have decreased [2], although contextual quotation errors remain substantial.

A quotation error occurs when a statement is used with a different meaning from its source [4], and is more complex to identify and resolve. This includes

instances where primary data are reported incorrectly or incompletely, along with errors in the intellectual context of the cited publications. Quotation errors can result in unscientific writing when excluding other scientific findings up to intellectual input violations. They can also mislead readers, propagate errors, and ultimately undermine the credibility of scientific publications.

The prevalence of citation and quotation errors has been well-documented in the medical literature of specific fields, such as general surgery, foot and ankle surgery, orthopedics, dermatology, emergency medicine, and public health—ranging from 11% to 41% for citation errors and 7.5% to 38% for quotation errors [2,3,5–11]. Moreover, a recent systematic review and meta-analysis (SRMA), including 15 medical research studies with 5,535 quotations, reported that the medical literature analyzed had a 14.5% quotation error rate, 64.8% of which were major errors [12].

A major quotation error occurs when a claim contradicts the statement in the cited article and fails to substantiate or is not related to the author's claim in the source publication. Minor quotation error occurs when a cited statement includes incorrect quantitative values (e.g., patient numbers or percentages), and it is oversimplified as compared with the author's claim or the statement suggesting a conclusion not reached by the authors of the cited article. Additionally, indirect references, also known as secondary references, are

included in minor types of quotation inaccuracies [2]. While classifying quotation errors as major or minor has been standard in the quotation error-related literature [2,6,11], in-depth analyses of such errors have not been performed. Furthermore, the analysis of quotes has been primarily performed on articles published in scientific journals following peer-review [10]. However, rectifying errors in already published articles is both challenging and unproductive; thus, quotation assessments should be carried out before submitting articles for publication. To our knowledge, there is still a lack of in-depth analyses on the accuracy of quotations, or frequency and types of quotation errors in manuscripts being considered in scientific journals before the submission process. Furthermore, significant quotation inaccuracies, such as contradiction and failure to substantiate, have not been evaluated or analyzed in detail.

Therefore, the present study aimed to identify and quantify the common quotation error types in multi-authored medical manuscripts (by Global Andrology Forum [GAF] members) in the field of andrology prior to submission in a peer-reviewed journal. Furthermore, the study assessed how the different types of errors were rectified, and what impact these errors had on different aspects of the manuscript.

The current study was based on the following hypotheses:

- The rate of quotation errors is significantly correlated with the number of references and in-text citations.
- Factual inaccuracies, which are errors that indicate a citation whose subject is related to the topic but does not accurately support the facts, are the most common type of quotation error in the reviewed manuscripts.
- Implementing a quotation verification process can effectively reduce quotation errors before manuscript submission.
- Quotation errors can be associated with certain factors such as the number of authors and degree of the authors.

By addressing these objectives and hypotheses, the study seeks to contribute to the ongoing efforts to enhance the accuracy and reliability of scientific literature in andrology and beyond.

MATERIALS AND METHODS

1. Study design and data collection

Twelve manuscripts with their “Quotation Verification Sheets” written and prepared by GAF members between 2023 and 2024 were randomly selected for this study. Unique numbers were given to the manuscripts, and random numbers were generated with a computer to select them for inclusion. Randomly selected manuscripts underwent the process of determining the quantity of quotation errors, analyzing the types of these errors, and the rectification of errors. The study types of the twelve manuscripts were narrative reviews (n=4) [13-16] and original articles (n=8). Original articles included SRMAs (n=4) [17-20], and global surveys (n=4) [21-24].

2. Quotation verification process

The quantity and types of quotation errors were evaluated using a classification developed by the GAF [25,26], based on quotation verification sheets from manuscripts prepared by GAF members, along with an analysis of the corrections performed.

GAF is an international scientific research group specializing in andrology [25,26] which implements a rigorous internal review process to minimize quotation inaccuracies before manuscript submission. During the preparation phase of any manuscript and thus before considering it ready for publication submission, the GAF policies require an extensive internal review process for all citations to double check, detect, and, if needed, correct any quotation inaccuracies by experienced senior researchers [27]. These are tabulated in a “Quotation Verification Sheet.”

In brief, the routine GAF quotation verification process (Fig. 1) begins with the lead author creating a cloud storage platform for storing cited articles in the manuscript, which is shared with all responsible authors. In the second step, the authors upload full-text PDFs of the cited articles with the quoted statements highlighted. In the third step, following the finalization of the manuscript writing, the responsible authors fill out the “Quotation Verification Sheet” based on the final manuscript draft. A sample quotation verification sheet is presented as supplementary material (Supplement File 1). In the final step, selected experienced co-authors and responsible authors check the accuracy of the quotations. Once any error is detected, they

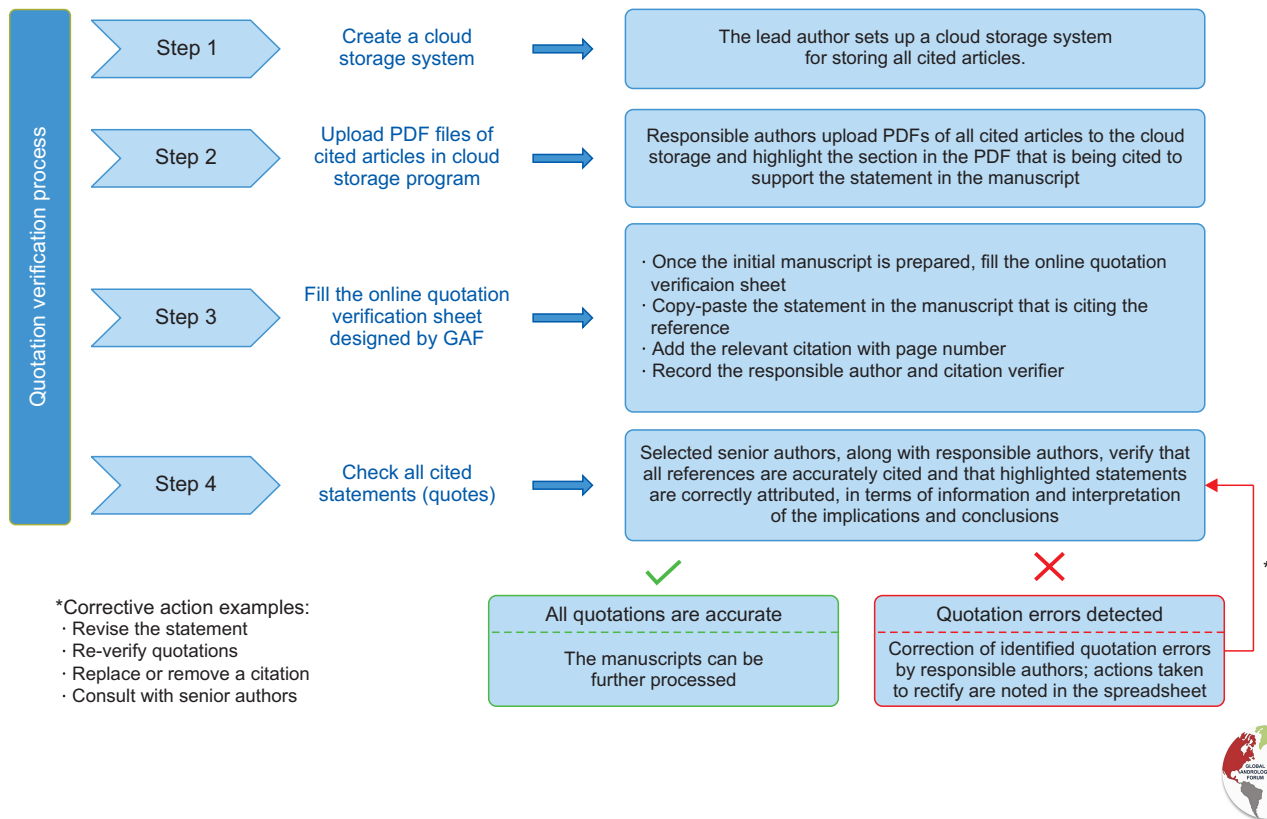


Fig. 1. Flow chart of the quotation verification process. GAF: Global Andrology Forum.

Box 1.

Definition of some terms used in this article and types of quotation errors

In-text citation is the total number of all cited references in the manuscript.

Quotation error occurs when a statement is used with a different meaning from its source

Types of Quotation Errors

Omission error (*i.e.*, no citation or absence of a citation) occurs when a factual statement or data lacks supporting references. In a paper, all factual statements must be supported by sources that provide evidence for the observation or claim.

A factual error occurs when a linked literature reference needs to provide correct evidence for the statement or observation. This type of error can be subdivided into three subcategories: (i) **Factual mistake** - a citation that does not address the statements and is often due to a technical confusion with the correct source; (ii) **Factual inaccuracy** - a citation whose subject is related to the topic but not accurately supporting the stated facts; and (iii) **Factual interpretation** - a statement representing a new or different interpretation of the primary data in the cited publication.

Partiality error occurs when only some, but not all, relevant sources are cited, neglecting others. When multiple sources are available and previously published, they are often needed to substantiate the validity of a point. For example, the rate of infertility may change between studies; thus, numerous studies must be cited to provide the most accurate prediction and highlight the diversity in other studies. Multiple sources are also beneficial for substantiating one's own statement. For instance, adapting an ideally well-supported citation might require at least four references: the original research article reporting the relevant discovery, at least one primary source that replicates the finding by another independent group of authors, another recent primary source from yet another independent group, and a recent secondary source that supports the statement.

A source type error occurs by neglecting the correct citation of the original and, thus, the primary source of information, citing only a secondary, repetitive source publication. The primary source typically refers to the original research paper that conducted the study and claimed intellectual authorship. On the other hand, a secondary source such as review papers, book chapters, and meta-analyses integrates or systematically analyses primary literature to draw more conclusive data, supporting a novel idea derived from analyzing and integrating the literature.

Table 1. Types of quotation errors, reasons for these inaccuracies, and suggestions for the rectification of them

Types of quotation error	Reason(s) of the error	Suggestions for the rectification of quotation errors
Omission error	Absence of citation to support a factual statement	Add related references or remove the statement
Factual mistake	The citation does not address the subject of the statement	Reference should be changed with a related reference Statement and reference should be removed
Factual inaccuracy	A citation whose subject is related to the topic but does not accurately support the facts	The statement should be revised Statement and related references should be removed
Factual interpretation	A statement representing a new interpretation of data observed in the citation	The statement should be modified according to the result of the cited reference or the author should explicitly state that he/she is presenting a novel interpretation of the data.
Partiality error	All relevant sources are not cited	Relevant references should be added
Source-type error	Absence of a citation of the primary source of information and citing only secondary source	Secondary reference should be replaced by primary source

determine the error type according to the classification of quotation errors (see Box 1), propose a rectification (Table 1) to correct the error, and guide the responsible authors on any unclear matters. The manuscript can be processed once the errors are corrected (Fig. 1).

For the current study, the quotation verification sheets and the corresponding manuscripts were collected by the lead authors. All related information in each sheet was recorded in the spreadsheet tool, such as the manuscript title, types and quantity of quotation errors, and the details of rectification errors. The number of references, in-text citations, and authors were extracted and recorded from the included manuscripts. The percentage of quotation error was calculated [27] using the in-text citation number, which is the total number of all cited references in the text - and the total number of errors for each manuscript (Table 2). Authors' degrees (or qualifications) were obtained from the document, including authorship information prepared for each manuscript.

Quantifying the impact of quotation errors on different sections of the manuscripts was done using a grading key, with the first author of each manuscript providing the report (Supplement Table 1).

3. Statistical analysis

The statistical analysis was conducted using the Python programming language (open-source v3.12). The data management and statistical analysis tasks were performed using the following libraries: pandas, matplotlib, NumPy, and SciPy [28-31]. The coding interface utilized was JupyterLab, an open-source software with version 1.2.6.

The Spearman correlation test was used to assess the correlation between scalar variables, and the Mann-Whitney U test was utilized to compare scalar variables between two groups, with $p < 0.05$ considered significant. Descriptive analyses are given in medians and interquartile ranges (IQRs; 25–75 percentiles).

RESULTS

In the present study, 2,362 in-text citations were counted and analyzed in twelve manuscripts. The summary of the key observations is given in Table 2. The median (IQR) number of authors in these manuscripts was 43 (13.8–141.8). The median (IQR) number of references was 80 (63.8–142.8), and the median (IQR) number of in-text citations was 134.5 (97.8–182.3). The median value of quotation errors in the studies included was 10.3%. Factual inaccuracy was the most common type of quotation error, and it was observed in all twelve manuscripts at various rates.

The negative impact of quotation errors differs across various sections of the paper. After the initial process of reporting errors, the authors are asked to rate the negative impact of reported quotation errors in their manuscripts between 0 and 4 (0=no impact, 1=minor impact, 2=moderate impact, 3=high impact, 4=very high impact).

For the results section, the authors of 5 out of 12 manuscripts reported a negative impact. The median impact rating of quotation errors in the results section was 0 (0–1.25) overall, and 2 (1–2) in the affected articles only. For the discussion section, eleven out of 12 manuscripts had quotation errors with a median rat-

Table 2. An overview of the critical observations

Article ID	Study type	Number of authors	Number of references	Number of in-text citations	Rate of quotation errors (%) ^a	Quotation error type						Reference
						Citation omission error	Factual mistake	Factual inaccuracy	Factual interpretation	Partiality error	Source-type error	
6	Original article	144	382	762	2.2	-	2	3	2	1	9	[17]
12	Review article	5	116	161	2.5	-	1	1	-	-	2	[15]
8	Original article	264	67	96	8.3	3	2	3	-	-	-	[24]
10	Original article	43	76	153	9.2	1	6	5	-	1	1	[18]
9	Review article	5	47	58	10.3	-	-	5	-	1	-	[16]
11	Original article	16	54	116	10.3	-	8	2	2	-	-	[19]
2	Original article	163	147	315	10.8	-	6	13	9	4	2	[22]
3	Original article	138	37	64	10.9	-	1	2	1	-	3	[23]
1	Original article	141	73	100	15	-	5	1	1	2	6	[21]
7	Original article	29	86	113	23	9	4	11	2	-	-	[20]
4	Review article	10	162	187	27.8	-	3	3	-	5	41	[13]
5	Review article	38	169	237	62.4	6	12	27	13	1	89	[14]

^aRate of quotation errors=(total number of quotation errors/ in-text citation number)×100.

Articles have been ordered based on rate of quotation errors (%). Heatmap illustrates quotation error types from no error (green) to highest number of errors (red).

ing of negative impact of 1.5 (1–2) overall, and 2 (1–2) in the affected articles only. For the conclusion section, only one manuscript is reported with a rating of 3. In the overall evaluation, 6 out of 12 manuscripts were rated as affected by quotation errors, and the median rating was 0.5 (0–1), and 1 (1–2.5) when in the affected articles only.

To get insight into the possible causes for the quotation error, we analyzed the total quotation errors and the six types of errors for correlation with the number of references and in-text citations. We found that a paper's total quotation errors correlated with the number of references ($\rho=0.706$; $p=0.010$; $n=343$) and the number of in-text citations ($\rho=0.636$; $p=0.026$) at a statistically significant level. Factual inaccuracies and factual interpretations were also correlated with the total number of quotation errors (Table 3). The other four types of errors (factual mistake, partiality error, source-type error, omission) did not significantly correlate. Other factors, such as the number of authors or authors with academic degrees like MD or PhD, did not significantly correlate with the total number of quotation errors.

Table 3. Correlation coefficients between the total number of quotation errors and different variables

Variable	ρ (rho)	p-value
Factual mistake	0.581	0.061
Factual inaccuracy	0.588	0.044*
Factual interpretation	0.861	0.013*
Partiality error	0.394	0.382
A source-type error	0.707	0.050
Number of authors	0.242	0.449
Number of references	0.706	0.010*
Number of in-text citations	0.636	0.026*
Number of authors with MD degree	0.238	0.457
Number of authors with PhD degree	0.141	0.663

*Spearman correlation test ($p<0.05$) was considered significant.

When manuscripts were grouped by the number of authors, less than or equal to 50 and greater than 50 authors, no statistically significant difference was observed between the groups regarding quotation errors (Table 4).

DISCUSSION

Quotation errors are common in the medical literature, with one in five quotations needing more accuracy [32]. The rate of quotation inaccuracies has been reported to range from 14.5% to 25.4% for medical journal articles across different SRMAs [10,12,32]. The analysis of quotes has been mostly performed for published scientific articles, not allowed opportunity of correction [10]. To our knowledge, however, no study has examined the quotation's accuracy before the submission process. The present study evaluated the quantity and types of quotation errors based on classification made by the GAF in quotation verification sheets of manuscripts prepared by GAF members and analyzed the corrections performed.

The median number of errors reported in the present study was 10.3%. This is the first study in the literature that reports quotation inaccuracies in andrology-related articles. The most common type of error reported was factual inaccuracy, followed by factual mistakes and source-type errors in the current study. This aligns with the study recalculating quotation errors in medical research articles, in which the most familiar quotation inaccuracy was content (factual) errors [12]. Articles published in the pediatric orthopedic and emergency medicine literature also reported the incorrectly cited statements of authors and quantitative errors as the most common error types [7,33]. There has been an inconvenient trend in medical articles, attributing scientific findings to the author of the latest

Table 4. Comparison of the manuscript for the number of authors

Variable	≤50 Authors	>50 Authors	p-value
Number of quotation errors	14.00 (9.00–39.00)	15.00 (8.00–17.00)	>0.999
Factual mistakes	4.00 (2.00–7.00)	2.00 (2.00–5.00)	0.624
Factual inaccuracy	5.00 (2.50–8.00)	3.00 (2.00–3.00)	0.511
Factual interpretation	0.00 (0.00–2.00)	1.00 (1.00–2.00)	0.610
Partiality errors	1.00 (0.00–1.00)	1.00 (0.00–2.00)	0.797
Source-type errors	1.00 (0.00–21.50)	3.00 (2.00–6.00)	0.619

Values are presented as median (interquartile range).

Mann–Whitney U test ($p<0.05$) was considered significant.

review rather than the author of the primary source of the finding, called “lazy author syndrome” [34]. Using secondary sources as a reference may result in the incorrect interpretation of the original study's authors' claims or conclusions [10,35]. The partiality error type was rarely observed in our manuscripts, while no comparable information about this available in the literature.

Several factors have been identified as risk factors for reference errors, including the total number of references, the impact factor of the journal, and the publications written by a single author [2,3,36]; however, other studies could not find similar results in terms of the risk factor [5,6,9,37,38]. In the present study, quotation errors were significantly correlated with the reference and in-text citation numbers. Limiting the number of references has been proposed to decrease the probability of error in different study types, including case reports, original studies, and reviews [3]. However, while reducing the number of references can lower the likelihood of errors, determining which is most suitable or superior for citation is often challenging. Additionally, systematic reviews on the subject must still include all relevant references, making it difficult to limit them. Another potential risk factor for quotation errors, as discussed in the literature, is the academic degree of the authors. However, we found no correlation between quotation errors and the authors' degree (MD or PhD), which aligns with the findings of Luo and colleagues [11].

Multi-author articles are expected to include more citation errors [27]. However, we could not find any associations between the number of authors and the total number of errors or different types of errors. These results are in line with the findings of other studies evaluating quotation errors in a particular field of medicine [2,7,9,11,38,39]. In our study, the evaluated manuscripts had relatively more authors than reported in other studies, which were 3 to 9 authors in the study of Davids and colleagues [7], and 2 to 8 authors in the study by Luo's and colleagues [7,11], but there was no significant effect on the number of errors. This can be because not all authors participated directly in the article's writing. In our study, for example, manuscript eight had 264 authors, but not all of them were directly involved in writing the manuscript. Some were responsible for implementing the survey, while others handled tasks such as statistical analysis. As a result,

it is difficult to determine the exact impact of multiple authors on quotation accuracy.

This study revealed a significant relationship between quotation errors, factual inaccuracies, and factual interpretations. Factual errors are mainly caused by the authors' lack of full-text reading [27]. However, reading the entire article is recommended before citing it, executed by only 20% of authors [40,41]. Authors are thought to be responsible for reference accuracy [11], and reference errors prevent good-quality publications and result in poor journal reflection [7,27].

After evaluating the impact of quotation errors on different manuscript sections, we found that the discussion was the most affected part (11 out of 12 articles), followed by the overall message. Several factors may have influenced this result. For instance, authors might distort the findings or conclusions of cited articles intentionally or unintentionally to support or endorse their findings or conclusions [27], or they might cite the primary source listed in the secondary publication (for example a review) without ever reading it.

When examining only the manuscripts containing the errors in the results section (5 out of 12 articles), the observed moderate impact (median 2 out of 4) suggests that, although the results section is typically more robust and relies heavily on primary data or analyses, quotation errors can still have a noticeable effect.

The discussion section typically involves synthesizing findings and comparing them with previous literature to explain the implications, which relies heavily on cited work. The observed impact of quotation errors in this section was moderate (median score of 2 out of 4). This suggests that such errors may result in inaccurate comparisons or misinterpretations, undermining the credibility and relevance of the arguments and increasing the risk of drawing inappropriate conclusions.

We conducted a rectification process to correct the quotation errors in the current study. Errors were rectified by modifying, revising, or removing statements and removing or changing references. Rectification corrected inaccurate citations and quotations before the manuscripts were submitted to journals. Thus, we recommended several best practices for authors, reviewers, and editors to mitigate quotation errors.

Recommendations: Based on our results, we recommend several steps for authors during the writing process and before article submission. By adhering to

Table 5. Recommendations for reducing quotation errors

Reading the full text	Authors must read the entire text of the articles they are citing. Relying solely on the abstracts or snippets can lead to misinterpretation and factual inaccuracies. Full-text reading allows authors to comprehensively understand the referenced article, ensuring that citations and quotations are both accurate and relevant.
Utilizing primary sources	Reading the primary sources ensures accurate use of information and helps avoid quotation errors.
Citing the "Methodology," "Results" and "Conclusion" sections of references	Authors should avoid citing the "Introduction" and "Discussion" sections of the source article in their manuscript. Instead, they should focus on the "Methodology," "Results," and "Conclusion" sections. The "Introduction" and "Discussion" sections primarily contain literature reviews and the author's opinions, which do not include the original hypothesis, data, or solutions.
Quality over quantity	Prioritizing quality over quantity in citations strengthens the research's reliability by incorporating high-quality references directly relevant to the study, thereby avoiding errors from overloading the manuscript with numerous references except for systematic reviews.
Software utilization	Employing reference management software such as EndNote, Mendeley, or Zotero is crucial for accurately managing and formatting citations. However, manual verification of the accuracy of quotes and citation details is necessary to ensure their correctness.
Rigorous review process	Implementing a thorough review process that involves expert authors can effectively identify and rectify errors at an early stage, thereby enhancing the accuracy and reliability of the work.
Cross-checking	Verifying all citations against their original sources before submission ensures accuracy. Implementing GAF's innovative quotation verification process provides a reliable and effective method for minimizing quotation errors.

GAF: Global Andrology Forum.

these recommendations, authors can significantly minimize quotation errors, enhancing their manuscripts' accuracy and credibility (Table 5).

CONCLUSIONS

Quotation errors are common in medical manuscripts, with factual inaccuracies being the most frequent. These errors are significant because incorrect citations—such as indirect or contradictory references—can contribute to misinformation, especially given the cumulative nature of medical literature compared to other scientific fields. The negative impact of quotation errors on a manuscript's discussion and overall message is a serious concern for all reproductive researchers.

The quotation verification process used by GAF members, which involves thorough checking and correction before submission, has effectively reduced errors. This approach can serve as a model for improving the quality of medical publications. The GAF model includes a comprehensive internal review by senior researchers, using "Quotation Verification Sheets" to systematically identify and categorize errors, meticulously correct mistakes, limit references and in-text citations to the most relevant, and provide training on proper citation practices. By adopting this structured and rigorous verification process, other research groups and

journals can significantly improve the quotation accuracy, readability, and the overall integrity of scientific publications.

While our study offers valuable insights, it has some limitations. The sample size of twelve manuscripts may not fully capture the diversity of medical literature, and the selection was based on availability, which might only reflect some types of andrology articles. Future research should aim to include a more extensive and more diverse sample to validate our findings. Building on our results, several important areas for future research emerge. Studies should further investigate the effectiveness of different quotation verification methods, assess the impact of author training on quotation accuracy, and examine the role of journal policies in minimizing errors. These efforts will be critical in advancing the integrity and quality of scientific publications. By addressing these gaps, the field can move toward a more rigorous and reliable approach to research, strengthening the trustworthiness of medical literature worldwide.

Conflict of Interest

The authors have nothing to disclose.

Funding

None.

Acknowledgements

Research support for this study was provided by the Global Andrology Forum.

Author Contribution

Conceptualization: AA. Data curation: AA, AMM, BS. Methodology: AA, AMM. Project administration: AA, AMM. Supervision: AA, AMM. Writing – original draft: AMM, BS. Writing – review & editing: All authors.

Supplementary Materials

Supplementary materials can be found via <https://doi.org/10.5534/wjmh.240255>.

REFERENCES

1. Sharp D. Kipling's guide to writing a scientific paper. *Croat Med J* 2002;43:262-7.
2. Reddy MS, Srinivas S, Sabanayagam N, Balasubramanian SP. Accuracy of references in general surgical journals—an old problem revisited. *Surgeon* 2008;6:71-5.
3. Fenton JE, Brazier H, De Souza A, Hughes JP, McShane DP. The accuracy of citation and quotation in otolaryngology/head and neck surgery journals. *Clin Otolaryngol Allied Sci* 2000;25:40-4.
4. Lee SY, Lee JS. A survey of reference accuracy in two Asian dermatologic journals (the *Journal of Dermatology* and the *Korean Journal of Dermatology*). *Int J Dermatol* 1999;38:357-60.
5. Awrey J, Inaba K, Barmmparas G, Recinos G, Teixeira PG, Chan LS, et al. Reference accuracy in the general surgery literature. *World J Surg* 2011;35:475-9.
6. Buijze GA, Weening AA, Poolman RW, Bhandari M, Ring D. Predictors of the accuracy of quotation of references in peer-reviewed orthopaedic literature in relation to publications on the scaphoid. *J Bone Joint Surg Br* 2012;94:276-80.
7. Davids JR, Weigl DM, Edmonds JP, Blackhurst DW. Reference accuracy in peer-reviewed pediatric orthopaedic literature. *J Bone Joint Surg Am* 2010;92:1155-61.
8. Eichorn P, Yankauer A. Do authors check their references? A survey of accuracy of references in three public health journals. *Am J Public Health* 1987;77:1011-2.
9. George PM, Robbins K. Reference accuracy in the dermatologic literature. *J Am Acad Dermatol* 1994;31:61-4.
10. Jergas H, Baethge C. Quotation accuracy in medical journal articles—a systematic review and meta-analysis. *PeerJ* 2015;3:e1364.
11. Luo M, Li CC, Molina D, Andersen CR, Panchbhavi VK. Accuracy of citation and quotation in foot and ankle surgery journals. *Foot Ankle Int* 2013;34:949-55.
12. Mogull SA. Accuracy of cited "facts" in medical research articles: a review of study methodology and recalculation of quotation error rate. *PLoS One* 2017;12:e0184727.
13. Gül M, Russo GI, Kandil H, Boitrelle F, Saleh R, Chung E, et al. Male infertility: new developments, current challenges, and future directions. *World J Mens Health* 2024;42:502-17.
14. Calogero AE, Cannarella R, Agarwal A, Hamoda TAA, Rambhatla A, Saleh R, et al. The Renaissance of Male Infertility Management in the Golden Age of Andrology. *World J Mens Health* 2023;41:237-54.
15. Motawi A, Crafa A, Hamoda T, Shah R, Agarwal A. The andrological landscape in the twenty-first century: making sense of the advances in male infertility management for the busy clinicians. *Int J Environ Res Public Health* 2024;21:1222.
16. Wyns C, Vogiatzi P, Saleh R, Shah R, Agarwal A. Sperm morphology value in assisted reproduction: dismantling an enigma and key takeaways for the busy clinician. *Ther Adv Reprod Health* 2024;18:26334941241303888.
17. Cannarella R, Shah R, Hamoda TAA, Boitrelle F, Saleh R, Gul M, et al. Does varicocele repair improve conventional semen parameters? A meta-analytic study of before-after data. *World J Mens Health* 2024;42:92-132.
18. Cannarella R, Shah R, Saleh R, Boitrelle F, Hamoda TAA, Singh R, et al. Effects of varicocele repair on sperm DNA fragmentation and seminal malondialdehyde levels in infertile men with clinical varicocele: a systematic review and meta-analysis. *World J Mens Health* 2024;42:321-37.
19. Palani A, Cannarella R, Saleh R, Salvio G, Harraz AM, Crafa A, et al. Impact of varicocele repair on assisted reproductive technique outcomes in infertile men: a systematic review and meta-analysis. *World J Mens Health* 2024. doi: 10.5534/wjmh.240132 [Epub].
20. Cannarella R, Shah R, Ko E, Kavoussi P, Rambhatla A, Hamoda TAA, et al. Effects of varicocele repair on testicular endocrine function: a systematic review and meta-analysis. *World J Mens Health* 2024. doi: 10.5534/wjmh.240109 [Epub].
21. Agarwal A, Farkouh A, Saleh R, Abdel-Meguid Hamoda TA, Harraz AM, Kavoussi P, et al. Controversy and consensus on indications for sperm DNA fragmentation testing in male

- infertility: a global survey, current guidelines, and expert recommendations. *World J Mens Health* 2023;41:575-602.
22. Farkouh A, Agarwal A, Hamoda TAA, Kavoussi P, Saleh R, Zini A, et al. Controversy and consensus on the management of elevated sperm DNA fragmentation in male infertility: a global survey, current guidelines, and expert recommendations. *World J Mens Health* 2023;41:809-47.
23. Agarwal A, Farkouh A, Saleh R, Hamoda TAA, Salvio G, Boitrelle F, et al. Technical aspects and clinical limitations of sperm DNA fragmentation testing in male infertility: a global survey, current guidelines, and expert recommendations. *World J Mens Health* 2024;42:202-15.
24. Rambhatla A, Shah R, Ziouziou I, Kothari P, Salvio G, Gul M, et al. Global practice patterns and variations in the medical and surgical management of non-obstructive azoospermia: results of a world-wide survey, guidelines and expert recommendations. *World J Mens Health* 2024. doi: 10.5534/wjmh.230339 [Epub].
25. Agarwal A, Saleh R, Boitrelle F, Cannarella R, Hamoda TAA, Durairajanayagam D, et al. The Global Andrology Forum (GAF): a world-wide, innovative, online initiative to bridge the gaps in research and clinical practice of male infertility and sexual health. *World J Mens Health* 2022;40:537-42.
26. El Ansari W, Savira M, Atmoko W, Shah R, Boitrelle F, Agarwal A. The Global Andrology Forum (GAF): structure, roles, functioning and outcomes: an online model for collaborative research. *World J Mens Health* 2024;42:415-28.
27. Agarwal A, Arafa M, Avidor-Reiss T, Hamoda TAA, Shah R. Citation errors in scientific research and publications: causes, consequences, and remedies. *World J Mens Health* 2023;41:461-5.
28. Harris CR, Millman KJ, van der Walt SJ, Gommers R, Virtanen P, Cournapeau D, et al. Array programming with NumPy. *Nature* 2020;585:357-62.
29. Hunter JD. Matplotlib: a 2D graphics environment. *Comput Sci Eng* 2007;9:90-5.
30. Team TPD. Pandas-dev/pandas: Pandas. Zenodo, 2020.
31. Virtanen P, Gommers R, Oliphant TE, Haberland M, Reddy T, Cournapeau D, et al. SciPy 1.0: fundamental algorithms for scientific computing in Python. *Nat Methods* 2020;17:261-72.
32. Wager E, Middleton P. Technical editing of research reports in biomedical journals. *Cochrane Database Syst Rev* 2008;2008:MR000002.
33. Goldberg R, Newton E, Cameron J, Jacobson R, Chan L, Bukata WR, et al. Reference accuracy in the emergency medicine literature. *Ann Emerg Med* 1993;22:1450-4.
34. Gavras H. Inappropriate attribution: the "Lazy Author Syndrome". *Am J Hypertens* 2002;15:831.
35. Klitzing N, Hoekstra R, Strijbos JW. Literature practices: processes leading up to a citation. *J Doc* 2019;75:62-77.
36. Lok CK, Chan MT, Martinson IM. Risk factors for citation errors in peer-reviewed nursing journals. *J Adv Nurs* 2001;34:223-9.
37. Lawson LA, Fosker R. Accuracy of references in psychiatric literature: a survey of three journals. *Psychiatr Bull* 1999;23:221-4.
38. Homeier D, Adams M, Lynch T, Cognetti D. Inaccurate citations are prevalent within orthopaedic sports medicine literature. *Arthrosc Sports Med Rehabil* 2024;6:100873.
39. Al-Benna S, Rajgarhia P, Ahmed S, Sheikh Z. Accuracy of references in burns journals. *Burns* 2009;35:677-80.
40. Simkin MV, Roychowdhury VP. Read before you cite! *Complex Systems* 2003;14:269-274.
41. Steel CM. Read before you cite. *Lancet* 1996;348:144.