
Original articles

Accuracy of references in scholarly journals: an analysis of 450 references in ten biomedical journals

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Abstract

Background The validation of reference lists of scholarly articles is an integral part of science writing, editing and publishing. In pursuit of sharing research reports with the global scientific community, authors should accurately cite primary sources to allow readers and indexers easily track them. This study examines errors in reference lists of selected English-language biomedical journals.

Methods Ten English-language MEDLINE®-indexed journals were selected and assessed for the reference errors. The reference lists of the first issues of these journals, published in 2005, 2008, and 2011, were analyzed. Selected from the table of contents of the ten journals, the 5th article of the 2005 issue, 10th article of the 2008 issue, and 15th article of the 2011 issue were analyzed. A total of 30 articles were picked. From each of these articles, 15 references were randomly selected for final analysis. The total number of the analyzed references was 450. The trends of major and minor reference errors during 2005-2011 were also analyzed.

Results Eighty-one errors were noted in the 450 analyzed references. The reference error rate was 18% (95% Confidence Interval [CI] 14%-22%). There were 33 major errors (7.3%, 95% CI 4.92%-9.75%) and 48 minor errors (10.6%, 95% CI 7.8%-13.53%). The most common major errors were non-retrievable references (4.7%) and incorrect spelling of author names and order (1.1%). The reference accuracy rate improved from 70.6% in 2005 to 90% in 2011, whereas the error rate decreased from 29.4% to 9.9%, respectively.

Conclusion The study revealed an 18% reference error rate in ten MEDLINE®/PubMed-indexed journals. Joint efforts of authors, peer reviewers, editors, and publishers might prevent most reference errors. Topical trainings in scholarly writing and bibliographic management for all stakeholders of scholarly publishing are recommended to improve the reference validation.

Keywords Bibliography; reference validation; errors; biomedicine; periodicals as topic

Introduction

References are signposts that identify primary literature sources and help authors to credit original ideas and writings. Proper referencing guarantees ethical writing and facilitates tracking related scientific sources.¹ Authors should be skilled to track original ideas and scientific facts in the literature. Accurately citing these ideas and facts is critically important since these are the generic currency for scientists.

Listing well-checked and validated references in a scholarly article has its reasoning. Readers can develop their

own understanding of the subject matter by tracking primary sources and familiarizing with the authors' views on these sources.² Some reference errors, and particularly spelling mistakes, do not affect the retrieval of the cited articles. However, erroneously recorded journal title, publication year, volume, and page numbers make it difficult to locate the references and properly index the citing articles.³ Such errors break the links between citing and cited sources and lead to the dissemination of incorrect information, which can question the trustworthiness of the research reports.⁴

This study reports the frequency of reference errors in ten selected English-language biomedical journals. The trend of the errors during 2005-2011 is analyzed and inter-journal variation in the errors is presented.

Methods

The following ten MEDLINE®/PubMed-indexed journals were randomly selected for the study: 1) *The Saudi Journal of Gastroenterology* (SJG), 2) *Canadian Journal of Surgery* (CJS), 3) *The American Journal of Surgery* (TAJS), 4) *The Breast Journal* (BJ), 5) *Journal of Plastic, Reconstructive & Aesthetic Surgery* (JPRAS), 6) *Saudi Medical Journal* (SMJ), 7) *Asian Journal of Surgery* (AJS), 8) *Journal of Research in Medical Sciences* (JRMS), 9) *BMC Medical Education* (BMC-ME), and 10) *Canadian Journal of Gastroenterology & Hepatology* (CJGH).

To assess the accuracy of references, original research articles from the first issues of the selected journals in 2005, 2008 and 2011 were analyzed. From the tables of contents of the journals every 5th article from the 2005 issue, 10th article from the 2008 issue, and 15th article from the 2011 issue were examined. The total number of the retrieved articles was 30. Fifteen references were randomly selected from each of these 30 articles, with 450 total references being collected for the analysis.

Only original articles were assessed since these are the most common items in biomedical journals. Focusing on original articles allowed to ensure consistency in the analysis. Editorials, reviews, case reports, and letters were excluded.

Records of each selected reference were checked in Web of Knowledge, ScienceDirect, PubMed, and Google Scholar. The initial searches through these platforms were based on journal title, author's surname, keywords from the article title, and year of publication. In case of failure to retrieve a reference, phrases of exact title, author's surname, and keywords along with year of publication were consecutively searched. A cited reference was then compared with a correct reference to record errors in the name or order of the authors, article title, journal title (full or abbreviated by PubMed titles

were acceptable), volume, issue, and page numbers.

Incorrect references were categorized as those with major and minor errors in accordance with the established criteria.⁵ Major errors included 1) incorrect authors order or spelling mistakes in authors' names, 2) incorrect article title, 3) incorrect journal title, 4) incorrect year, 5) erroneous or missing volume and issue number, and 6) incorrect page numbers. Minor errors included 1) incorrect author initials, 2) slightly incomplete title, 3) missing volume or issue number, and 4) incorrect last page numbers.

Statistical analysis

The frequency of each error was expressed as percentage and 95% CI. Spearman's rank correlation analysis was used to explore the relationship between reference error rate and number of cited references in the articles. SPSS software (19th version, Chicago, Illinois, USA) was employed for all statistical analyses. P value below 0.05 was set as significant.

Results

Of the total 450 references 81 were erroneous (18%, 95% CI 14%-22%). There were 33 major (7.3%, 95% CI 4.92%-9.75%) and 48 minor (10.6%, 95% CI 7.8%-13.53%) errors. The distribution of major and minor errors amongst 450 analyzed references is presented in Tables 1 and 2. Non-retrievable references were predominant major errors (4.7%), whereas wrong or missing issue numbers accounted for the most frequent minor errors (8%). Number of errors across analyzed journals is presented in Table 3. *The Breast Journal* and *Canadian Journal of Surgery* contained large numbers of major and minor errors.

Table 1. Distribution of major reference errors

Type of errors	N of errors	%
Non-retrievable references	21	4.7
Incorrect author name or order	5	1.1
Incorrect title	3	0.7
Missing or wrong year	2	0.4
Wrong page numbers	2	0.4
Total	33	7.3

Table 2. Distribution of minor reference errors

Type of errors	N of errors	%
Wrong or missing issue numbers	36	8
Wrong or missing first or last page numbers	3	0.7
Incorrect spelling of author names	1	0.2
Incomplete article title	2	0.4
Incomplete journal title	1	0.2
Missing volume number	5	1.1
Total	48	10.6

There was an inverse and significant association between reference error rate and the number of references cited in the articles (Spearman's rank correlation coefficient -0.285, P=0.01).

Table 3. Distribution of reference errors across journals

Journal title	Major error	Minor error
The Saudi Journal of Gastroenterology	1	1
Canadian Journal of Surgery	4	15
The American Journal of Surgery	7	1
The Breast Journal	6	18
Journal of Plastic, Reconstructive & Aesthetic Surgery	1	1
Saudi Medical Journal	4	3
Journal of Research in Medical Sciences	6	2
BMC Medical Education	3	6
Asian Journal of Surgery	0	0
Canadian Journal of Gastroenterology & Hepatology	1	1

The yearly analysis of reference errors showed that the highest rate (29.4%) was observed in 2005, which dropped to 14.7% in 2008 and to 9.9% in 2011 (Figure 1). The percentage of combined major and minor reference errors also decreased over the years (Figure 2).

Figure 1. Percentages of correct and erroneous references during 2005-2011

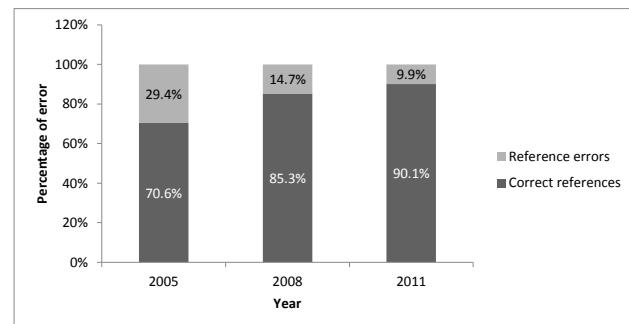
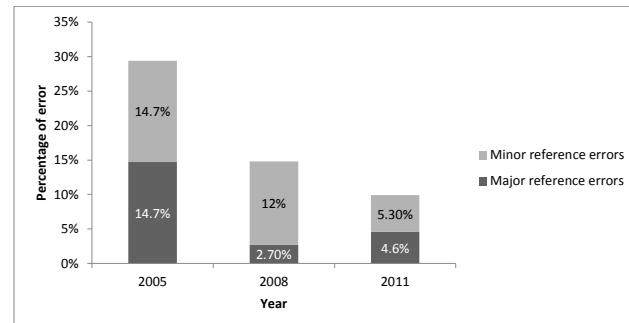


Figure 2. Major and minor reference error rates during 2005-2011



Discussion

The reference error rate of 18%, recorded in the present study, is within the range of previously published similar rates (11.1%-60%).⁶⁻⁹ One of the earliest studies of accuracy of references (1987) reported that 31% of the 150 analyzed references in public health journals contained errors, with 3% of these errors being so substantial that the cited sources could not be located.⁹ In the present study 7.3% of references contained major and 10.6% minor errors, which may reflect the improved validation of references in the past decade.

Interestingly, error rates differ across disciplines. For example, in an analysis of five dental journals the error rate reached 42%,¹⁰ whereas the same parameter was 48% for three surgical journals analyzed in another study.¹¹

In the present study the most frequent type of major error was irretrievable references (4.7%), highlighting the importance of careful validation of cited sources by peer reviewers and editors at the pre-publication stage. The responsibility for reference validation lies with all stakeholders of scholarly publishing. Authors who cite references without retrieving and reading related full-texts diminish the value of the reference lists. Inaccurate reference lists negatively affect the indexability and impact of the journals. Reviewers and editors should take into account that citations to redundant (duplicate) and retracted items may also cause difficulties in locating references.¹²

Some journal publishers employ editorial management software that validates references and draws the attention of reviewers and editors to incorrect or incomplete citations. However, not all journals have access to such software, making it mandatory to check all citations manually. In the present study wrong or missing issue numbers in references accounted for the most frequent minor errors (8%). Similar rates are reported elsewhere.¹³ High-impact journals reportedly have low rates of minor errors. However, rates of major errors reach up to 49%.¹⁴

In the present study the highest rate of major errors was in *The American Journal of Surgery* (7%) and minor errors in *The Breast Journal* (18%). No reference error was found in *The Asian Journal of Surgery* during 2005-2011. Such differences across the journals may be due to the differing editorial policies and tools for the reference validation.

In this study variables used for Spearman's correlation analysis were reference error rate (aggregate of major and minor error rates) and the number of cited references in selected articles. The results showed an inverse relationship between the variables, suggesting a decrease of reference errors with increasing number of references. Reference errors declined from 29.4% in 2005 to 9.9% 2011. This trend is encouraging as it may suggest that editorial checks are becoming more stringent and reference management tools are being increasingly used. However, more concerted efforts are still needed to eradicate inaccurate references.

There are some limitations of the current study. Reference errors were analyzed in a relatively small number of indexed journals. The duration of follow-up is short (2005-2011). The analysis did not examine whether reference errors affected contents of the published articles.

Large-scale studies of errors in different types of references (eg books, conference abstracts, URL sources) across multiple disciplines are still warranted.

Conclusion

Joint efforts of authors, peer reviewers, editors and publishers may prevent most reference errors. Topical trainings in scholarly writing and bibliographic management for all stakeholders of scholarly publishing are recommended to improve the reference validation.

Competing interests

None declared.

References

- 1 Fenton JE, Brazier H, De Souza A, Hughes JP, McShane DP. The accuracy of citation and quotation in otolaryngology/head and neck surgery journals. *Clinical Otolaryngology and Allied Sciences* 2000;25(1):40-44.
- 2 Al-Benna S, Rajgarhia P, Ahmed S, Sheikh Z. Accuracy of references in burns journals. *Burns* 2009;35(5):677-680. doi: 10.1016/j.burns.2008.11.014
- 3 Siebers R, Holt S. Accuracy of references in five leading medical journals. *The Lancet* 2000;356(9239):1445. doi: 10.1016/S0140-6736(05)74090-3
- 4 Azadeh F, Vaez R. The accuracy of references in PhD theses: a case study. *Health Information and Libraries Journal* 2013;30(3):232-240. doi: 10.1111/hir.12026
- 5 Schulmeister L. Quotation and reference accuracy of three nursing journals. *Image-the journal of nursing scholarship* 1998;30(2):143-146.
- 6 Reddy MS, Srinivas S, Sabanayagam N, Balasubramanian SP. Accuracy of references in general surgical journals—an old problem revisited. *The Surgeon* 2008;6(2):71-75.
- 7 Lee SY, Lee JS. A survey of reference accuracy in two Asian dermatologic journals (the *Journal of Dermatology* and the *Korean Journal of Dermatology*). *International Journal of Dermatology* 1999;38(5):357-360. doi: 10.1046/j.1365-4362.1999.00706.x
- 8 Ngan Kee WD, Roach VJ, Lau TK. How accurate are references in the Australian and New Zealand Journal of Surgery? *The Australian and New Zealand Journal of Surgery* 1997;67(7):417-419.
- 9 Eichorn P, Yankauer A. Do authors check their references? A survey of accuracy of references in three public health journals. *American Journal of Public Health* 1987;77(8):1011-1012.
- 10 Doms CA. A survey of reference accuracy in five national dental journals. *Journal of Dental Research* 1989;68(3):442-444. doi: 10.1177/00220345890680030101
- 11 Evans JT, Nadjari HI, Burchell SA. Quotational and reference accuracy in surgical journals. A continuing peer review problem. *JAMA* 1990;263(10):1353-1354. doi:10.1001/jama.1990.03440100059009
- 12 Uncles MD. Comment: Omission and redundancy in the use of citations. *Interfaces* 2008;38(2):134-136.
- 13 Jackson K, Porrino JA Jr, Tan V, Daluiski A. Reference accuracy in the *Journal of Hand Surgery*. *The Journal of Hand Surgery* 2003;28(3):377-380. doi: 10.1053/jhsu.2003.50085
- 14 Lok CK, Chan MT, Martinson IM. Risk factors for citation errors in peer-reviewed nursing journals. *Journal of Advanced Nursing* 2001;34(2):223-229. doi: 10.1046/j.1365-2648.2001.01748.x