Medicinski podmladak

Medical Youth

Mini review article

CITING LITERATURE IN BIOMEDICAL RESEARCH

CITIRANJE BIOMEDICINSKE LITERATURE

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Abstract

Even though it is considered to be the least demanding part while writing a paper, significant attention should be devoted to citing literature. By using citation, original authors are acknowledged, readers are directed to the used material, validity of the used sources is confirmed, evidence of current research is provided, and plagiarism is avoided. Numerous shortcomings in the citation of scientific literature have been recognized in recent times. Results of a recent meta-analysis showed that 25.4% of published scientific papers consisted of citation errors. The academic community encounters the problems of incorrect citations on a daily basis, and assessing the accuracy of citations requires considerable effort. Most researchers are aware of the presence of various citation errors, but few respect their presence, i.e., the consequences of the identified problem. Assessing the presence and type of inaccurate citations in the biomedical scientific literature, as well as identifying factors associated with their presence, is important for preserving the integrity of the academic community. To improve citation accuracy in the biomedical scientific literature, recommendations for authors, mentors, readers and editors should be implemented in academic environment. These recommendations would encourage good citation practice, prevent errors and promote progress throughout the scientific community.

Keywords:
citation,
biomedical literature,
accuracy

doi:10.5937/mp73-34969
Editorial board: podmladak.med.bg@gmail.com

Sažetak

Iako se smatra najmanje zahtevnim delom pisanja rada, posebnu pažnju treba posvetiti citiranju literature. Citat daje priznanje autorima originalnih radova, upućuje čitaoca na korišćeni materijal, potvrđuje validnost korišćenih izvora, pruža dokaze o aktuelnim istraživanjima i izbegava plagijarizam. Uočeni su brojni nedostaci prilikom citiranja naučne literature. Rezultati nedavne metaanalize pokazali su da 25,4% objavljenih naučnih radova sadrži greške u citiranju. Akademska zajednica se svakodnevno susreće sa problemima netačnih citata, a procena tačnosti citiranja zahteva znatan napor. Većina istraživača svesna je prisustva grešaka u citiranju, ali malo njih prepoznaje posledice identifikovanog problema. Procena prisustva i vrste netačnih citata u biomedicinskoj naučnoj literaturi, kao i identifikovanje faktora povezanih sa njihovom pojavom, važno je za očuvanje integriteta akademske zajednice. Kako bi se unapredila tačnost citiranja u biomedicinskoj naučnoj literaturi potrebno je definisati i napisati preporuke koje će autori, mentori, čitaoci i urednici primenjivati. Ove preporuke podstakle bi dobru praksu citiranja, sprečile greške i promovisale napredak u celoj naučnoj zajednici.

Ključne reči:
citiranje,
biomedicinska literatura,
tačnost

Citing literature

Citation is a standardized method of presenting the sources of information and ideas used in writing a scientific paper (1). The primary role of citing literature is to monitor the flow of scientific research ideas during the creation of a scientific paper, with the inclusion of relevant evidence. When writing a scientific paper, the literature should be cited to show the merits of the authors of other papers, to show readers the material on which the analysis, discussion or conclusions are based, or to show readers how they can access the material used (1). Even though it is considered to be the least demanding part while writing a paper, significant attention should be devoted to citing literature. By using citation, original authors are acknowledged, readers are directed to the used material, validity of the used sources is confirmed, evidence of current research is provided, and plagiarism is avoided (1). The academic community encounters the problems of incorrect citations on a daily basis, however assessing the accuracy of citations requires considerable effort. Recent meta-analysis showed that citation errors were found in 25.4% of published scientific papers (2). Additionally, van der Vet and Nijveen pointed out that the retracted papers have been cited years after they were withdrawn (3). Most researchers are aware of the presence of various citation errors, but few acknowledge their presence, i.e., the consequences of the identified problem. Assessing the presence and type of inaccurate citations in the biomedical scientific literature, as well as identifying factors associated with their presence, is important for preserving the integrity of the academic community.

Citation errors

Numerous shortcomings in the citation of the scientific literature have been recognized. First studies researching the accuracy of citations in the biomedical scientific literature were conducted back in 1985 by Lowry (4) and De Lacei et al. (5). A study published in the British Medical Journal showed a prevalence of incorrect citations of 33% (4), while another group of authors reported that the prevalence of incorrect citations in six reviewed journals ranged from 10% to 20% (5).

Porrino and collaborators (6) reviewed citations of only one paper, selected because the authors were aware of the high rate of inaccurate citations. The reviewed paper was by Knirk and Jupiter, published in 1986, in which 40% of citations had errors in quoting. Because of this subjective approach, the findings of this study cannot be generalized (7).

Studies assessing the citation accuracy in biomedical scientific papers, often use a "journal-oriented" approach where authors choose the journal and analyze the prevalence of citation errors in articles published in the selected journal (8). The results have shown that 10% to 50% of papers contain incorrect citations (2, 9). Only few studies reported an incorrect citation rate of less than 10% (10, 11).

A study published in 2004 analyzed the accuracy of citations in three anatomical journals. A total of 272 citations were included in the study, and 52 citation errors were found. The prevalence of citation errors in this study was 19% (52 / 272). The authors of this study hypothesized that in publications published before the introduction of the Medical Database (MEDLINE), the error rate would be much higher due to the unavailability of bibliographic data, however, results showed that citation error rates were not related to the publication date. These errors are thought to be the result of the author's laziness rather than the unavailability of papers in electronic form. Also, this study analyzed the relationship between the presence of an error in citations and the journal impact factor. Although previous studies have shown that journals with higher impact factor have fewer citation errors (12, 13), this was not the case in this study (14).

Several studies examined the prevalence of citation errors in the scientific papers in field of orthopedics. In 2013, Ma Luo et al. analyzed the accuracy of citations in papers from journals of foot and joint surgery. In 25

papers, from five journals, there were 249 references with 408 citations. The rate of incorrect citations in all journals was 20%. No statistically significant difference in citation errors between journals was found in this study (15). In 2012, Buijze and others published a study concerning errors in citing literature regarding the scaphoid bone. This study included 2011 references cited 3840 times, with an inaccurate citation rate of 7.6%. The results of multivariate logistic regression indicate that the type of study represents a statistically significant predictor for the presence of citation errors (10). An analysis of citation accuracy in pediatric orthopedic journals was conducted by Davids and collaborators in 2010. Five papers from four orthopedic journals were selected for review. Using the random number generator, ten references were selected from each paper. Letters to the author, abstracts, presentations, book chapters, theses and review papers were excluded from the analysis. A total of 200 examined references were cited 398 times in 20 papers. The accuracy of the citations was checked independently by two authors and the errors were classified as major and minor. More than a third of the total number of citations had error (38%). An association between the rate of inaccurate citations and impact factor was not found, as well as an association between the accuracy of citations and the type of study. The presence of inaccurate citations was not correlated with the number of authors of the paper, nor with the number of references (16).

To assess the quality of papers published in the Indian Journal of Dermatology, Venerology and Leprology (IJDVL), accuracy in citation was analyzed. Out of 440 references, cited in the May-June 2008 issue of the journal, 50 were selected by the random number generator. The overall citation error rate was 43.5% (9). Authors Lee S. and Lee J. checked the accuracy of citations in two dermatological journals. All editions of the Korean Journal of Dermatology (KJD) and the Issues of the Journal of Dermatology (JD), published in 1993, were initially included in the study. Using a table of random numbers, 100 references per journal were selected to form the final sample. Books and book chapters were excluded from the analysis. The accuracy of all citations was checked in relation to the cited original work and errors were classified as major and minor. Fourteen percent of citation errors were found in JD magazine, while in KJD the percentage was 27%. To emphasize the importance of citation errors, the authors cited several examples. One of the analyzed papers refers to the Jarzabek-Chorzelska M. reference to confirm that Scl 70 antibodies were found in scleroderma patients in 75% of cases. However, the original work of the author Jarzabek-Chorzelska M. showed the frequency of Scl 70 antibodies in 77% of patients with diffuse scleroderma and 44% of patients with acrosclerosis (17).

The author Montenegro is among the first in the field of neurosurgery to investigate the accuracy of citations. His study, published in 2020, included 240 papers from four journals selected based on impact factor. Out of 240 papers, the overall citation error rate in the Montenegro study was 16.6% (18).

Indian Pediatrics have been publishing 25 papers in each issue. Gupta et al. analyzed citation accuracy in 12 editions from 2002, consisting of 17 original papers. A list of references from each paper was compiled starting with the first article published in January 2002. Books, book chapters, dissertations, monographs, dictionaries and websites were excluded from the research. Citation errors were determined by the consensus of all authors and classified into two categories. Of the 242 references that met the inclusion criteria, 176 formed the final sample. Citation errors were identified in 8.6% of references, which according to the author is more than in other pediatric journals in the study period (19).

Lawson and Fosker published a study in 1999, reporting the rate of incorrect citations in three psychiatric journals. The results showed that citation errors were identified in 6.8% of references. All references cited in the February 1997 issue were numbered, and using a table of random numbers, 50 cited references were selected and included in the study. The papers were reviewed and the errors were classified as minor and major. Minor errors included generalized claims or simplifications of information that are not directly related to the original paper, while major errors involved contradictory citing information, unrelated or not supported by information from the original paper. In order to show an example of a major error, the author cites several citation errors. In the first paper, when quoting the source, stiffness in babies is mentioned as a neonatal form of hyperextension, which is not in line with the original paper. The possible connection between these two syndromes, as stated in the original paper, has been misinterpreted. Another example concerns the misquotation of numerical data, which may lead clinicians to erroneously conclude about the urgency of a patient's condition after risperidone overdose. According to the findings of the original work, the patient was admitted to the hospital 45 minutes after consuming a high dose of risperidone tablets. The time until admission to the hospital was quoted as 45 hours. A correlation between citation errors and the number of references was not found in this study (20).

Despite the growing availability of surgical literature, citation errors still occur. Review of citation accuracy in surgical journals in 2011 was conducted by Awrey et al. In 2007, there were 139 surgical journals on the JCR list, of which 17 were in the field of general surgery. Using a random number generator, five journals were selected for analysis. One issue of each magazine was analyzed. All references from the original papers published in the selected edition were collected, of which 180 were selected from each journal. All papers were reviewed by two independent researchers. The citations for review were previously marked, while the names of the journals and authors were hidden from researchers. If there was a disagreement, the decision was made by consensus of the six authors of this paper. Nine hundred

references were reviewed, and the percentage of erroneous citations was different, depending on the type of error. Misinterpretation of the findings and citation of the non-existent findings were qualitative errors that were present in 17.3% of the reviewed papers. Quantitative errors were misquoted numerical data or citation of non-existent numerical data and their occurrence rate in this study was 6.3%. Defining potential predictors of citation errors was not the aim of this study. However, the authors state that when reviewing the papers, it was noticed that the journals with the highest impact factor had the most minor citation errors. Minor errors include misquoted numerical data and misinterpretation of findings (21).

In 2008, the accuracy of citations in leading surgical journals was reviewed in the United Kingdom. Four journals with 258 references were reviewed and at least one mistake was found in 11.6% of papers. In this study, higher percentage of citation errors was associated with journals with lower impact factor. Also, a statistically significant correlation was found between the number of references and the presence of citation errors (11). Same year, a paper was published reviewing the accuracy of citations in two major journals in plastic surgery. After randomly selecting 60 references from the journal, same were reviewed by two independent researchers. The observed rate of incorrect citations was 13.7%, while the correlation between the presence of errors and the number of references was not found. The first authors of the reviewed papers were from 33 countries around the world; 13 from the countries of the first world, 20 from the countries of the second and third world. The country of origin of the author and the frequency of citation errors were not statistically related (22). Back in 1990, Evans and collaborators estimated the rate of inaccurate citations in surgical journals. They stated that of the 137 papers reviewed, 40 contained citation errors (29.2%) (23). Comparing the results of recent research (11,21,22) with the work from 1990 (23), one can notice a difference in citation error rates in surgical journals. The reason for this may be better availability of resources thanks to unique online databases and the use of bibliographic software.

According to research conducted by Jergas and Baethge in 2015, every fifth citation contains an error, and approximately half of them do not correspond to the statements of the authors of the original papers. This would mean that the average article with 50 references, contains six completely wrong citations (2).

Important consequence of the presence of incorrect citations in the literature is called "chains of incorrect citations". This phenomenon occurs when an incorrect citation is taken from a previously published paper in which a citation error was already made. It significantly violates the integrity of the scientific literature and happens when authors, instead of reading the original paper, take citation from another source. The presence of chains of incorrect citations in journals of different fields of medicine varies a lot. In emergency medical journals, chains of incorrect citations occur in 41% of cases (24), in specialist and general medical journals about 6% (5), while in anatomical journals occurs in 24%.

The importance of proper citation

When writing a scientific paper, authors should adopt the practice of correct citation. Citation errors diminish the integrity of the scientific literature and can have serious consequences, however, learning good practice in citation is often neglected. To improve citation accuracy in the biomedical scientific literature, recommendations for authors, mentors, readers and editors should be implemented in the academic environment. These recommendations would encourage good citation practice, prevent errors and promote progress throughout the scientific community.

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