Annales de l'Unité de recherche en pratique pharmaceutique – 18 Dec 2018, p.1-7
http://urppchusj.com - 10.18163/urppchusj20181218

Article original

Evolution of the bibliometric indicators of nine pharmaceutical journals from 2011 to 2016

Ferrand É, Larivière V, Lebel D, Bussières JF

Éléonore Ferrand, D. Pharm., Assistante de recherche, Unité de recherche en pratique pharmaceutique, Département de pharmacie, CHU Sainte-Justine, Montréal, Qc, Canada

Vincent Larivière, PhD, Professeur Agrégé, titulaire de la Chaire de recherche du Canada sur les transformations de la communication savante, Observatoire des Sciences et des Technologies, Centre Interuniversitaire de Recherche sur la Science et la Technologie, Université de Montréal, Montréal, Qc, Canada

Denis Lebel, B. Pharm., M.Sc., F.C.S.H.P., Adjoint au chef, Unité de recherche en pratique pharmaceutique, Département de pharmacie, CHU Sainte-Justine, Montréal, Qc, Canada

Jean-François Bussières, B.Pharm., M.Sc., F.C.S.H.P., Chef, Unité de recherche en pratique pharmaceutique, Département de pharmacie, CHU Sainte-Justine, Professeur titulaire de clinique, Faculté de pharmacie, Université de Montréal, Montréal, Qc, Canada

Pour toute correspondance : Jean-François Bussières, CHU Sainte-Justine, Montréal, Qc, Canada, H3T1C5 – 514.345.4603 – jf.bussieres@ssss.gouv.qc.ca

Abstract

Introduction: Very few studies have analyzed the impact of journals in the field of pharmaceutical practice. Objectives: Describe the evolution of bibliometrics indicators of pharmaceutical journals. Methods: This is a longitudinal descriptive study. Seven bibliometric indicators were identified; Impact factor (IF), EigenFactor, Article Influence, Source Normalized Impact per Paper, Scimago Journal Rank, CiteScore and Impact per Publication. Nine pharmaceutical journals to which North American hospital pharmacists are usually exposed in their clinical practice were selected. Bibliometric indicators variables were extracted from 2011 to 2016. We analysed the evolution of the IF and its correlation to other bibliometric indicators. Results: We observed an increase in the IF of 30.0% for Pharmacol Ther 29.3% for Ann Pharmacother 24.5% for Br J Pharmacol 21.1% for Expert Opin Pharmacother 15.1% for Eur J Pharmacol 10.5% for J Pharm Pharmaco 6.9% for J Clin Pharm The 1.1% for Pharmacotherapy and -16% for J Am Pharm Assoc during the study period. The average coefficient of correlation between the IF and the six other bibliometric indicators is at least greater than 0,897. Conclusions: The IF of eight out of nine pharmaceutical journals increased between 2011 and 2016. The IF is highly correlated with six other bibliometric indicators.

Introduction

Bibliometrics can be defined as a set of mathematical and statistical processes used to measure production and use of scholarly materials. Initially used by librarians to better understand the use of their journal subscriptions, these indicators are nowadays used for a variety of purposes, including evaluating the performance of journals, researchers, and institutions. Among those, the Impact Factor (IF), developed in the 1960s by Eugene Garfield is probably the most well-known [1, 2]. Over the last decades, hundreds of different bibliometric indicators have been created; all of which have strengths and weaknesses, and for which misuse has been recognized [3-9].

Pharmaceutical practice is based on the provision of pharmaceutical services, care, education and research in community or hospital pharmacy, using both non-pharmacological and pharmacological approaches [10]. Several terms from the controlled vocabularies can be used to retrieve articles related to the pharmaceutical practice. For instance, Medical Subject Headings (MeSH) of the National library of Medicine (NLM) defines pharmacy as the practice of compounding and dispensing medicinal preparations, drug therapy as the use of DRUGS to treat a DISEASE or its symptoms and pharmacology as the study of the origin, nature, properties, and actions of drugs and their effects on living organisms [11-13].

Very few studies have analyzed the impact of journals in the field of pharmaceutical practice. While some pharmacy journals are indexed in PubMed or Web of Science (WOS), several more professionally-oriented journals are not covered by these databases. The decision to submit a manuscript to an indexed journal can be based the scope of the research project (internal criteria), but also on external criteria such as the reputation of the journal and on the expected repercussions on the career of the authors. In Canada, hospital pharmacists have relatively low

exposure to bibliometric indicators as their work mainly focuses on pharmacy services, pharmaceutical care and teaching.

Objectives

The main objective is to describe the evolution of the bibliometric indicators for a selection of pharmacy journals between 2011 and 2016. The secondary objective is to measure the correlation between the Impact Factor and a selection six other bibliometric indicators for the year 2016.

Methods

This is a longitudinal descriptive study.

From the database of journals identified in the National Center for Biotechnology Information (NCBI) database, we have identified all journals with the "Pharm *" character string. Based on this selection and the content of these journals, we identified a relevant selection of pharmaceutical journals to which Canadian hospital pharmacists are usually exposed in their clinical practice, that included at least some articles on the scope of pharmacy practice and for which bibliometric indicators were available from 2011 to 2016 inclusively.

The selection was established by consensus by the research team including journals indexed in Web of Science. The included journals were Pharmacotherapy (Pharmacotherapy), Annals of Pharmacotherapy (Ann Pharmacother), British Journal of Pharmacology (Br J Pharmacol), European Journal of Pharmacology (Eur J Pharmacol), Journal of Clinical Pharmacy and Therapeutics (J Clin Pharm Ther), Pharmacology & Therapeutics (Pharmacol Ther), Journal of the American Pharmacists Association (J Am Pharm Assoc), Expert Opinion on Pharmacotherapy (Expert Opin Pharmacother), Journal of Pharmacy and Pharmacology (J Pharm Pharmaco).

Based on available bibliometric indicators, we identified eight commonly used bibliometric indicators with complementary approaches to measuring journal's scholarly impact. These are the number of citations, Impact Factor (IF) [1, 2], EigenFactor (EF) [14], Article Influence Score (AIS) [15], Source Normalized Impact per Paper (SNIP) [16], Scimago Journal Rank (SJR) [17], CiteScore [18] and Impact per Publication (IPP) [19]. We then extracted the annual values of each bibliometric indicators for each of the journals, as well as several other information from the WOS (number of articles, number of citations, number of citable items, IF, EF, AIS), Scopus (number of citations, number of documents published, SNIP, SJR, Citescore), and Certified Wireless Technology Specialist (CWTS) Journal Indicators (IPP) [20].

The data are presented longitudinally. In order to calculate the correlation between each bibliometric indicator and the IF, we also divided the EF and the SJR by the total number of applicable publications (e.g. five-year time window for the EF and three-year time window for the SJR). A Pearson correlation coefficient was calculated for each indicator versus the IF for the year 2016. Only descriptive statistics were performed.

Results

Evolution of the Impact Factor

From 2011 to 2016 and in decreasing order of importance, we note an increase in the IF of 30.0% (from 1,127 to 8,562) for Pharmacol Ther, 29.3% (from 20126 to 2.748) for Ann Pharmacother, 24.5% (from 4.409 to 5.491) for Br J Pharmacol, 21.1% (from 3.21 to 3.89) for Expert Opin Pharmacother, 15.1% (from 2.516 to 2.896) for Eur J Pharmacol, 10, 5% (from 2.18 to 2.41) for J Pharm Pharmaco, 6.9% (from 1.57 to 1.679) for J Clin Pharm The, 1.1% (from 2.9 to 2.932) for Pharmacotherapy and -16% (from 1.476 to 1.241) for J Am Pharm Assoc (Fig 1).

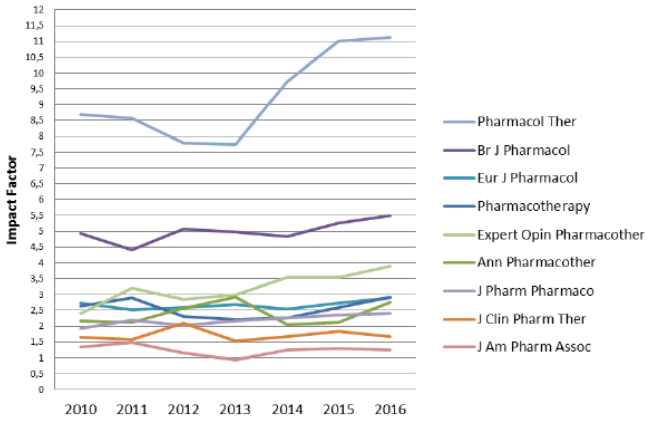

Figure 1 Evolution of the impact factor of the nine pharmaceutical journals, 2011 to 2016

Two of the nine journals selected in our study showed a much higher IF than the others in 2016 (e.g. Pharmacol Ther (11.127) and Br J Pharmacol (5.491)) whereas values between 1.241 and 3.980 were obtained for the other journals. Pharmacol Ther has the highest IF and showed a marked growth in 2014, associated to a few manuscripts cited numerous times. For instance, according Web of Science, the article by Zanger et al. was cited at least 589 times on the 12th april 2018 since its publication in

2013. In the WOS, that article represents 5% of the citations of Pharmacol Ther.

Evolution of the number of citations in Scopus and Web of Science

Two journals stand out in terms of number of citations: the Br Pharmacol J (average value of 33,675 citations on Scopus and 29,372 citations on WOS from 2011 to 2016) and the Eur J Pharmacol (average value of 33,371 citations on Scopus and 29,127 citations on WOS from 2011 to 2016) (Fig2, Fig3). However, a high number of citations does not guarantee a high impact factor because of the methodological calculation (e.g. number of citations divided by the number of documents published in the last two-year period). Thus, Eur J Pharmacol, which has a similar number of citations than Br Pharmacol J, had a much lower IF in 2016 (2.896 vs. 5.491).

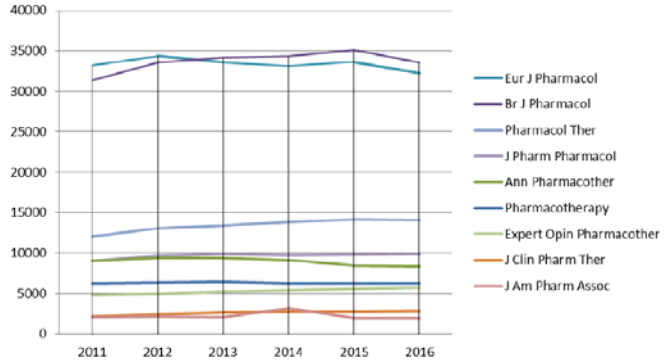

Figure 2 Evolution of the number of citations per year per pharmacy journal from 2011 to 2016 in Scopus

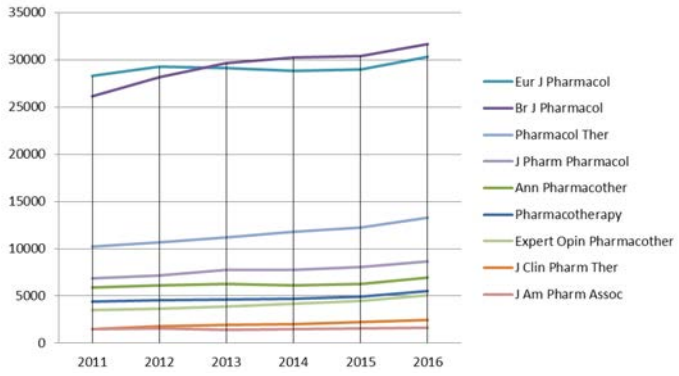

Figure 3 Evolution of the number of citations per year per pharmacy journal from 2011 to 2016 on World of Science

Notoriety indicators in 2016

Table 1 presents the rank of nine pharmaceutical journals according to seven notoriety indicators in 2016. The journals are sorted in descending order of Impact Factor. Perhaps unsurprisingly, ranks differ according to the indicator used. The average rate of citations per year for all journals combined was 12,832.3±15,399.6 on Scopus and 10,721.4±10,928.6 on WOS, with a minimum of 1,383 citations for J Am Pharm Assoc in 2013 and a maximum of 35,079 citations for Br Pharmacol J in 2015. The difference between citation rates in the two databases is likely explained by the larger coverage of Scopus. The ranking of journals varies according to the indicator. Pharmacol Ther remains first in the rankings for all indicators except for EF. EF categorizes the Br J Pharmacol in first position, followed by the Eur J Pharmacol and Pharmacol Ther. The positioning of the first three journals according to the EF in the ranking is coherent with the journals that the highest number of citations in 2016 on both WOS and on Scopus—this is not surprising, as the EF is mostly influenced by the size of the journal.

Interchangeability of indicators

Regarding the interchangeability of the indicators with each other, we evaluated the correlation of the indicators with the IF (Table 2). For AIS, SNIP, SJR, PPI and Cite score, the correlation is excellent suggesting interchangeability of these indicators, except EF. However, a corrected EF taking into account the number of documents provides an excellent correlation, as it becomes size-independent. A similar correction for the SJR provides also a good correlation.

Discussion

This longitudinal descriptive study offers an original comparison of the evolution of seven bibliometric indicators of nine pharmacy journals. There is little published literature comparing the evolution of these bibliometric indicators in pharmaceutical journals and their correlation with the IF. A few articles have looked at the evolution of publications, citations, references, authors, IF counts for journals, academic department, country in pharmacy journal while other studies have used bibliometric indicators to describe the scope of practice in pharmacy [21-25].

In the Web of Science, there were 1,497 journals within the clinical medicine discipline indexed in 2000 against 2,539 in 2016. For the same years, pharmacy and pharmacology journals represented respectively 9.3% and 9.6% of all indexed journals.

Table 1 Rank of nine pharmaceutical journals according to the impact factor and their indicators in 2016

Variables	Years indexed in National Library of Medicine	IF	EF	AIS	SNIP	SJR	IPP	Cite Score	Average citations in WOS from 2011-2016	Average citations in SCOPUS from 2011-2016
Pharmacol Ther	1979	11.127	0.02218	2.889	3.057	4.266	10.44	11.17	11564.8	13426.2
Br Pharmacol J	1975	5.491	0.04299	1.340	1.408	2.604	1.96	5.11	29372.3	33674.8
Expert Opin Pharmacother	1999	3.890	0.01100	0.869	0.920	0.997	2.73	2.85	4124.7	5283.0
Pharmacotherapy	1981	2.932	0.00795	0.782	1.238	1.083	2.81	2.86	4787.5	6295.3
Eur J Pharmacol	1970	2.896	0.03219	0.655	0.931	1.072	2.87	2.98	29126.7	33371.3
Ann Pharmacother	1992	2.748	0.00986	0.758	1.152	1.025	2.45	2.41	6273.8	8971.8
J Pharm Pharmaco	1965	2.410	0.00688	0.542	0.880	0.705	2.46	2.55	7717.5	9679
J Clin Pharm The	1987	1.679	0.00393	0.513	0.792	0.646	1.70	1.92	1990.8	25665.8
J Am Pharm Assoc	2003	1.241	0.00171	0.324	0.834	0.491	1.24	0.97	1534.2	2229.2

IF: Impact Factor; EF: Eigenfactor; AIS: Article Influence Score; SNIP: Source Normalized Impact per Paper; SJR: Scimago Journal Rank; IPP: Impact per Publication; WOS: Web Of Science

Table 2 Profile of the correlations between the impact factor and each bibliometric indicator by year of analysis

	EF	EF corrected	AIS	SNIP	SJR	SJR corrected	IPP	CiteScore
IF 2011	0.418	0.997 *	0.985	0.933	0.975	0.817 **	0.988	0.987
IF 2012	0.460	0.986 *	0.987	0.934	0.978	0.795 **	0.981	0.970
IF 2013	0.499	0.984 **	0.984	0.941	0.979	0.817	0.980	0.975
IF 2014	0.431	0.997 **	0.997	0.950	0.971	0.885	0.988	0.986
IF 2015	0.402	0.994	0.997	0.969	0.983	0.920	0.995	0.990
IF 2016	0.485	0.995	0.996	0.963	0.978	0.912	0.923	0.992
Average correlation	0.449	0.992	0.991	0.948	0.977	0.857	0.976	0.983

IF: Impact Factor; EF: Eigenfactor; AIS: Article Influence Score; SNIP: Source Normalized Impact per Paper; SJR: Scimago Journal Rank; IPP: Impact per Publication; WOS: Web Of Science

* excluding J Pharm Pharmaco and Expert Opin Pharmacother and J Am Pharm Assoc.

** excluding J Pharm Pharmaco and Expert Opin Pharmacother

This increase in the number of indexed journals applies to both medical and pharmaceutical journals between 2000 and 2016.

Growth of notoriety

Our results show that the IF of all included journals has progressed between 2011 and 2016, with the exception of the J Am Pharm Assoc. The J Am Pharm Assoc is the one that offers more research-oriented content in professional practice than most of the others, that do include both pharmacotherapy and pharmacology papers. This type of research is more difficult to fund and it is reasonable to think citation rates can be higher when dealing with pharmacotherapy and pharmacology than with practice models. We believe that most of the other journals included in our analysis also publish articles on the roles and the impact of pharmacists, but in lower proportions. However, we did not conduct a quantitative analysis by type of article by journal. Chew et al. have identified other factors that may explain the growth of IF, including the active recruitment of 'high-impact' articles (e.g. editorial's policy), improved services to authors to accelerate the review process, the identification of niches (e.g. area of specific interest to attract academics), better promotion, prepublication and online publication [26]. These are likely to play a role here.

Most indexed journals are concerned about the values of bibliometric indicators because these values help to attract more submissions of manuscripts. This dynamic can help to find better quality manuscripts, but also encourage misuse (e.g. promoting articles with citations from the same journal, encouraging self-inducement, encouraging reviewers to offer citations favoring the journal, limit the number of articles published to reduce the denominator and artificially increase the ratio).

The IF of the nine pharmaceutical journal considered in our study are much lower than those of medical journals (e.g. N Eng J Med (72.46), Lancet (47.83), JAMA (44.41)). Again, we believe that the citations rate for articles on pharmacology is higher than the one for articles on pharmacotherapy (e.g. approach to treatment of disease) or models of practice. One hypothesis is that the authors of articles on pharmacology come from academia, while the articles on pharmacotherapy and practice models are more written by clinicians in practice.

Interest of those indicators

There is a high correlation (values above 0.9 with the exception of three values) between the IF and the seven other bibliometric indicators included in our study. To account for the number of publications per journal, the EF value must be corrected by dividing the EF by the number of articles published in the previous five years while the SJR value must be divided by the number of articles published in the previous three years. Ramin et al. showed a high correlation between IF and EF as well as SJR for 13 nuclear medicine journals [27]. Thus, the six bibliometric indicators studied are well correlated with the IF.

It can be tempting to establish a scorecard of journals using these indicators. Although all the indicators are correlated with the IF, the order varies according to the selected bibliometric indicator. All bibliometrics indicators are sensitive to the number of citable items published by journals but they have some particularities which could affect the value of the indicator (e.g. time windows, exclusion or not of self-citations, eligible citable items, discipline considerations and the content of database selected). Researchers should consider more than on bibliometric indicator to assess a journal, an institution or a researcher. In addition to the bibliometric indicators, we believe that the choice of journals to be considered for the maintenance of professional competence must include a selection of journals relevant to a practice. Indicators can help select some of these journals, but in pharmacy practice, consulting non-indexed professional journals is also useful and worth considering.

Limitations

There are other indexed pharmaceutical journals that have not been included in the analysis. It is possible that the evolution of the bibliometric indicators of these journals differs. Along these lines, there are many other bibliometric indicators that can be compiled at the journal level; we have performed a selection based on their availability. The results of this study cannot be generalized to these other indicators. In addition, our analysis focuses on a limited period of time (2011 to 2016). A longer period of time could be used to further appreciate the evolution of notoriety of the journals included. Some indicators (e.g. IF, SNIP, SJR, IPP, CiteScore) allow for self-reflection, which some question in the use of bibliometric indicators. A comparison of pharmaceutical journals taking into account indicators allowing self-reflection could also be considered. Moreover, this study does not include an analysis of the content of the journals but only the values of the indicators themselves.

Conclusion

In conclusion, this article describes the evolution of the bibliometric indicators of a selection of nine pharmaceutical journals indexed from 2011 to 2016. The impact factor of all but

one of the journals increased during the study period. Six bibliometric indicators (e.g. EF corrected, SJR corrected, AIS, SNIP, Citescore, IPP were highly correlated with IF.

Relecteur : Aucun

Financement : Aucune source de financement.

Conflits d'intérêts : Les auteurs ne déclarent aucun conflit d'intérêt en lien avec cet article.

References

1 Garfield E. Citation indexes for science. A new dimension in documentation through association of ideas. Int J Epidemiol 2006;35:1123-7.

2 Garfield E. The History and Meaning of the Journal Impact Factor. JAMA 2006;295:90–3.

3 Garfield E. How can impact factors be improved? BMJ 1996;313:411–3.

4 Larivière V, Sugimoto CR. The Journal Impact Factor: A brief history, critique, and discussion of adverse effects. Glänzel W, Moed H, Schmoch U, Thelwall M. éd. Springer Handbook of Science and Technology Indicators; 2017 [2017, en ligne] https://arxiv.org/ftp/arxiv/papers/1801/1801.08992.pdf (Site visité le 12 avril 2018).

5 Garfield E. Journal impact factor: a brief review. CMAJ 1999;61:979-80.

6 Amin M, Mabe M. Impact factors: use and abuse. Int J Environ Sci Technol 2004;1:1.

7 Krell FT. The Journal Impact Factor as a performance indicator. Eur Sci Ed 2012; 38:3-6.

8 Gingras Y. Dérives et effets pervers de l'évaluation quantitative de la recherche : sur les mauvais usages de la bibliométrie. Rech Soins Infirm 2015;2:72-8. [2015, en ligne] www.cairn.info/revue-recherche-en-soins-infirmiers-2015-2-page-72.htm (Site visité le 12 avril 2018).

9 Todeschini, Roberto, and Alberto Baccini. Handbook of bibliometric indicators: Quantitative tools for studying and evaluating research. John Wiley & Sons, 2016.

10 Ordre des pharmaciens du Québec. Standards de pratique. [2018,en ligne] www.opq.org/doc/media/290_38_fr-ca_0_standards_pratique_vf.pdf (Site visité le 12 avril 2018).

11 National Center for Biotechnology Information.MeSH;Pharmacy.[2018,en ligne www.ncbi.nlm.nih.gov/mesh/68010604 (Site visité le 12 avril 2018).

12 National Center for Biotechnology Information.MeSH Drug therapy. [2018, en ligne] www.ncbi.nlm.nih.gov/mesh/68004358 (Site visité le 12 avril 2018).

13 National Center for Biotechnology Information. MeSH;Pharmacology. [2018, en ligne] www.ncbi.nlm.nih.gov/mesh/68010600 (Site visité le 12 avril 2018).

14 Bergstrom CT, West JD. Assessing citations with the Eigenfactor metrics. Neurology 2008;71:1850-1.

15 Sugimoto C, Larivière V. Measure the research. What everyone needs to know. New York (United States of America): Oxford University Press; 2018.

16 Moed HF. The Source-Normalized Impact per Paper (SNIP) is a valid and sophisticated indicator of journal citation impact. 2010. arXiv preprint arXiv:1005.4906.

17 González-Pereira B, Guerrero-Bote VP, Moya-Anegón F. A new approach to the metric of journals'scientific prestige: The SJR indicator. J Informetr 2010;4:379-91.

18 Elsevier. CiteIndicateur: a new metric to help you track journal performance and make decisions. [2018, en ligne] www.elsevier.com/editors-update/story/journal-metrics/citeindicateur-a-new-metric-to-help-you-choose-the-right-journal (Site visité le 12 avril 2018).

19 Hardcastle J. New journal citation metric-Impact per publication.[2014,en ligne] http://editorresources.taylorandfrancisgroup.com/new-journal-citation-metric-impact-per-publication/ (Site visité le 12 avril 2018).

20 CWTS Journal Indicators. [2018, en ligne] www.journalindicators.com/ (Site visité le 12 avril 2018).

21 Desselle SP, Andrews B, Lui J, Raja GL.The scholarly productivity and work environments of academic pharmacists, Research in Social and Administrative Pharmacy. [2017, en ligne] http://dx.doi.org/10.1016/j.sapharm.2017.09.001 (Site visité le 12 avril 2018).

22 Li G, Hu LH, Liao Z, et al. Scientific publications in pharmacology and pharmacy journals from Chinese authors in various parts of North Asia: a 10-year survey of the literature. J Int Med Re 2010;38(3):750-9.

23 Aleixandre-Benavent R, González Alcaide G, Miguel-Dasit A, et al. Análisis de citas y factor de impacto nacional e internacional de Farmacia Hospitalaria (2001-2005).Farm Hosp 2007;31:150-5.

24 Robert C, Wilson CS, Venuta A, Ferrari M, et al. Evolution of the scientific literature on drug delivery: A 1974–2015 bibliometric study. J Control Release 2017;260:226-33.

25 Barrett A, Helwig M, Neves K. Mapping the literature of hospital pharmacy. J Med Libr Assoc 2016;104:118-24.

26 Chew M, Villanueva EV, Van Der Weyden MB. Life and times of the impact factor: retrospective analysis of trends for seven medical journals (1994- 2005) and their Editors' views. J R Soc Med 2007;100:142–50.

27 Ramin S, Sarraf Shirazi A. A comparaison between Impact Factor, SCImago journal rank indicator and Eigen factor score of nuclear medicine journals. Nucl Med Rev Cent East Eur 2012;15:132-6.