NARRATIVE REVIEW

Impact Factor as a Journal Evaluation Tool and its Impact

K Amita[1], S Vijay Shankar[2]

ABSTRACT
The academicians, researchers, or scholars all around the world have been influenced by some factors before publishing their research. They are also curious to understand the fate of the articles published and its impact. This analysis is referred to as bibliometrics, which works based on citation analysis. One of the important bibliometric tools is the "journal impact factor (IF)" or "IF." Most of the researchers particularly the relatively young in the field of research are not aware of the concepts of IF. This article provides a brief insight regarding IF and alternative metrics in the evaluation of a journal.
KEY WORDS: Bibliometrics, journal impact factor, publications.

Introduction

Journals are a platform and means for dissemination of systematic research output to the scientific community in general and for the practitioners at large. The quality of scientific research is a somewhat a misty concept and requires analysis of several parameters including internal and external indicators. A research is considered to be of good quality if its results are useful to the scientific community and the practitioners. Internal quality indicators of research are the peer review process by able experts in the particular field. External quality indicators, apart from the research content, include certain objective measures such as bibliometrics such as distribution rates, inclusion in various indexing databases, subscription rates, and reach of the journal to the international community. These external quality indicators add value to the peer review process.

In the last decade, there has been a sharp rise in the number of scientific journals vis- a- vis publishers.

Access this article online

Quick Response Code:

Website: www.jmsh.ac.in

To improve the ranking of the journal, few publishers may indulge in malpractice. The academicians, researchers, or scholars all around the world have been influenced by some factors before publishing their research. They are also curious to understand the fate of the articles published and its impact. The analysis is referred to as bibliometrics, which works based on citation analysis.[1] One of the important bibliometric tools is the "journal impact factor (IF)" or "IF." It is also surprising to know that researchers particularly the relatively young in the field of research are not aware of the concepts of IF. Hence, it is of utmost importance for a researcher to have the knowledge of the same and also to be aware of alternative metrics.

Discussion

The IF is the most widely used quantitative measure to evaluate the quality of a journal to rank it and it further facilitates the comparison with other journals in a particular field. It basically measures the frequency with which the "average article" in a journal has been cited during a particular period.[2]

The IF was originally devised by Eugene Garfield, an American linguist, and businessman in 1955, for evaluation of individual journal. Later on, Irving H sher and Eugene Garfield together drafted a formula to calculate journal IF. The IF is calculated by the Thompson Reuters (TR) Company, which is

[1]Associate Professor, Department of Pathology, Adichunchanagiri Institute of Medical Sciences, Balagangadharanatha Nagara, Nagamangala Taluk, Mandya - 571 448, Karnataka, India, [2]Professor, Department of Pathology, Adichunchanagiri Institute of Medical Sciences, Balagangadharanatha Nagara, Nagamangala Taluk, Mandya - 571 448, Karnataka, India
Address for correspondence:
Dr. S Vijay Shankar, Professor, Department of Pathology, Adichunchanagiri Institute of Medical Sciences, Balagangadharanatha Nagara, Nagamangala Taluk, Mandya - 571 448, Karnataka, India. Phone: +91-9845357933.
E-mail: vijayshankarpatho@gmail.com

a database of more than 5000 journals. Every year TR publishes "journal citation reports" which ranks journals based on various parameters one of these being the journal IF.[2]

How to calculate the IF

The IF is defined as the average number of citations in the present year to the articles published in previous 2 years divided by the total number of citable articles in the same 2 years. For example: The IF for the year 2015 is calculated as follows:

$$\text{IF}\,2015 = \frac{\text{Citations in 2015 to articles from 2013 to 2014}}{\text{Total "citable articles" in 2013 and 2014}}$$

Note that this will be analyzed and published in 2016.

The numerator includes all citations in the current year to any published items in the previous 2 years. While, denominator encompasses a total number of only "citable articles" in the same 2 years. The citable items exclude editorials, letter to the editor and sometimes case reports.

The IF provides quantitative evidence for editors to showcase their journal among the competitors. For the librarians, it helps them to manage journals and procure the ones with high IF. It guides authors to select journal of good quality for publication. The IF also tells the reader, the quality, and the prestige of a particular journal. IF is used by government organizations and institutions a scale for promotion and appointment of faculty. IF is one of the criteria's, adopted by various funding agencies for allocation of grants.[3]

Limitations

Limitations of IF are many. As IF is calculated over a short duration of 2 years, it is more applicable for scientific journals dealing with molecular biology and biochemistry in which citations occur frequently. In comparison, the arts, ecology, anatomy, neurobiology, and mathematics research find citations occurring over a longer durations extending over a decade and even later, the impact of the advancement lasting for a longer duration as well. That is why the IF for medical science journals is 0.001-30 and that for other discipline like pharmacy practice, it is 0.001-2. So, different disciplines have different IF, and thus, it is absurd to compare the journals in between the disciplines based on the IF as the sole criteria.[4]

IF reflects the citation value of only some articles in a particular journal. Other non-citable articles will gain undue value due to just its presence in that journal irrespective of its quality. Thus, IF fails to determine the quality of a "particular paper" or a "researcher." It just tells the reader, regarding the utility of the journal or the articles within them and it should be noted that the quality cannot be constrained by time, i.e., 2 years/5 years.[5] Another point to be noted is that the new journals get its first 2 years IF only at the end of 3 years. IF hence should not be used as sole criteria to measure the worthiness of the journal as it can be influenced by many factors.[6]

44 years after he devised the IF, Eugene Garfield himself in an editorial has expressed that he devised IF so that it can be constructively used. At the same time, he was also aware of the fact that the same can be misused if it is in wrong hands.[7] This is true even now as there are lots of manipulations done to thrive in this competitive world and to gain influence, and hence use it as a tool to make profit as more and more journals are coming up and publishing has become commercial.

It is important to note that both the numerator and the denominator are amenable to manipulations by the publishers and the editors, which are detrimental to its true value. For example, several journals to increase the citations include more review article and original articles which attract more citations. Likewise, in an attempt to decrease the denominator value, they include all the published articles. Similar acts such as the editorial policy of requesting authors to cite to previous published articles in the journal, self-citation, accepting works of renowned research groups (thus attracting more citations), refraining from publishing clinically important items such as case reports, etc., are known in the publishing world.[2,5,6,8]

In spite of the limitations aforementioned, a few systematically conducted studies have endorsed the validity of IF as a quality indicator for general medical journals.[9] However, this remains still a debatable issue. However, the article published in

a high IF journal need not be of great importance or quality.[10]

Alternatives

As already mentioned, the IF is not a reliable tool to measure a particular research or a researcher. Hence, there is a need for an alternative tool which is a good measure to assess a researcher. One such tool is "h" index which was suggested in 2005 by Jorge E. Hirsch, a physicist at University of California, San Diego. The researcher has index "h" if he/she has published h papers, each of which has been cited in other papers at least 3 times.[4]

For example, a scholar has "h" index of 2. It means the scholar has 2 papers, each of the two papers is cited in other papers at least 2 times. This also means that papers which are cited <2 times are not included in calculating the "h" index.

Therefore, "h" index reflects both the number of publications and the number of citations per publication. And hence, this being an author based metric; it can be a good tool to assess the productivity and citation impact of the author. However, one important limitation of is that the "h" index of the researcher has to be used to compare researchers in the same field as the rate of citations can vary in different fields.[4]

The other alternatives which are used to evaluate a journal are immediacy index, i10 index.

Immediacy index

This is a 1 year citation developed by ISI and states how quickly the articles in the journal are cited. This index is calculated by dividing the number of citations to the articles published in the given year by the number of articles published in that particular year. This index is a useful tool to compare journals specializing in specific research. However, journals which are open access, release frequent issues and covered by wider databases would have a spuriously high immediacy index.

Eigen factor score (ES) and the article influence score (AIS): These are calculated based on the citations received over a 5-year period.

ES: It has no denominator. It is based on some algorithms and it uses both the number of citations and the "quality" of citations.[11]

AIS

This has both numerator and denominator, almost similar to the calculation of IF except that the numerator is ES itself, thus including the quality of citations. The quality means the greater weight for citation is given if it comes from a highly cited journal whereas less weightage is given for poorly cited journals. The details are available at http://www.eigenfactor.org/methods.htm

$$\text{Article influence score} = \frac{\text{Eigen factor score}}{\text{Number of "citable" articles}}$$

Advantages of Eigen factor and article influence scores are the 5 years' time frame and do not take into account journal self-citations.

Impact per publication published by Elsevier. This uses a citation window of 3 years. This is defined as "the ratio of citations in a year (Y) to scholarly papers published in the three previous years (Y-1, Y-2, and Y-3) divided by the number of scholarly papers published in those same years (Y-1, Y-2, and Y-3)."[12] As this tool uses the same papers in both numerator as well as the denominator, this provides a fair indication of the impact of the journal.

It has to be remembered that the prestigious journal citation report published by TR takes into account Eigen factor, Article influence scores, immediacy index, and cited half-life in journal evaluation.

Future

In the past few years, the journal IF as a sole metric, to assess the researcher has come under fire by the scientific community. At the December 2012, meeting of the American society of cell biology, the critique was formulated and was called as DORA, the San Francisco Declaration on research assessment.[9] This will act as a tool for analyzing the quality of research papers. The declaration discourages the use of journal IF and other such journal-based metrics. It is also envisaged to evaluate a particular research on the basis of its inherent quality rather than the journal in which it is published. Recently, a regulation was passed by an apex body to exclude "online only publications" for performance assessment of a researcher for which a strong case was done to revocation of the circular.[13] On contrary to this, DORA favors online e-journals due to its ease of accessibility, and as there is no restriction of space. It also calls for authors to cite from primary research

rather than review articles and mentions that there should not be any reference limits for articles.[10] It is high time for the research community of India too, to join this league. If the recommendations are to be followed, the IF as a tool for evaluation for research might fade in the near future.

Conclusion

The whole onus of bibliometric indicators rests on citation and citation gives only an indication of impact. There is no linear correlation between citation and quality. Although IF was considered as a good tool for evaluation for scientific journals, this alone should not be used to access the scientific credibility of a research paper or researcher as it is amenable for manipulations in wrong hands. "h" index is a better index to evaluate an individual researcher in a particular field. We should adopt a balanced view to assessing the quality of research by weighing the standard and most acceptable internal quality indicator, i.e., the transparent peer review process, against the more objective bibliometric parameters. Many alternatives to evaluate the scientific journal have come up, and the acceptance of the DORA might be a threat for IF and other bibliometric tools.

References

1. Cooper ID. Bibliometrics basics. J Med Libr Assoc 2015;103:217-8.
2. Wilms G. The impact factor. Neuroradiology 2013;55:803-6.
3. Bornmann L, Marx W, Gasparyan AY, Kitas GD. Diversity, value and limitations of the journal impact factor and alternative metrics. Rheumatol Int 2012;32:1861-7.
4. Winit-Watjana W. Impact factors: Misuse and initiatives. Arch Pharm Pract 2014;5:3.
5. Goldenberg D, Goyal N. Impact factor: What is it and is it still relevant? Ear Nose Throat J 2015;94:14-6, 19.
6. Hendee W, Bernstein MA, Levine D. Scientific journals and impact factors. Skeletal Radiol 2012;41:127-8.
7. Garfield E. Journal impact factor: A brief review. CMAJ 1999;161:979-80.
8. Falagas ME, Alexiou VG. The top-ten in journal impact factor manipulation. Arch Immunol Ther Exp (Warsz) 2008;56:223-6.
9. Saha S, Saint S, Christakis DA. Impact factor: A valid measure of journal quality? J Med Libr Assoc 2003;91:42-6.
10. Bladek M. DORA: San Francisco declaration on research assessment (May 2013). Coll Res Libr News 2014;75:191-6.
11. Rizkallah J, Sin DD. Integrative approach to quality assessment of medical journals using impact factor, eigenfactor, and article influence scores. PLoS One 2010;5:e10204.
12. Elsevier. Measuring a Journal's Impact. Available from: https://www.elsevier.com/authors/journal-authors/measuring-a-journals-impact. [Last accessed on 2015 Nov 11].
13. Bandewar SV, Pai SA. Regressive trend: MCI's approach to assessment of medical teachers' performance. Indian J Med Ethics 2015;12:192-5.

Financial Support: None; **Conflict of Interest:** None

How to cite this article: Amita K, Shankar SV. Impact factor as a journal evaluation tool and its impact. J Med Sci Health 2016;2(1):1-4.

Date of submission: 08-12-2015
Date of peer review: 15-12-2015
Date of acceptance: 30-01-2016
Date of publication: 15-02-2016