

ORIGINAL ARTICLE

IMPACT FACTOR: CALCULATION, SIGNIFICANCE, USE AND SOME MISUSES

Shruti Srivastava¹, Rabia Parveen Siddiqui²

HOW TO CITE THIS ARTICLE:

Shruti Srivastava, Rabia Parveen Siddiqui. "Impact Factor: Calculation, Significance, Use and Some Misuses". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 40, October 05, 2015; Page: 6801-6805, DOI: 10.18410/jebmh/2015/927

ABSTRACT: Impact factor is the most popular bibliometric measure in use at present. It is a statistical mean reflecting the average number of citations to recent citable articles published by a particular journal. Apart from its intended use to compare journals, it is being increasingly used as a measure of quality of an individual scientist, researcher, author etc. Although it is used as a proxy for the relative importance of a journal, being open to manipulations make it an imperfect metric. Editorial policies can influence impact factor and journals are increasing their impact factor by adopting favorable policies. This article is about calculation, significance, use and some misuses of impact factor.

INTRODUCTION: Presently every author and journal is concerned about impact factor. Although word "impact factor" is widely used by editors and journal's web sites are showing graphs of yearly increase in impact factor, there is a poor understanding about its method of calculation, relation to research and scholarly publications among authors and researchers from medical field. Hence we are presenting this article about calculation, significance, use and some misuses of impact factor.

HISTORY: Bibliometrics, also known as scientometrics is the application of mathematical and statistical analysis to written publications, such as books, articles and journals.^[1] It helps in selection of journals with evaluation of their status and their significant contribution in a particular area. Citation analysis and content analysis are commonly used in bibliometrics. Impact factor is most commonly used citation metric.

Idea of citation index for science was described by Eugene Garfield "the founder of the Institute for Science Information" (ISI) in 1955.^[2] In 1963 along with Irv Sher he designed impact factor calculation to analyze and identify influential journals. Since 1975 it is published annually for journals indexed in Journal Citation Reports by Thomson Reuters [formerly Institute for Science Information"(ISI)].^[3]

How impact factor is calculated: Thomson Reuters calculates impact factor for journals indexed with it and publishes in its journal citation reports.

(<http://www.thomsonreuters.com/productservices/science/scienceproducts/a-z/journalcitation-reports/>). Web site describes this factor as a measure of frequency with which an 'average article' in a journal has been cited in a particular year or period. The factor is a ratio between citations and recent citable published items calculated by dividing the number of all current citations of items published in a journal during the preceding two years by the number of articles published in those two years by that journal.

ORIGINAL ARTICLE

For example, for a journal impact factor for the year 2014 = X/Y .

Where in:

X = The number of times that all articles published in that journal in 2012 and 2013 were cited by other indexed journals during 2014

Y = total number of citable items published by that journal in 2012 and 2013.

Articles and reviews etc. are usually considered citable items while editorials or letters to editors etc. are considered non citable. For a journal impact factor of 2.0, means that the articles published in that journal one or two years ago, on average have received two citations in Thomson Reuters ISI indexed journals.

By authors and researchers, it is assumed that articles from journals with high impact factor must be having a wider reach that is why they are cited more, so they want to publish in journals with high impact factors. It helps them gain recognition due to high number of citations and also helps in securing financial assistance for their future research projects because funding agencies very often are taking impact factor into consideration while deciding the quality of research.^[4]

Uses of Impact Factor: Intended use of impact factor was to compare journals regardless of their size.

According to Thomson Reuters website impact factor is useful for librarians, publishers and researchers as it helps them to know the influence of a published journal. It is also useful for information analysts and bibliometricians by helping them track bibliometric and citation trend and pattern.

With passage of time some newer uses of impact factor have also evolved. It is being used as a measure of quality of specific journals, authors, researchers and worth of a research is decided by the impact factor of the journal in which it is published.^[5]

Now a day there is a growing trend of use of this metric by universities, funding agencies, and administrators to evaluate individuals for academic appointments, resource planning and financial allocation for research programs on the basis of impact factor. Hence, it is becoming a common desire and practice for scientists to publish their research contribution in high impact factor journals. This trend is gradually catching up in developing countries also.⁽⁶⁾

How Impact Factor can be Influenced: Impact factor can be influenced by journal's specialty, the average number of authors per article, the type of journal, the type of article, and journal size (Average number of articles published annually), time taken in processing to publish articles and accessibility to articles etc.

Journals of some subjects have higher impact factor than others. In newly developing and expanding research fields like biochemistry and molecular biology publications are cited quickly, while Journals of static subject like mathematics generally have very low impact factor.^[7] Articles with higher number of authors generally are cited more frequently because authors tend to cite their own work and self-citation in turn increases the journals impact factor. An increase in Impact factor also occurs with publication of review articles and more quickly cited short articles

ORIGINAL ARTICLE

as compared to long research articles. Review articles help authors when desired number of references for an article is limited by a journal. Number of articles published annually by a journal also matters as Amin and Mabe has stated that impact factors for small journals vary as much as $\pm 40\%$ from year to year whereas impact factors for large journals vary as much as $\pm 15\%$ annually. Lesser time taken in processing of articles can increase number of citations because of longer time available to cite articles and many journals are trying to publish articles during initial parts of the year. Free open access articles can increase citations and impact factor due to greater availability.^[8]

Debate Over impact Factor: Use of impact factor as journal metric is associated with criticism because it cannot be reproduced in an independent audit. Use of impact factor to measure a journals importance is more controversial because it is open to manipulations and as discussed above can be influenced by editorial policies to boost impact factor.

Maximally criticized is method of calculation. Journals can limit citable items to increase their impact factor. Kumar V et al stated that during impact factor calculation only original papers and review articles are taken into denominator while for numerator all other published materials are used, which has caused various journals to implement a policy of publishing letters to the editors, editorials, congress reports and book reviews to increase their impact factor.^[4]

Other measures which can influence and increase impact factor has already been discussed above. Self-citation by authors prevents them from presenting a balanced overview of the literature. In addition there are several reports on coercive citations wherein an author is forced by a journals editor for citation of articles previously published in their journal to increase impact factor.^[9] But that can interfere with quality of final products in a journal and readers may not get what they desire for (balanced research findings).

Seglen has discussed limitations of the data base and has shown that the most cited 15% of the articles account for 50% of the citations, and the most cited 50% of the articles account for 90% of the citations. Thus the uncited articles are then given full credit for the impact of the few highly cited articles that predominantly determine the value of the journal impact factor suggesting that a journals impact factor is not really representative of the individual journal article. It is useful in assessing the quality of a journal but not of any individual articles because it depends on few highly cited articles and an average mean such as impact fact cannot cover variance of citation among individual articles in a journal.^[7]

Impact factor is only representative of number of citations from a journal during a specific time period. It is not representative of factors used to ensure quality like peer review process, statistical methods used etc.^[10] Eugene Garfield his self has stated that impact factor is a measure of influence of a journal not of quality.

Along with limitations Pendlebury has given simplicity, global view of internationally influential journals, insight into recent performance and ability to view changes over time due to stability as the main strengths of the impact factor.^[11]

Many new indices are now calculated including 5 year impact factor, immediacy index, cited half-life, source normalized impact per paper etc. For the assessment of an individual researchers worker "h index" is becoming increasingly recognized, as it is dependent on both

ORIGINAL ARTICLE

quantity (numbers of articles published) and quality (number of citations). Citation ranking analysis is also coming up.^[5] In spite of all this, impact factor will continue in its use as journal metric till some better alternative gains wider acceptance.

Authors aim is not to highlight the deficiencies, manipulations, and misuses of impact factor, but to make medical community aware of impact factor. We want medical community to know about various aspects related to impact factor because according to regulations of Medical council of India, now publication of research articles in journals is a must to get promotions through various cadres of medical teachers. Each and every faculty member is trying for publication of their research articles. Impact factor is most commonly used and publicized journal metric. Knowledge about this will help researchers to choose best journal for their publications.

REFERENCES:

1. "Bibliometrics". OECD Glossary of Statistical Terms. OECD. Available from <http://stats.oecd.org/glossary/detail>.
2. Garfield E. Citation indexes for science-new dimension in documentation through association of ideas. *Science* 1955; 122: 108-11.
3. Garfield E. The evolution of the Science Citation Index. *Int. Microbiol.* 2007; 10: 65-9.
4. Kumar V, Upadhyay S, Medhi B *Singapore Med J* 2009; 50(8): 752.
5. Simon Rieder, Charlotte S. Bruse, Christoph W. Michaski, Jorg Kleeff, Helmut Friess. The impact factor ranking— a challenge for scientists and publishers, *Langenbeck's Archives of Surgery* April 2010; 395, 1(suppl): 69-73.
6. Vera Morgan, & Aleksandar Janca, *Australasian Psychiatry*. Vol 8, No 3. September 2000.
7. Seglen PO. Why impact factor of journals should not be used for evaluating research. *BMJ* 1997; 314: 498-502.
8. Amin, A. and Mabe, M. Impact factors (Use and abuse): *Perspectives in Publishing*; 2000: 1-6.
9. Wilhite AW, Fong EA. Scientific publications. Coercive citation in academic publishing. *Science*. 2012 Feb 3; 335(6068): 542-3.
10. Patrizio E. Tressoldi, David Giofre, Francesco Sella, Geoff Cumming High Impact =High Statistical Standards? Not Necessarily So. *PLOS ONE*, www.plosone.org Volume 8 Issue 2 e56180.
11. David A. Pendlebury. The use and misuse of journal metrics and other citation indicators, *Arch. Immunol. Ther. Exp.*, 2009, 57, 1-11.

ORIGINAL ARTICLE

AUTHORS:

1. Shruti Srivastava
2. Rabia Parveen Siddiqui

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Pathology, Pt. J. N. M. Medical College, Raipur, Chhattisgarh.
2. Associate Professor, Department of Pathology, Pt. J. N. M. Medical College, Raipur, Chhattisgarh.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Shruti Srivastava,
H. No. 11, ST-23,
Sec-4, Bhilai, Chhattisgarh.
E-mail: arvind2shruti@yahoo.com

Date of Submission: 18/09/2015.
Date of Peer Review: 19/09/2015.
Date of Acceptance: 28/09/2015.
Date of Publishing: 05/10/2015.