



## Global Journal of Medicine and Public Health

[www.gjmedph.org](http://www.gjmedph.org)

### Impact factor of the journal as quantitative measure for quality of journal: pros and cons

Paneru Damaru Prasad

Lecturer, Department of Public Health, Pokhara University, Kaski, Nepal

#### ABSTRACT

Initially, Impact Factor was used as a means to rank the quality of journal to select scientific journals for the library holdings. Since 1960s, it has been used as a measure for quality and the tool for evaluation of journal's scientific worthiness. It is quantitative indicator for the quality of journal and measured as the ratio of frequency of citations to the number of articles published. It is heavily influenced by the date of publication, editorial policies, size and scope of journal, Institute of Scientific Information's indexing focus, publication practices etc. Despite its merits, it has been criticized for its validity issues, liable to manipulation and misuse. Hence, use of the impact factor as a measure of quality of journal is not all in all and it needs to be carefully evaluated. It should be used along with other parameters like immediacy index, cited half life etc while assessing the popularity and scientific quality of information.

**Key Words:** Impact factor, Journal, quality, Pros and Cons

Corresponding Author: Paneru Damaru Prasad, Department of Public Health, Pokhara University, Lekhnath-12  
Khudi, Kaski, Nepal

Email address: damaru.paneru@gmail.com

Funding: None

Conflict of interest: None

#### Introduction:

*...A quantitative indicator for quality of journal, to be evaluated cautiously...*

#### Historical Perspectives

In 1927, Gross and Gross in the United States (US) developed the concept of Journal Impact Factor (JIF) as a means to rank the scientific journals. Later on US University librarians adopted JIF as an objective method to select quality journals for their holdings. Nevertheless, Martyn and Gilchrist were the actual creators of impact factor.<sup>1</sup> Eugene Garfield and Irving H. Sher first adopted their concepts and methods during 1960s to assist in selecting core group of highly cited journals.<sup>2,3,4</sup> And Institute of Scientific Information's (ISI) Journal Citation Report (JCR) provided a massive scale up in the use JIF. The advent of the Thomson Reuters citation index made it possible to do computer-compiled statistical reports not only on the output of journals but also in terms of citation frequency. Thereafter, Science Citation index (SCI) was constructed by ISI and Thomson Reuters began to publish JCR in 1975 as part of the SCI and the Social Sciences Citation Index (SSCI). The impact factor devised by the Eugene Garfield (the

founder of the ISI) is now part of Thomson Reuters.<sup>2,3,5</sup> Evolution of the journal impact factor from its utility in library holdings to extension towards the assessment of citations further expanded the scope of impact factor within the academia and research.

#### Important Milestones in the historical development of the Impact Factor<sup>2,4</sup>

1873: US legal professions first used the Shepard's Citations

1927: Gross & Gross published their article on libraries and chemical education

1934: Bradford published his article on the distribution of scientific manuscripts and Bush (1945) published his article on recording people's information trails.

1951: Eugene Garfield joined the Welch Medical Indexing Project at Johns Hopkins and Garfield (1955) published his idea for a citation index in Science.

1958: Garfield borrowed \$500 and founded the Institute for Scientific Information (ISI).

1961: The SCI's precursor and the Genetics Citation Index were founded.

1963: The term "Impact factor" first used in the inaugural Science Citation Index (SCI).

1965: Price published his article about the network properties of scientific papers.

1997: The first journal was accused of manipulating its impact factor.

1998: By the 40<sup>th</sup> anniversary, ISI has its coverings over 8,000 titles.

1999: The concept of "topic-based" impact factors for occupational health was proposed.

2005: Approximately, 550 million citations were contained in the SCI database.

### **What does Journal impact factor mean?**

The impact factor (abbreviated as IF) is one of the measures for assessing the scientific contribution of a journal. It reflects the average number of citations to the recent articles published in science and social science journals. Furthermore, it is a measure of frequency with which the average articles in a journal has been cited in given period of time. It is the quantitative tool for evaluating quality of journals; used as a proxy for the relative importance of a journal within its field.<sup>6</sup> Journals with higher impact factors deemed to be more important than those with lower ones. It is based on the premise that if the papers published in a particular journal are cited more frequently in the scientific literature, then the journal bears a greater impact on the scientific field. Only research articles, original case reports, technical notes and reviews are considered citable however; commentaries, editorials, correspondence/letters to editors are considered non-citable. Impact factors are calculated yearly for those journals that are indexed in Thomson Reuters Journal Citation Reports.<sup>1,2,4</sup>

Journal Citation Reports (JCR) is a widely used tool for assessing the world's leading journals. The JCR provides quantitative tools for ranking, evaluating, categorizing and comparing journals. The annual JCR impact factor is a ratio between citations and recent citable items published. It includes a 5-year impact factor and shows rankings of journals by impact factor. Journal Citation Reports is published annually in two editions: JCR Science Edition containing more than 8,000 journals and Social Sciences Edition with more than 2,600 journals.<sup>5</sup>

### **Calculation methods**

Impact factor, developed by the Thomson's Institute for Scientific Information, measures the frequency by which an average article within a journal has been cited in a given period of time. More specifically, it is the ratio of total number of citations in the previous two years from the given year for which it is calculated to all the citable articles published in those two years. Hence, a journal's impact factor is based

on two factors:

(a) A numerator denoting the number of citations in the current year to any items published in the journal in the previous two years.

(b) A denominator denoting the number of substantive articles in the last two years.<sup>1,2,4</sup>

For example, the 2008 impact factor of a journal would be calculated as follows:

X = Number of times articles published in 2006 and 2007 were cited by indexed journals during 2008.

Y = the total number of "citable items" published by that journal in 2006 and 2007.

Hence, 2008 impact factor =  $x/y$ .

If a journal has an impact factor of 4 in 2008, then its papers published in 2006 and 2007 received 4 citations each on average in 2008. The 2008 impact factors are actually published in 2009; they cannot be calculated until all of the 2008 publications have been processed by the indexing agency. Thus, the impact factor of a journal is calculated by dividing the number of current year citations to the source items published in that journal during the previous two years.<sup>4,5</sup> New journals, which are indexed from their first published issue, will receive an impact factor after two years of indexing.<sup>7,8,9</sup>

### **Uses of Impact Factors**

Intended Use: Journal Comparison

The sole purpose of the impact factor is to compare the citation impact of one journal with other journals. Originally created IF was used to evaluate a journal's relative importance with others in the same field.<sup>1,6</sup>

Evolved Uses: Evaluation of Journals and Research

The impact factor is not only increasingly used to measure the quality of specific journals (as the best or most prestigious), rather time, budget and administrative pressures tempt many to use this readily available citation metric not only to support but to substitute for informed peer judgment in research evaluation.<sup>1,10</sup>

### **Criticism of Impact factor**

Validity

The impact factor is highly discipline dependent and could not be reproduced independently.

The impact factor reflects average number of citations per paper and it is not a normal distribution. Hence, it is not a valid representation of distribution and citation evaluation.

Lack of originality in the citable articles may reduce the impact factor. Hence, the editorial board prepares manuscripts with high priority that earns good impact factor.<sup>2,4</sup>

### **Editorial policies**

A journal can adopt editorial policies that increase its impact factor and it may publish a larger percentage of review articles. Therefore review articles can raise the impact factor of the journal leading to the highest impact factors in their respective fields.

Journals may change the fraction of "citable items" compared to front matter in the denominator of the IF equation.

Journals may publish a large fraction of their papers, or preferably papers which they expect to be highly cited, early in the calendar year. This gives those papers more time to gather citations.

Several methods exist for a journal to cite articles in the same journal will increase the journal's impact factor.<sup>3,10</sup>

### **Manipulations of the impact factor**

Coercive citation is a practice in which an editor forces an author to add spurious self citations to an article before the journal will agree to publish it in order to inflate the journal's impact factor.<sup>7,8,9</sup>

### **Incorrect application**

The impact factor is an average. Thus, underestimates the citations of the most cited articles while exaggerating the number of citations of the majority of articles.<sup>8,10</sup>

### **Factors influencing Impact factor of a Journal**<sup>6,7,8,9</sup>

1. Date of Publication: journals with articles that are steadily cited for a long period of time lose the calculation of impact factor.
2. Large Vs Small Journals: large journals tend to have a higher impact factor than small ones.
3. Average Citations: few highly cited papers greatly affect the impact factor.
4. Review Articles: these are cited more and ultimately increase the impact factors.
5. Changing and Growing Fields: rapidly changing and growing fields have much higher impact factor than those of established disciplines.
6. ISI's Indexing Focus: Unequal focus on the different disciplines. For example there is much focus on the clinical medicine and biomedical researches.
7. Research publications Vs Clinical Practices: research publications have higher citation rates.

### **Common misuses of the impact factor**<sup>1,6,10</sup>

1. Promotion and tenure decisions (impact factors of the journals where an author has published).
2. Journal selection by researchers for article submissions.
3. University administrators' rating or ranking academic and research programs within and across.
4. Establishment of journal reputations by their publishers to attract subscriptions and institutions.

An impact factor indicates to some extent the quality of a journal as a whole however; it is the impact participation by top authors only. Factor alone does not indicate the quality of individual articles within a journal. The overall quality of the research performed depends upon the prestige of associated academic departments, research programs or institutions too.

### **Limitations of Impact factors**<sup>4,6,10,11,12</sup>

1. A journal's score is heavily influenced by its total number of citable articles
2. The calculation method is based on a highly skewed distribution.
3. Relatively few journals continue to receive the bulk of all citations.
4. Relatively few articles in any journal are responsible for most of its citations.
5. The two year citation counting process favors "fast moving" disciplines only.
6. The impact factor number does not take into account of the context of the article.

### **Techniques to increase impact factor**<sup>2,3,4,5</sup>

1. Cite articles previously published in the same journal.
2. Publish a greater proportion of review articles.
3. Focus on research areas which naturally generate more citations.
4. Eliminate topics and categories that generate few citations.
5. Publish controversial articles, popular themes or "hot topics"
6. Publish the journal's contents online for free.

### **Discussion**

Impact factor is one of the quantitative measures for quality of journal however; its uses are frequently associated with many pros and cons. With the several decades of colossal criticisms and appreciations, "impact factor" has been evolved as one of the quality markers in the scientific arena. It draws the attention of scientists and researchers to find the worthy scientific information and usefulness of the publications within the academia, professional practices and research. Hence, it helps in decision

making for the acceptance of scientific work.

Impact factor is criticized due to its limitations such as publication bias, subjective variation and skewed distributions. It is highly influenced by the citations frequencies and subjects under consideration. Meanwhile, in the field of health sciences, citations exceed relative to the numbers of publications due to the busy schedules in the professional health care practices. Journals of fundamental subjects have higher impact factors however; applied subjects have high acceptance rates with low practices for publications, retaining its controversy, misleading and misuses. In fact, sometimes Journals with high impact factor may have lesser scientific foundations than those with low IF.

### Conclusion

Impact factor is the best available widely used bibliometric index and the best simple tool to help for decision making to acknowledge scientific qualities of research. Despite its utility, it is considered as one of the inconsistent measures of scientific validity having high degree of subjectivity, liability to manipulation, low rigidity and citation dependency. Hence, careful evaluation and application of impact factor along with other quality indicators must be used to evaluate Journal's quality. Furthermore, there is still scope for the Integration of knowledge and development of trustworthy tool to translate the journal's quality in the scientific showground.

### References

1. Janice M, Flahiff M, Jolene M, Miller M. Journal Impact Factors: Use and Misuse. 2011. Available from: <http://www.utoledo.edu/library/mulford/index.html> 419.383.4218.
2. Eric Archambault, Vincent Lariviere. History of the journal impact factor: Contingencies and consequences. *Scientometrics*. 2009; 79 (3): 1-3. Doi: 10.1007/s11192-007-2036-x. Available from: <http://www.ost.uqam.ca/Portals/0/docs/articles/2009/11-arch2036.pdf>.
3. Garfield E. How can impact factors be improved? *BMJ*. 1996; 313(1): 411-13. Available from: <http://www.bmj.com/content/313/7054/411.extract>.
4. Derek RS. Historical Development of the Journal Impact Factor and its Relevance for Occupational Health. *Industrial Health*. 2007; 45 (1): 730-742. Available from: [www.jniosh.go.jp/en/indu\\_hel/pdf/IH\\_45\\_6\\_730.pdf](http://www.jniosh.go.jp/en/indu_hel/pdf/IH_45_6_730.pdf).
5. Journal Citation Reports. Thomson Reuters releases: The 2009 Journal Citation Reports

(JCR). Available from: <http://uclibs.org/PID/36787>.

6. Amin M, Mabe M. Impact factors: Use and Abuse. *Perspectives in Publishing*. 2000 Oct; 1:1-6 Available from: [www.elsevier.com/framework\\_editors/pdfs/Perspectives1.pdf](http://www.elsevier.com/framework_editors/pdfs/Perspectives1.pdf).
7. Thappa DM. First impact factor of Indian Journal of Dermatology, Venereology and Leprology. *Indian J Dermatol Venereol Leprol*. 2011; 77(1):1-2. Available from: <http://www.ijdv1.com/text.asp?2011/77/1/74962>.
8. Kanthraj GR. Journal impact factor. *Indian J Dermatol Venereol Leprol* 2006; 72(4):322-5. PMID: 16880587.
9. Free encyclopedia. Impact factor. From Wikipedia (modified on 27 June 2012 at 15:26) Available from: [http://en.wikipedia.org/wiki/Impact\\_factor](http://en.wikipedia.org/wiki/Impact_factor).
10. Kothur PF. Impact Factor: A misused measure of the Scientific Literature. *Indian J. Anaesth*. 2006; 50 (4): 246-248. Available from: [www.medind.nic.in/iad/t06/i4/iadt06i4p246.pdf](http://www.medind.nic.in/iad/t06/i4/iadt06i4p246.pdf)
11. Hecht F, Hecht BK, Sandberg AA. The journal "impact factor": A misnamed, misleading, misused measure. *Cancer Genet Cytogenet*. 1998 Jul 15; 104(2): 77-81. PMID: 9666797.
12. Magnavita N. Fifty years of impact factor: pros and cons. *Med Lav*. 2005 Sep-Oct; 96(5): 383-90. PMID: 16711639.

### Access This Article Online

#### Quick Response Code:



Website:  
[www.gjmedph.org](http://www.gjmedph.org)