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Impact of impact factor, IF: Pros and cons in research, writing, and publication

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Abstract

Dissemination of scientific research work by publishing in an appropriate journal is necessary in science. The journal's characteristics, quality and prestige are important factors. There is no single straightforward and clear measurement for the quality and ranking of journals. Beyond the basic requirement of peer review, a regular publication by a robust editorial board and its reputable members should be considered.

The quality and prestige of journals depend on their characteristics and include the indexing of a journal, i.e. on which databases a journal is listed, i.e. indexed. Among many indexing platforms, journal impact factor or simply impact factor (IF) for journals listed in Web of Science provides a ranking for its journals, i.e. Science Citation Index journals. The IF is a citation-based journal metric that has become synonymous for journal prestige.

The IF is released yearly by the Journal Citation Report and is considered the most influential for quality and prestige by authors, journal editors, publishers, and academia despite the limitations in the calculation. The IF in the current year is calculated by the total number of papers published in a journal in the previous two years divided by the total number of citations to the published articles in those two years. To overcome the possible limitation of IF, the know-how of other metrics like SCImago, cite-score, h-index and others should be considered.

Keywords: Cite-Score, H-Index, Impact Factor, Research Writing Publication, Science Citation Index, Scimago

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Concept and history of impact factor IF

Eugene Garfield, is credited for 'citation and indexing' of academic literature. He launched the Science Citation Index (SCI), now better-known Web of Science (WoS). Citation provides links for the papers in related that is of interest. By listing other's publications as 'cited' resource builds a web of academic ecosystem. While performing the literature search, additional papers are identified, and it provides list of new citations. Based on this concept the SCI was created.^{1,2}

Eugene conceptualized impact factor (IF) in 1955, establishing the Institute for Scientific Information (ISI) in 1960 and later went to start publishing the first SCI journal list in 1964 based on the citation reports. The Journal Citation Report (JCR) is released annually by SCI and ranks the journals based on calculation of IF which has established itself as a well-known prestigious metric synonymous with the quality of journals.^{3,4,5}

The IF or journal impact factor (JIF) is based on the concept that articles with higher citation counts have greater influence or 'impact' because the citation is an acknowledgment of published work by other researchers.² By 1975, yearly JIF calculation began for journals listed in the JCR. In 1992, the ISI was acquired by Thomson Scientific & Healthcare to become Thomson ISI. Again, it was sold to Onex Corporation and Baring Private Equity Asia who founded a new corporation, the Clarivate which releases JCR annual report to rank the SCI journals based on IF.⁶

Besides WoS famous indexing database, the SCI, there are many other internationally established indexing databases like PubMed (<https://pubmed.ncbi.nlm.nih.gov/>), SCOPUS (<https://www.elsevier.com/products/scopus>), etc. Locally in Nepal, the NepJOL (<https://www.nepjol.info/>) provides a repository database for the journals published in Nepal. Google Scholar under Google is a browser that provides a platform for the publications available online, includes journal indexed in other databases, for example PubMed. Similar to

Google Scholar, there is Baidu Scholar (<http://xueshu.baidu.com/>) under the Chinese internet browser Baidu (similar to Google) which provides an important platform for publications in eastern languages like China and the Asian subcontinent.

Calculation of IF

The IF for a journal for the current year is based on the number of citations in the previous 2 years (numerator) divided by the number of citable articles (denominator) published in the same 2 years. Example,

The IF for journal A in 2024

=A/B

=999/555

=1.8

A

=number of citations to items published in year 2022 plus 2023

=555+444

=999

B

=number of citable items published in 2022 plus 2023

=333+222

=555

Factors that impact the calculation of IF

Citable items are an important factor and includes all items indexed in the WoS as articles and reviews. Other document types, like editorial, letter, and meeting abstract are not included in the denominator. The WoS counts the bibliography of publications in scientific journals for citable items.⁷

That's why it is necessary to know how IF is calculated and what are the influencing factors. This is important and influences the ecosystem of research, writing, and publication.⁸ Some influencing factors are:

- 1) Subject area- for example, history journals may not have the same levels of citations as medicine.

- 2) Types of articles- Journals that publish more reviews, meta-analyses, and RCTs generate more citation tend to have higher IF.
- 3) Availability- Journals and articles available freely as open-access tend to have higher IF.
- 4) Self-citations- Can inflate IF.
- 5) Controversial or questionable papers- These items usually stay in people's minds and are cited and may increase IF.
- 6) Larger and older journals- Publish a larger pool of articles to cite from increases IF.
- 7) Inaccurate citations- Can alter the IF.

These potential bias in the calculation of IF should be taken into consideration during interpretation and misunderstanding for the IF.⁹ Only 'articles' or 'reviews' and 'proceedings papers' are counted in the denominator, whereas citations to all papers (including editorials, news items, letters to the editor, etc.) are counted for the numerator. This means that journals that publish more of such papers will have higher IF.¹⁰ Similarly, self-citations have been reported unusually high in some countries.¹¹

What is considered a good IF

There is no universal 'number' to indicate what is a good IF, usually higher the better. The factors that may affect the calculation of IF should be

considered, like the discipline, field, and research topics. For example, the experimental material sciences having an IF >10 is common but in most other scientific journals only 2% of journals have an IF >10. Simply being an SCI journal is a credit for a good journal, like a member of an elite club, even these journals may have an IF of 0.001.^{12,13,14}

Looking at the IF number and for better journals should not be a rule of thumb for the pools of journals, rather should be compared in the same discipline, field and category as listed on the website (<https://www.scijournal.org/>) for SCI journals. The WoS prepares master list (<https://mjl.clarivate.com/home>) of SCI journals searching across disciplines, regions and specialty collections.

The most recent annual report of SCI journals, the JCR 2024 which includes 21801 journal titles with an IF from <0.1 to 503.1 shows that nearly 2/3rd (64% cumulative) journals have IF ≤2. Having an IF of 5 is outstanding as only 6% of journals are in the range of IF 5-10. Only 2% of journals have an IF >10 and are considered outstanding in the ranking of SCI journals that are assigned an IF^{13,14}, Figure 1.

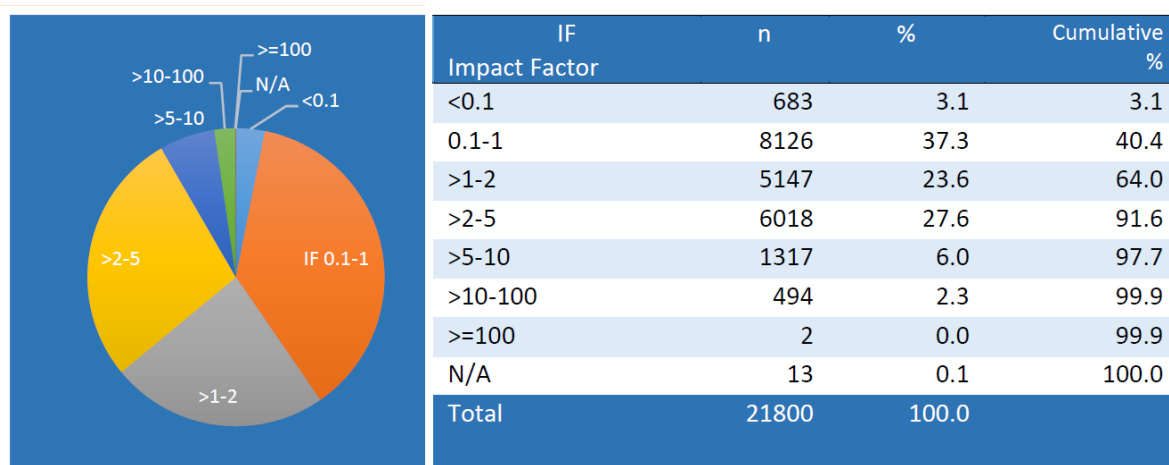


Figure 1. The 2024 journal citation report (JCR) for science citation index (SCI) journals impact factor (IF)

The concern for IF

Concern for IF as a measure of quality (of article) is controversial. The reason is that IF is a measure for journals, and literally it stands for journal impact factor (JIF). The IF is not meant as a tool for judging the quality of articles. However,

it is a well-known fact that publishing in 'good' journals is difficult, and usually have a high IF in respective field and discipline.^{4,15} The benefits of IF are its simplicity in calculation to assess the journals. It provides a guide to the authors where to publish. And publication helps promote the authors. The IF is frequently used as a

marketing tool to attract researcher, the publisher, and the libraries to choose from the vast pool of journals.¹⁶

Other influencing factors, like discipline, field, and topics have importance in calculation of IF.^{3,4,17} In recent years the JIF or simply IF has become 'the tool' for scholarly assessment. This has given rise to malpractices by some journals and publishers using 'tricks and tactics' to inflate IF by increasing the nominator or decreasing the denominator counts. Thus, it raises the concern whether or not the IF should be considered gold standard especially with the increase of open access (OA) journals.^{16,18}

The SCI does not index all journals. Thus, highly publicized IF has limitations in coverage of high-quality journals. There is a significant and positive correlation between IF and CiteScore (CS), but it's interesting to note that the top 10% of the most-cited journals with high CS (of Elsevier) did not have an IF.¹⁹

The CS is also released yearly, and is calculated from journals that are indexed in Scopus (<https://www.scopus.com/sources>).⁵ It is based on the citations collected for articles published in the preceding four years in the Scopus database of Elsevier. The CS is relatively new metrics in use since 2016.²⁰

The IF may be unfairly biased against publications from non-English non-Western countries.²¹ Similarly, CS may favor Elsevier's titles. The SCImago, another metrics which is a publicly available portal depends and uses information contained in Scopus, may also have similar limitations like IF.^{16,22,23,24}

The IF even being a journal-level metric and not an article- or individual-level metric is often misused in evaluation of individual researcher, funding, and even recruitment.²⁵ The literature shows papers available on English language search engines and databases are authored and focused on the Western world and are pro-Global North, especially the USA.²⁶

Research field has great influence in generating IF. The field-normalized IF to some extent can overcome this bias and can be used for generalizability. The quartile 1 or Q1 journals are within the top 25% in the specific field, and similarly, the Q3 journals are in the lowest 25% of IF distribution.²⁷

Beyond IF: The SCImago, Eigenfactor Score, AIS, SNIP, CiteScore, H-index, and more

Analysis and study of 'citation' has gradually emerged as an important domain. The term 'Scientometrics and Journalology' has come up and help generate alternative metrics. Citation density (average number of references cited per source article), half-life (number of retrospective years required to find 50% of the cited references) are few examples. These alternative metrics provide extra information, to overcome the biases and factors which influence IF.^{3,4,17}

Some important alternative metrics are SCImago, the Source Normalized Impact per Paper (SNIP), and the Eigenfactor Score, etc.^{23,24,28}

Eigenfactor is the number of times articles from the journals published in the past five years. Journal self-citation, i.e. references from one article in a journal cited to another article from the same journal are removed to decrease bias. The main difference with a 5-year IF is the value added to each citation i.e. citedness of the citing journal, for example citations from highly cited journals are given weightage than those of lesser cited journals.²⁹

The Article Influence Score (AIS) and SNIP have a positive correlation when compared to the IF. These two metrics are open-access alternatives compared to the proprietary IF.³⁰

The AIS measures the impact of a journal's articles in the first five years after publication. An AIS of 1.00 is the average score, >1.00 indicates above-average and <1.00 below-average.³¹

The SNIP is of value at article level and decreases the bias of IF. The SJR calculation is influenced by the field of the study and the number of

scientists in the field. For example, IF of Molecular Cell (13.156) was five times that of Annals of Mathematics (2.793) but SNIP almost similar 0.386 and 0.247 respectively.³²

Sites related to IF calculation: WoS, JCR, SCI, SCIE and ESCI

The Web of Science (WoS; new name for previous Web of Knowledge) is a paid-access platform that provides citation data. Currently, it is owned by Clarivate and contains millions of records.^{1,33,34}

The WoS indexing includes Science Citation Index (SCI), SCI Expanded (SCIE), and Emerging Sources Citation Index (ESCI). The IF produced by SCI journals has earned a good reputation.^{35,36} Both SCI and SCIE journals are available online. The SCIE differs from SCI for IF. The SCI has a numerical (non-zero) impact factor whereas SCIE provides journals rank for impact factor.

The ESCI, is now maintained by Clarivate Analytics since 2017. The ESCI journals do not have an IF. The journals are evaluated yearly and transferred to SCIE for ranking.^{37,38}

The IF assigned to an SSI journal and not to individual articles or a researcher may not be a proper tool to evaluate a researcher as echoed by the DORA (Declaration on Research Assessment).^{25,39}

Limitation of IF

Some of the limitations of IF include journals' unfair practice. These include selecting articles that are predicted to be highly citable and preference for English language articles and journals, older journals vs. specialized new journals.¹⁶ The 2024 JCR and IF covers >21,800 journals, including OA journals, science journals, and social science journals, from 113 countries, across 254 categories.^{40,13} In the 2024 JCR report, only 3 journals from Nepal are listed, and the JNMA is dropped this year.⁴¹

There is survey of opinions of contributors from Asia, Europe, USA. The survey seeks implications

of IF as an academic output performance evaluation tool. I further explore whether it is beneficial or doing more harm. The survey revealed mixed results, overall response was more for SCI journals than non-SCI, like PubMed journals. Interestingly, when PubMed journals were also listed on SCI, a higher IF was considered superior than PubMed index journal not on SCI and thus without an IF.⁴²

The deficiencies in calculation and skewed citation distribution, the unfair comparisons across disciplines and categories, incentives to publish in SCI journals, article processing charges (APCs), and commercialization of IF as a business brand are some of the limitations of IF.^{43,39}

Even with all these limitations and concerns, it seems everybody is involved in the IF-game.¹⁸ The editors strive to increase their journals IF by increasing the nominator or decreasing the denominator. The OA journals tend to have higher IF. Even with limitations, IF continues to influence the research writing and publication ecosystem. The citation-based IF metrics has been in use and other alternatives still have to overcome the influence of IF.

Conclusion

The journal impact factor (JIF) or simply IF is a citation-based metrics. The journals listed on Science Citation Index (SCI) have an IF. For this simple reason, the widely considered PubMed indexed journals may not listed in SCI will not have an IF. The Journal Citation Report (JCR) from Clarivate provides yearly report on IF. This report is considered influential for quality and prestige by authors, journal editors, publishers, and academia.

Calculation of IF is simple. The current year IF is calculated by the total number of papers published in a journal in the previous two years divided by the total number of citations to the published articles in those two years.

There are concerns for the use of IF for evaluation of individual researcher because it is a journal metrics and not meant for individual researcher. There are limitations and concerns

in the calculation of IF. To overcome the possible limitation of IF, the know-how of alternative metrics like SCImago, cite-score, h-index, and others should be considered.

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References

1. Web of Science. In: Wikipedia. 2024 [Link](#)
2. Jacso P. The impact of Eugene Garfield through the prism of Web of Science. 2010. [Link](#)
3. Garfield E. The History and Meaning of the Journal Impact Factor. JAMA. 2006 Jan 4;295(1):90. [Google Scholar](#) [Full Text](#)
4. Garfield E. The evolution of the science citation index. Int Microbiol. 2007;10(1):65. [Google Scholar](#) [Full Text](#) [Link](#)
5. Bahadoran Z, Mirmiran P, Kashfi K, Ghasemi A. Scientific Publishing in Biomedicine: How to Choose a Journal? Int J Endocrinol Metab. 2020 Nov 25;19(1):e108417. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
6. Gould KA. Journal Citation Reports 2023: Understanding Bibliometric Data. Dimens Crit Care Nurs. 2023 Oct;42(5):245. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
7. Journal Citation Reports: Document Types Included in the Impact Factor Calculation. [Link](#)
8. Kumar A. Is "Impact" the "Factor" that matters...? (Part I). J Indian Soc Periodontol. 2018 Apr 23;22:95–6. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
9. Dong P, Loh M, Mondry A. The "impact factor" revisited. Biomed Digit Libr. 2005 Dec;2(1):7. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
10. Amin M, Mabe M. Impact factors use and abuse. 2004. [Google Scholar](#) [Full Text](#)
11. Singh Chawla D. Self-citations in around a dozen countries are unusually high. Nature. 2024 Jan 10. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
12. Joannah W. What's a good impact factor (ranking in 27 categories). SCI Journal. 2022 Feb 9:1-4. [Google Scholar](#) [Full Text](#)
13. Meo SA, Jawaid SA. Journal Citation Report 2024 and Impact Factor of Pakistani Biomedical Journals: Grading impact and analysis. Pakistan Journal of Medical Sciences. 2024 Aug;40(7):1315. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
14. Heaney K. Journal Citation Reports 2024: Simplifying journal evaluation. Clarivate. 2024. [Link](#)
15. Hoeffel C. Journal impact factors. Allergy. 1998 Dec 1;53(12):1225. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
16. Kaldas M, Michael S, Hanna J, Yousef GM. Journal Impact Factor: A Bumpy Ride in an Open Space. J Investig Med. 2020 Jan 1;68(1):83–7. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
17. Lock SP. Journalology: are the quotes needed. CBE Views. 1989;12(4):57–9. [Google Scholar](#)
18. Falagas ME, Alexiou VG. The top-ten in journal impact factor manipulation. Arch Immunol Ther Exp (Warsz). 2008 Aug 1;56(4):223–6. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
19. CiteScore highlights top-cited journals neglected by other metrics. 2017. [Link](#)
20. Scopus. Abstract and citation database. Elsevier. [Link](#)
21. Tennant JP. Web of Science and Scopus are not global databases of knowledge. Eur Sci Ed. 2020 Oct 27;46:e51987. [DOI](#) [Google Scholar](#) [Full Text](#)
22. Is SCImago Impact factor (SJR) and Thomson Reuters impact factor (JCR) considered alternative to each other or not?. ResearchGate. [Link](#)
23. Scimago Journal & Country Rank. [Link](#)
24. Villaseñor-Almaraz M, Islas-Serrano J, Murata C, Roldan-Valadez E. Impact factor correlations with Scimago Journal Rank, Source Normalized Impact per Paper, Eigenfactor Score, and the CiteScore in Radiology, Nuclear Medicine & Medical Imaging journals. Radiol Med (Torino). 2019 Jun;124(6):495–504. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
25. Waltman L, Traag VA. Use of the journal impact factor for assessing individual articles: Statistically flawed or not? F1000Research. 2021 Mar 1;9:366. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
26. Fleerackers A, Chtena N, Pinfield S, Alperin JP, Barata G, Oliveira M, et al. Making science public: a review of journalists' use of Open Access research. F1000Research. 2023;12:512. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
27. Liu W, Hu G, Gu M. The probability of publishing in first-quartile journals. Scientometrics. 2016 Mar;106(3):1273–6. [DOI](#) [Google Scholar](#) [Full Text](#)
28. Macri C, Bacchi S, Teoh SC, Lim WY, Lam L, Patel S, et al. Evaluating the Ability of Open-Source Artificial Intelligence to Predict Accepting-Journal Impact Factor and Eigenfactor Score Using Academic Article Abstracts: Cross-

- sectional Machine Learning Analysis. J Med Res. 2023 Mar 7;25:e42789. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
29. Eigenfactor. [Link](#)
30. Oosthuizen JC, Fenton JE. Alternatives to the impact factor. Surgeon. 2014 Oct;12(5):239-43. [DOI](#) [PubMed](#) [Google Scholar](#)
31. Article Influence Score. [Link](#)
32. Leydesdorff L, Opthof T. Scopus's source normalized impact per paper (SNIP) versus a journal impact factor based on fractional counting of citations. J Am Soc Inf Sci Technol. 2010;61(11):2365–9. [DOI](#) [Google Scholar](#) [Full Text](#)
33. The History of ISI and the work of Eugene Garfield. Clarivate. [Link](#)
34. Analytics C. Acquisition of the Thomson Reuters Intellectual Property and Science Business by Onex and Baring Asia Completed. [Link](#)
35. R DS. What is the difference between SCI, SCIE and ESCI Journals? iLovePhD. 2023. [Link](#)
36. company W of SG a Clarivate. Web of Science Master Journal List. Web of Science Group, a Clarivate company. [Link](#)
37. Clarivate - data, insights and analytics for the innovation lifecycle. Clarivate. [Link](#)
38. Thomson Reuters: Clarifying the complex. [Link](#)
39. Read the Declaration. DORA. [Link](#)
40. Journal Citation Reports JCR. Clarivate. [Link](#)
41. Pham H. Journal Citation Reports (JCR): Impact Factor 2023 (Web of Science). 2023. [DOI](#) [Full Text](#)
42. Wáng YXJ, Arora R, Choi Y, Chung HW, Egorov VI, Frahm J, et al. Implications of Web of Science journal impact factor for scientific output evaluation in 16 institutions and investigators' opinion. Quant Imaging Med Surg. 2014 Dec;4(6):453–61. [DOI](#) [PubMed](#) [Google Scholar](#) [Full Text](#)
43. Bardiau M, Dony C. Measuring back: bibliodiversity and the Journal Impact Factor™ brand, a case study of IF-journals included in the 2021 Journal Citations Report™. Insights. 2024 Jan 9;37(1). [DOI](#) [Google Scholar](#) [Full Text](#)