

Comparisons of Bibliometric Indices to Gauge the Quality of Virology Journals

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ABSTRACT

The study proposed identifying and assessing virology journals' quality by virtue of internationally accepted bibliometric indicators, namely, JIF, CS, SJR, and *h5*-index. The data collected from Web of Science, Scopus, and Google metrics for the year 2018 under the category 'Virology'. Thirty-six journals retrieved, then ranks and values of journals compared with each indicator's metrics. To assess the compatibility, the bivariate correlation coefficient calculated using SPSS. Microsoft Excel and Microsoft access 2010 used to analyze and visualize the journal's ranking with each indicator. The results exclaim except *Cell Host and Microbe*, none of the journals shows a similar ranking in all four indicators. Only seven journals are open access, and the rest of the 29 closed access—the USA leading 'Virology' researches. The calculation of the correlation coefficient indicates that all the indicators are compatible and can be used as an alternative to others to assess the journals' quality. Mainstream researchers in virology can securely utilize the SJR and *h5*-index indices as feasible options to JIF.

Keywords: Bibliometrics, Journal impact factor, CiteScore, SCImago Journal Rank, *H5* and *Virology*.

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INTRODUCTION

The word virus originates from the Latin, which means poison or foul issue, appeared in English to indicate an infectious disease. Studies on viruses and infectious diseases are called virology.^[1] Virology is a scientific discipline which deals with the biology, ecology, evolution, interaction, and cooperation of viruses. Also, it deals with viral diseases, different microorganisms, and the capacity of infections to convey their own and heterologous hereditary information into cells. Virus and viral ailments have been at the focuses of science, agriculture, and medication for centuries.^[2] The bibliometric indicators are crucial in assessing the quality of a journal; these indicators increasingly used to measure researchers' and educators' success and prestige.^[3] The significance of publishing articles in high impact journals increased gradually. It is compulsory in most academic organizations for the promotion and hence gained the attention of virologists, policymakers, researchers, and librarians. Simultaneously, publishing research articles in high impact journal helps to attract more audiences, and it might lead a researcher to be famous and well-read.^[4] Identifying a

quality journal is one of the significant tasks of the researchers. However, scientometric analysis of 'virology' has been conducted occasionally,^[5] but the bibliometric analysis to check Virology journals' quality never been undertaken so far. Therefore, this study conducted to evaluate the quality of virology journals by using bibliometric indicators, such as Journal Impact Factor (JIF), Cite Score (CS), SCImago Journal Rank (SJR), and *h5* index.

Eugen Garfield first introduced the concept of impact factor in 1955. The JIF is included in the JCR from 1975 forward.^[6] The Journal impact factor calculation is based on a previous two year period. It involves dividing the number of times articles cited by the number of citable articles. Estimation of 2018 Journal impact factor as:

$$\text{JIF 2018} = \frac{A}{B} \quad (1)$$

Therefore,

A = Number of citations in 2018 to articles published in 2016 and 2017 in a journal

B = Number of articles published in 2016 and 2017 in a Journal

However, JIF criticized the incorporation of references of articles that excluded from the calculation formula's denominator (editorial, letters, etc.). Just a 2-year time frame for analysis, the consideration of self-citations, English language bias, and absence of an evaluation of the quality of the

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origin of the citation or the risk of manipulation.^[7] CiteScore is another bibliometric indicator to measure the quality of academic Journals.^[8] It comprises of three-years citation window. CiteScore incorporates all types of documents, such as articles, reviews, letters, notes, editorials, conference papers, etc., indexed in Scopus. Subsequently, the numerator and the denominator utilized in the CiteScore calculation are reliable.^[9] An example of the CiteScore calculation of 2019 given below^[10]

$$\text{CS 2019} = \frac{\text{No of Citations (2018,2017,2016)}}{\text{Documents published in 2016-2018}} \quad (2)$$

CiteScore praised for including all types of publications to evaluate but criticized as problematic to ‘penalize’ titles like *Nature* and *The Lancet*. These titles publish a significant volume of front matter content (editorials, notes, letters to the editor, etc.), which typically not all around cited (if at all), which may function a key in scholarly communication or professional practice.^[11]

SCImago is another bibliometric indicator that supported calculation as Google PageRank. This indicator shows the visibility of the journal contained in the Scopus database from 1996.^[12] The websites of the SCImago is <https://www.scimagojr.com/index.php>. SJR utilizes a 3-year citation window.^[13] Calculation of SCImago Journal rank as mentioned in the equation below

$$\text{CS 2019} = \frac{\text{Average \# of weighted citations received in a year}}{\text{\# of documents published in the previous three years}} \quad (3)$$

h5-index is the product of Google scholar metrics, <https://scholar.google.com/schhp?hl=en>.^[14] *h5-index* defined as “It is the largest number of h such that h articles published in the last five (5) years have at least h citation each”. Therefore, the *h5* index of 100 means that the journal published 100 articles in the past five (5) years, with at least 100 or more citations each.^[14]

Objectives of the study

This research’s main objective is to evaluate the journals’ quality that publishes the research in the virology field. The assessment carried out by employing various globally accepted bibliometric indicators (employed by many databases), namely JIF, CS, SJR, and *h5-index*. Also, this study compared the indicator’s compatibility with each other to employ one indicator with respect to another without compromising the quality by using bivariate correlation coefficient analysis in SPSS software to ensure the error-free result.

METHODS AND MATERIALS

The journals metric retrieved from the web of science (JIF), from SCImago (SJR), from the Scopus database (CiteScore

and SJR), and from the Google scholar metrics (*h5-index*) as of 13th May 2020. The data strategically filtered as JCR year ‘2018’, edition ‘SCIE,’ categories ‘virology’, selected category scheme ‘Web of Science.’ Thirty-six journals have retrieved and analyzed by using different indicators and parameters. JIF considered a principle indicator to compare with other indicators (CS, SJR, and *h5-Index*). To assess the compatibility of the indicators as an alternative to each other for assessment of virology journals, Pearson’s (r) and Spearman’s (p) correlation coefficient calculated by using IBM SPSS (version 21.0). Microsoft Access (2010) and Microsoft Excel (2010) used for data visualization and representation.

Data analysis and interpretations

General Assessment: The general assessment of virology journal reflects that:

Type of access: Out of 36 journals, only 7 (19.44 %) are open access, and the rest of 29 (80.56%) are closed access.

Country-wise distribution: The USA is leading in virology publications, i.e., 13 out of 36 journals. The UK ranks second (8 journals), followed by Netherland (6 journals), Switzerland and Germany (2 journals) each. France, China, South Africa, UAE, and Slovakia publish 1 journal out of 36.

Quartile: The journals are already arranged in JIF by their quartile and hence ranked accordingly. The first nine (9) journals are Q1, and the next nine (9) journals are Q2, Q3, Q4, respectively (Table 1).

Table 2: Bivariate correlation.

Correlation statistic	Coefficient Values	Significant
Pearson’s r between JIF and CS values	0.895	0.000
Pearson’s r between JIF and SJR values	0.883	0.000
Pearson’s r between JIF and H5 Values	0.701	0.000
Spearman’s rho between JIF and CS ranks	0.841	0.000
Spearman’s rho between JIF and SJR ranks	0.702	0.000
Spearman’s rho between JIF and H5 ranks	0.614	0.000

Top five ranked journals of all indices

Journal impact factor (JIF): The top five JIF rank virology journals are *Cell host and microbe* (15.753), *Annual Review of Virology* (6.566), *Plos Pathogens* (6.463), *Advances in Virus Research* (5.6), *Virus evolution* (5.408). The journal *Cell host and microbe* possess the highest impact factor (15.753), and Journal *Virologie* represent the lowest impact factor (0.161).

CiteScore (CS): The top five rank journals are *Cell host and microbe* (10.5), *Annual Review of Virology* (6.57), *Plos Pathogens* (6.02), *Advances in Virus Research* (5.46), and *Current Opinion*

in *Virology* (4.79). Interestingly, the top four journals of the JIF indicator and CS indicator shows equal ranks. The journal *Virus Evolution* and *Virologie* shares the lowest level.

SCImago journal ranking (SJR): According to indicator SJR, the top five rank virology journals are *Cell host and microbe* (7.822), *Annual Review of Virology* (4.215), *Plos Pathogens* (3.909), *Aids* (2.706), and *Journal of Virology* (2.59). The top three journals of JIF, CS, and SJR have the same ranks. The journal *Virologie* (0.12) holds the lowest rank.

h5-Index: The top five rank *h5-index* virology journals are *Cell host and microbe* (102), *Plos Pathogens* (92), *Journal of Virology* (77), *Aids* (65) and *Virology* (53).

The top ten journals in comparison to JIF with other indicators

The top ten journals in all indicators compared with the help of bump chat. JIF considered as a primary indicator to compare with others, namely, CS, SJR, and *h5-index*.

Figure 1 and 2 shows a bump charts for the top ten JIF ranked virology journals in comparison to CS and SJR ranking. For CS the graph indicates an excellent correlation between the two indices (JIF&CS) except *Virus Evolution*, which suffers very strappingly. In SJR three journals shows a tremendous correlation between the indices. In contrast, Journals *Advances in Virus Research* and *Virus Evolution* shows maximum changes, the remaining five journals exhibited a rational correlation between the two JIF and SJR ranking. This finding is with a similar agreement of.^[15]

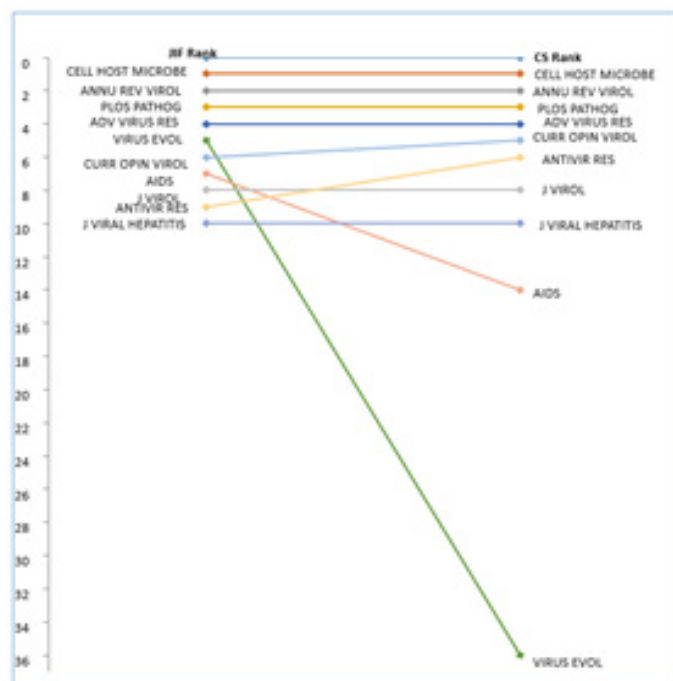


Figure 1: Bump Chart JIF vs. CS.

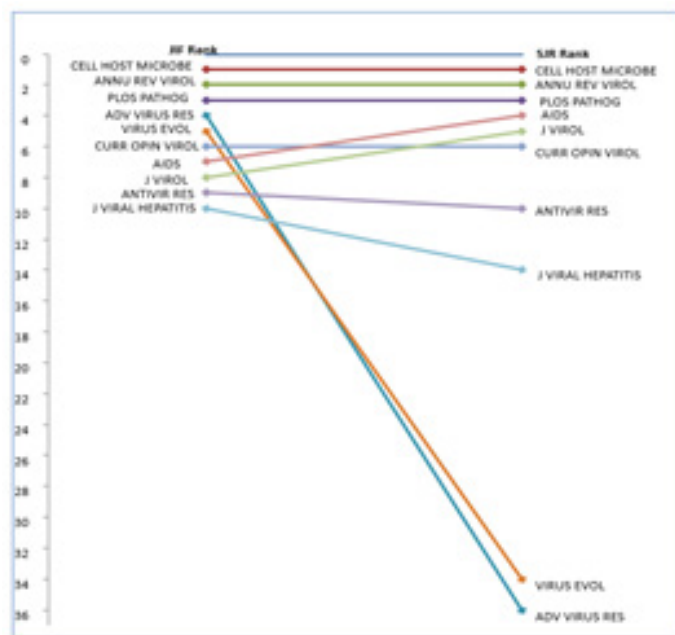


Figure 2: Bump Chart JIF vs. SJR.

In the H-5 index (refer to Figure 3), the journals *Cell Host and Microbe* exposed a superb correlation between the two indices. All other journals are fluctuating between the indices and having a reasonable correlation among them, except the journals *Advances in Virus Research* and *Virus Evolution* facing the most substantial changes. This result is with the agreement with the quality assessment of Nuclear physics journals.^[16]

Bivariate correlation: Bivariate correlation (Table 2) between the indices, namely JIF, CS, SJR, and H5, for ranking of the selected virology journals. The highest Pearson's (r) correlation noted between JIF and CS ($r = 0.895$), moderate correlation between JIF and SJR ($r = 0.883$), while the least correlation between JIF and *h5* index ($r = 0.701$). In the case of Spearman's ρ statistical correlation, an excellent correlation found between JIF and CS ranks of virology journals ($\rho = 0.841$), the reasonable correlation between JIF and SJR ($\rho = 0.702$) and low correlation noted between JIF and *h5* index ($\rho = 0.614$).

Figure 4 specifies the linear correlation between the value rank of JIF and CS indices. In case of the Figure 5, reasonable correlation found between the values and rank of JIF and SJR indices. While Figure 6, indicating a similar (as JIF vs. CS and JIF vs. SJR) correlation between value and rank of JIF and *h5*-index. The linearity of the relationship is recognizable between the rank of JIF vs. CS, JIF vs. SJR, and JIF vs. *h5* index.

RESULTS AND CONCLUSION

The assessment of 36 virology journals, based on JCR year 2018, shows that not a single journals demonstrate a

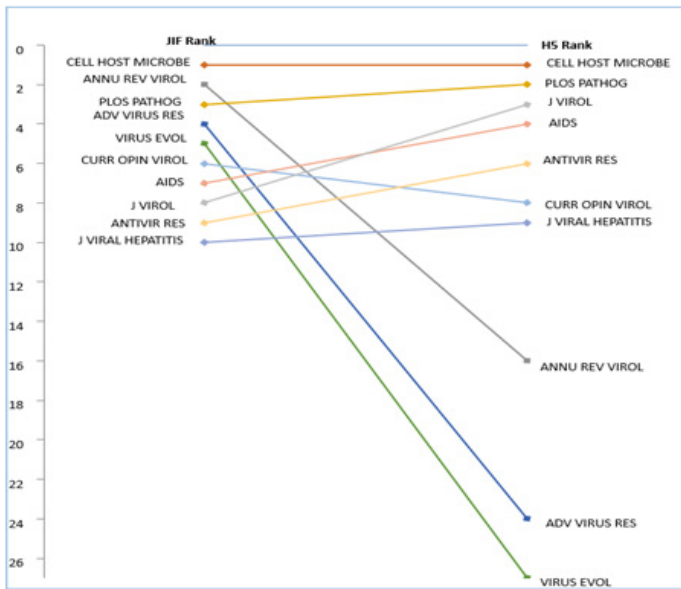


Figure 3: Bump Chart JIF vs. *h5*-Index.

similar ranking in the metric of four bibliometrics selected bibliometric indicators (JIF, CS, SJR, and *h5*-index). Except for the Journal *Cell Host and Microbe*, the journal ranked 1st in all four indicators. Other results noted as out of 36, only 7 have open access, and 29 journals are closed access. The USA leads in the production of virology journals. The correlation coefficient shows the visible linearity of the relationship between JIF VS CS, SJR, and *h5* index, making it clear that these indicators are compatible and complement each other.^[17] The above statement leads to the agreement with the suggestion of authors^[18] that each indicator can be used as an alternative to other, to assess the journals' quality. The study suggested that the mainstream researchers in *Virology* can securely utilize the freely accessible SJR and *h5*-index indices as a feasible option to JIF to evaluate the journals before publishing their research.

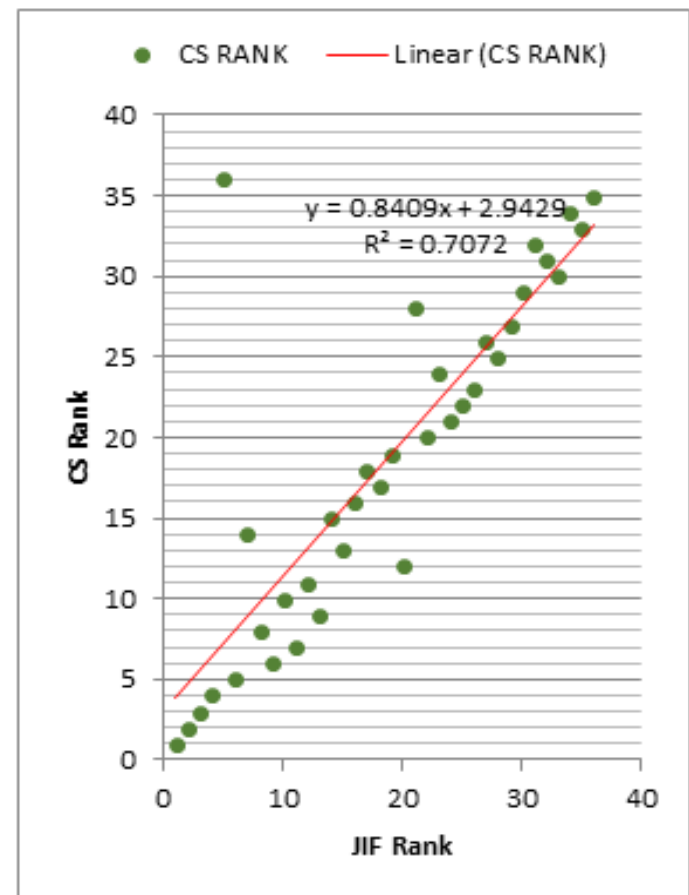
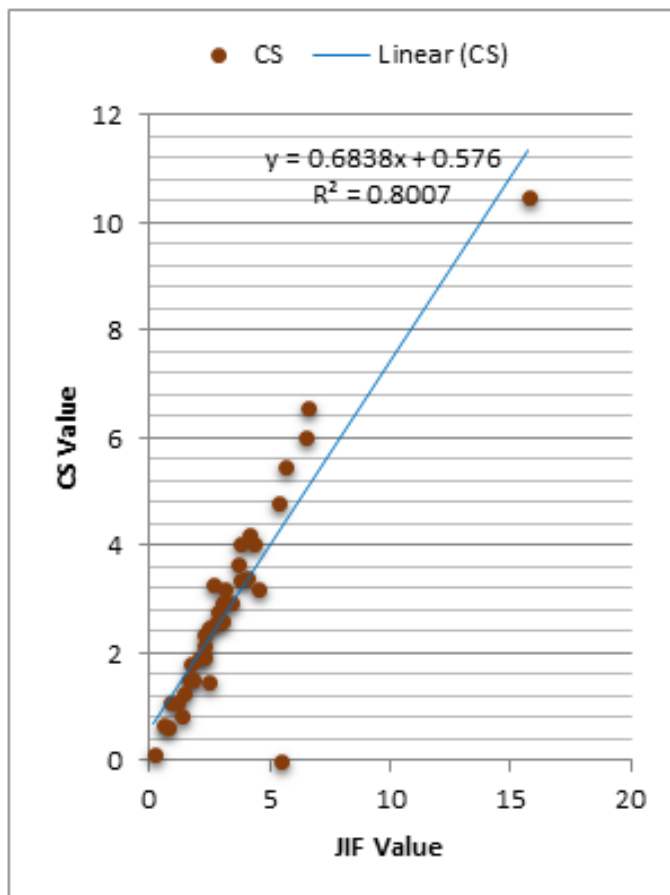


Figure 4: Scattered chart JIF vs. CS.

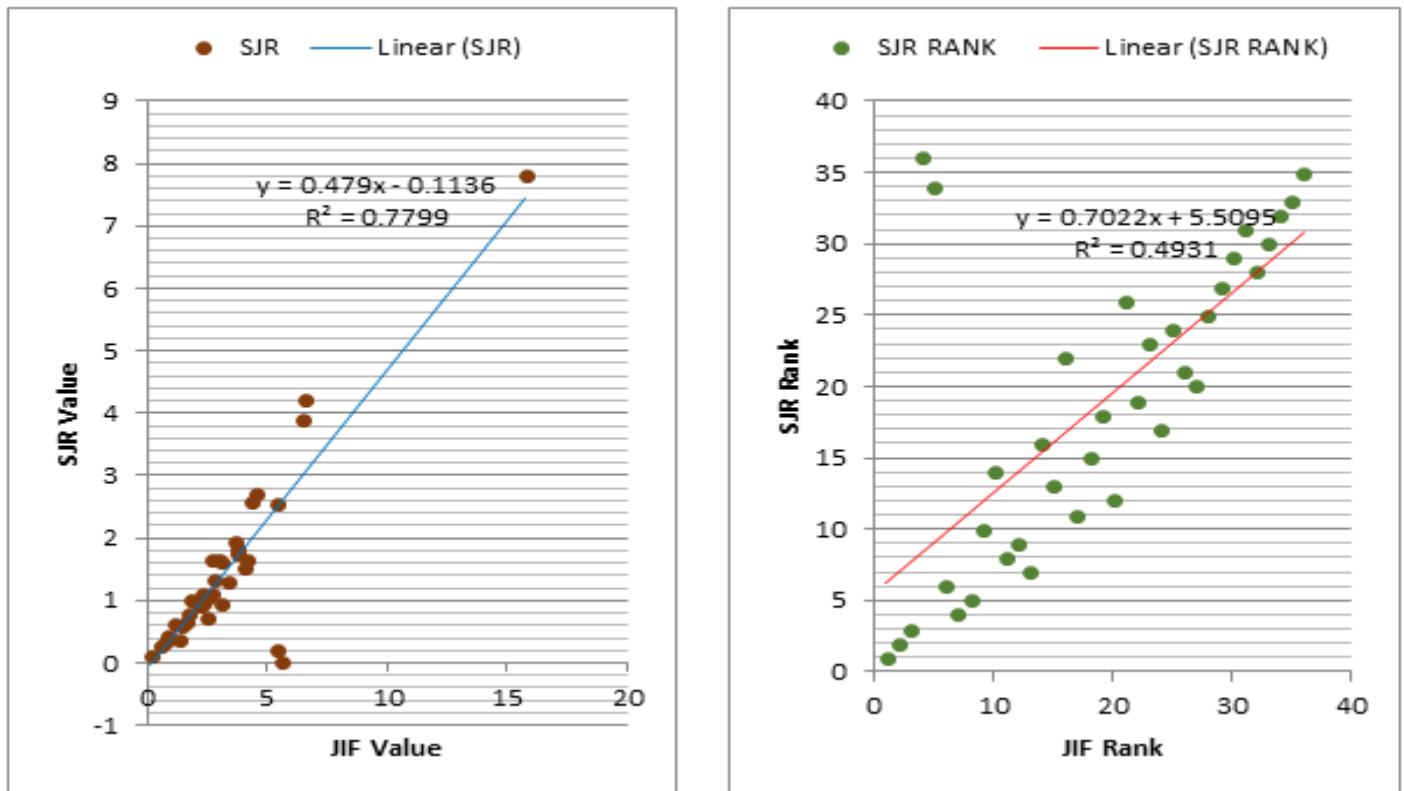


Figure 5: Scattered chart JIF vs. SJR.

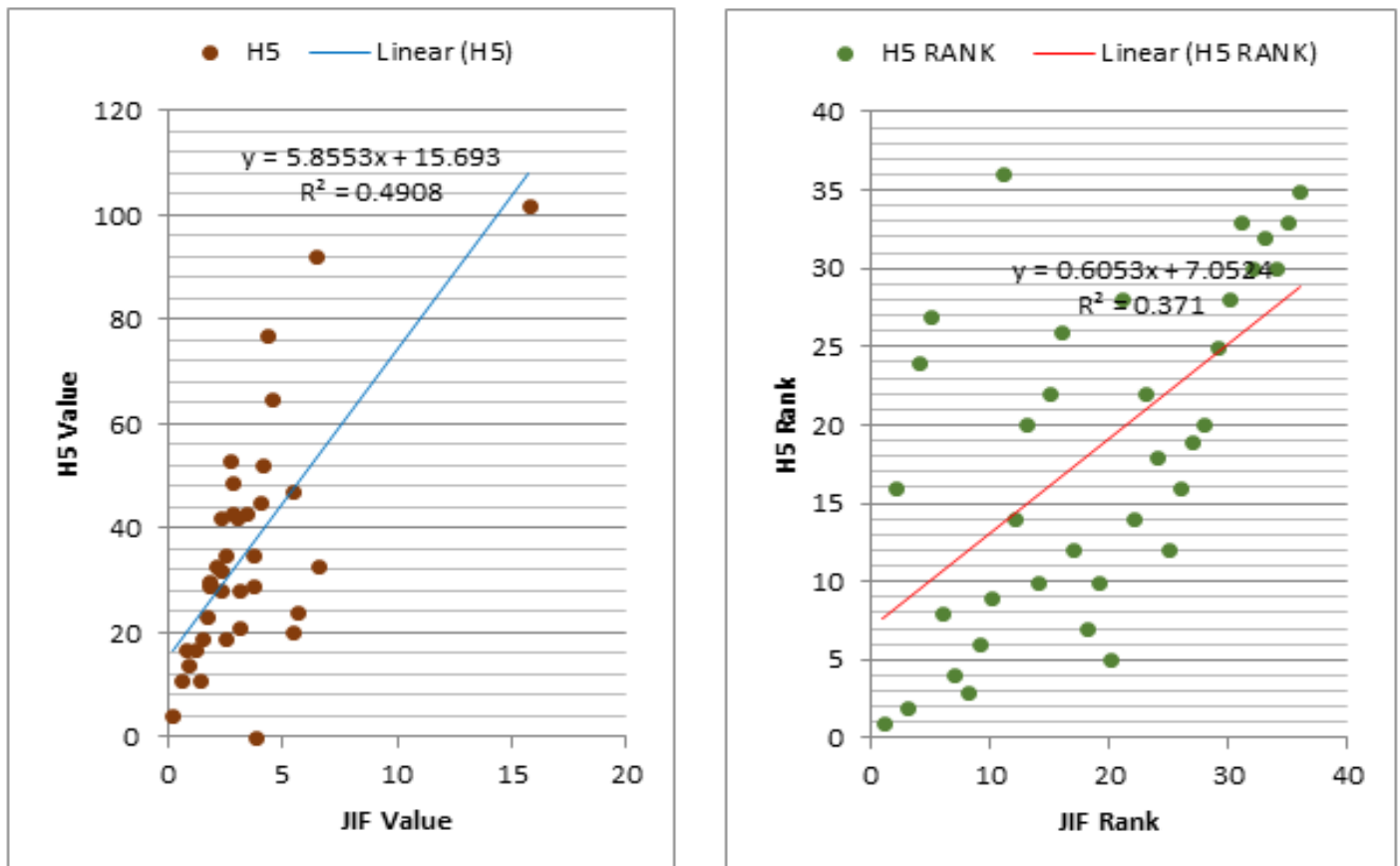


Figure 6: Scattered chart JIF vs. H5.

Table 1: General Assessments and Comparison of indicators as per ranks and values.

Journal title	JIF		CS		SJR		H5		Access	Country	Quartile
	Value	Rank	Value	Rank	Value	Rank	Value	Rank			
Cell host and microbe	15.75	1	10.5	1	7.82	1	102	1	Closed	USA	Q1
Annual review of virology	6.56	2	6.57	2	4.21	2	33	16	Closed	USA	Q1
Plos pathogens	6.46	3	6.02	3	3.90	3	92	2	Open	USA	Q1
Advances in virus research	5.6	4	5.46	4	0	36	24	24	Closed	USA	Q1
Virus evolution	5.40	5	0	36	0.2	34	20	27	Open	USA	Q1
Current opinion in virology	5.4	6	4.79	5	2.53	6	47	8	Closed	Netherlands	Q1
Aids	4.49	7	3.18	14	2.70	4	65	4	Closed	USA	Q1
Journal of virology	4.32	8	4.02	8	2.59	5	77	3	Closed	USA	Q1
Antiviral research	4.13	9	4.19	6	1.65	10	52	6	Closed	Netherlands	Q1
Journal of viral hepatitis	4.01	10	3.39	10	1.51	14	45	9	Closed	UK	Q2
Viruses-basel	3.81	11	4.03	7	1.81	8	0	36	Open	Switzerland	Q2
Retrovirology	3.74	12	3.37	11	1.73	9	35	14	Open	UK	Q2
Reviews in medical virology	3.70	13	3.65	9	1.92	7	29	20	Closed	USA	Q2
International journal of medical microbiology	3.36	14	2.94	15	1.28	16	43	10	Closed	Germany	Q2
Influenza and other respiratory viruses	3.09	15	3.2	13	1.60	13	28	22	Open	UK	Q2
Food and environmental virology	3.05	16	2.93	16	0.94	22	21	26	Closed	USA	Q2
Journal of clinical virology	3.02	17	2.61	18	1.64	11	42	12	Closed	Netherlands	Q2
Journal of general virology	2.80	18	2.78	17	1.31	15	49	7	Closed	UK	Q2
Virus research	2.73	19	2.57	19	1.09	18	43	10	Closed	Netherlands	Q3
Virology	2.65	20	3.29	12	1.63	12	53	5	Closed	USA	Q3
Virologica sinica	2.46	21	1.47	28	0.72	26	19	28	Closed	China	Q3
Virology journal	2.46	22	2.48	20	1.04	19	35	14	Open	UK	Q3
Antiviral therapy	2.30	23	1.92	24	0.93	23	28	22	Closed	UK	Q3
Journal of neurovirology	2.30	24	2.36	21	1.09	17	32	18	Closed	UK	Q3
Archives of virology	2.26	25	2.16	22	0.91	24	42	12	Closed	Germany	Q3
Journal of medical virology	2.04	26	1.94	23	0.96	21	33	16	Closed	USA	Q3
Aids research and human retroviruses	1.80	27	1.53	26	1.02	20	30	19	Closed	USA	Q3
Journal of virological methods	1.74	28	1.82	25	0.77	25	29	20	Closed	Netherlands	Q4
Virus genes	1.61	29	1.51	27	0.65	27	23	25	Closed	Netherlands	Q4
Viral immunology	1.41	30	1.26	29	0.59	29	19	28	Closed	USA	Q4
Southern African journal of HIV medicine	1.37	31	0.82	32	0.38	31	11	33	Open	South Africa	Q4
Current HIV research	1.11	32	1.09	31	0.63	28	17	30	Closed	UAE	Q4
Intervirology	0.87	33	1.1	30	0.44	30	14	32	Closed	Switzerland	Q4
Future virology	0.73	34	0.64	34	0.34	32	17	30	Closed	UK	Q4
Acta virologica	0.55	35	0.67	33	0.28	33	11	33	Closed	Slovakia	Q4
Virologie	0.16	36	0.11	35	0.12	35	4	35	Closed	France	Q4

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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