A Major Study of Citation-Based Indicators and Other Indicators for Evaluation

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ABSTRACT: *Altmetrics is gaining importance over the last few years with the birth of newer assessment tools. These metrics solve to answer the assessment issues and depend on a few measures other than publications and citations. Before accepting these measure or using them for evaluation, they need to be studied well. In this paper, the authors have used a few altmetrics measures and correlated them with citation measures and the results are presented in this paper.*

1. Introduction

There has been a rise in academic and scholarly works being published every year. Countries and organizations, scientists and scholars are interested in measuring the impact of these scholarly publications (Scotti, 2014). For many years, researchers have been dependent on traditional metrics like citations and publication counts to measure research impact. But traditional metrics have limitations and are applicable only to Journal articles (Featherstone,2014; Peters et al., 2015). As electronic media became popular and journals and authors began publishing online, data like the download data, how many times the article was viewed or saved was made available. These are some of the alternative ways of measuring the research impact and is also called Altmetrics.

What is Altmetrics?
The term was first used in 2010 by Jason Priem. It is a way to measure the interaction of people with a research work (Williams,2017). It is not meant to replace but instead complements traditional metrics (Troia, 2017). It captures online activities like the number of times a paper was downloaded, how many times was it shared, who is commenting, etc. Some examples that collect data and promote the use of alternative metrics are Altmetric.com, Altmetric.org,ImpactStory, PLOS Article -Level Metrics, Plum Analytics.

Advantages of Altmetrics

• Faster dissemination of an article (Williams,2017)

• Users do not have to wait for long to know about the impact a research work has made. It is made available quickly (Williams, 2017).

• The scholarly output of a researcher can be traced using Altmetrics(Williams, 2017).

• Several opportunities are made available to researchers like access to articles that have not yet been published (Williams, 2017).

Many studies have been conducted to determine the correlation between citation indicators and other indicators. Wang et al. (2014) conducted a study to find the correlation between citation indicators and other indicators like Total article view, HTML view, PDF view, Mendeley readership and Altmetric score using Spearman correlation coefficient. The correlation between citation indicators and PDF view was the strongest for articles. For journals, again there was a high correlation between citation and other metrics. They also calculate the correlation between altmetrics and other metrics. All other metrics have higher values than the citations. Lastly, correlation coefficient was computed for altmetrics, citation and three HTML view (PLOS HTML, PMC HTML and both PLOS HTML and PMC HTML together). PLOS HTML view had the highest correlation (Wang et al., 2014).

This study was undertaken for individual journal metrics. This is a small study with less volume of data.

2. Objectives of this Study

Some of the objectives of the study were:

• To study the performance of some journals against a few variables.

• To find out how individual journals perform within the class of citation-based metrics.

• To find how the journal impact values correlate with each other with the use of citation indicators.

• To find out how the altmetrics-based metrics are related with citation-based metrics.

• Is it possible to accept a particular metric?

The main goal is to understand how the various indicators correlate with each other as well as with the other indicators. For this purpose, some journals were selected, and their correlation value was calculated.

3. Data and Methodology

The data was directly drawn from the Journal's homepage. These are journals of Biomedcentral. It publishes 328 journals. Some of the journals have opted for transparent and open peer review and some of them also provide metrics like downloads. 15 journals were identified under the transparent and open peer review category.

4. Data Collection

Citation data like SNIP, SJR and Citescore were collected from the website of Scopus. Google impact and scholar impact data are from google and google scholar. The data on Downloads was already available in the Journal homepage.

4.1. Data Period
Since the latest data on citation indicators like SNIP, SJR and Citescore have not been made available yet, the 2019 data was taken up for the study. The data for Downloads, Google impact and Scholar impact were accessed in August 2020.

4.2. Data Analysis

15 Journals were selected and the citation data like SNIP, SJR and Citescore were obtained from Scopus. The next step was to correlate the citation indicators with each other as well as with the other indicators. The data on 2-year and 5-year impact was already available on the journal homepage. The google impact is the number of hits that was made available after searching for the journal in Google using double quotations.

Journal Name	SNIP	Rank	SJR	Rank	2-year impact	Rank	5-year impact	Rank	Citescore	Rank
Hereditary Cancer in Clinical Practice	0.82	14	0.839	11	2.237	7	2.163	11	2.05	12
BioData Mining	1.195	10	1.004	8	2.672	5	2.176	10	2.08	11
Biology Direct	0.679	15	1.316	3	2.193	8	2.721	8	2.87	5
Cardiovascular Ultrasound	1.07	11	0.766	12	2.043	11	2.113	12	2.09	10
Head and Face Medicine	1.217	7	0.659	13	1.492	14	1.858	14	1.85	14
Health Research Policy and Systems	1.224	6	0.987	9	2.365	6	2.762	7	2.29	8
Human Resources for Health	1.881	3	1.208	5	2.929	4	3.346	4	2.76	6
Implementation Science	2.352	1	2.872	1	4.525	1	5.741	1	5.5	1
Journal of Cardiothoracic Surgery	0.88	12	0.581	14	1.47	15	1.403	15	1.39	15
Journal of Foot and Ankle Research	1.199	9	0.625	15	1.598	13	1.983	13	2.02	13
Nutrition Journal	1.535	4	1.098	7	3.359	2	4.63	2	3.88	3
Population Health Metrics	1.991	2	1.394	2	3.328	3	3.754	3	3.23	4
Reproductive Health	1.407	5	1.223	4	2.177	9	2.836	5	2.62	7
Research Involvement and Engagement	1.216	8	1.159	6	2.177	9	2.836	5	4.4	2
Trials	0.88	12	0.98	10	1.883	12	2.185	9	2.12	9

Table 1. Citation-based Indicators

Table 1 lists all the 15 journals and all the 5 citation indicators like SNIP, SJR, Citescore, 2-year and 5-year impact. The journals have been ranked. It is clear from the above table that Implementation Science has the number 1 rank in all the 5 parameters. The other journals were ranked in a similar manner.

Journal Name	Downloads	Google Impact	Scholar Impact
Hereditary Cancer in Clinical Practice	163540	81,100	2,130
BioData Mining	155529	59,700	3,050
Biology Direct	297504	1,71,000	6,500
Cardiovascular Ultrasound	324964	1,91,000	8,700
Head and Face Medicine	218868	11,800	652
Health Research Policy and Systems	649478	2,33,000	8,380
Human Resources for Health	789946	83,90,000	32,100
Implementation Science	1676758	18,10,000	6,37,000
Journal of Cardiothoracic Surgery	784566	3,21,000	7,480
Journal of Foot and Ankle Research	557773	67,100	4,390
Nutrition Journal	1583109	6,07,000	52,700
Population Health Metrics	272266	1,67,000	6,730
Reproductive Health	1102036	1,89,00,000	18,70,000
Research Involvement and Engagement	141769	19,100	826
Trials	2854687	21,70,00,000	38,40,000

Table 2. Other impact indicators (other than citations)

Table 2 lists the impact indicators other than citation indicators like Downloads (the number of times the journal was downloaded), Google impact (the number of hits for a journal) and Scholar impact. These are the 3 parameters that are being compared.

Table 3 is the Master Table were all the journals and the indicators have been listed. It is evident from the above table that the citation indicators have a positive correlation between each other.

The correlation values were calculated for the citation indicators and the other indicators. For this purpose, Pearson correlation coefficient was used. As seen in Table 4, the values show a good correlation between SNIP, 2-year and 5-year impact. SNIP, SJR

Journal Name	SNIP	SJR	2-year impact	5-year impact	Citescore	Downloads	Google Impact	Scholar Impact
Hereditary Cancer in Clinical Practice	0.82	0.839	2.237	2.163	2.05	163540	81,100	2,130
BioData Mining	1.195	1.004	2.672	2.176	2.08	155529	59,700	3,050
Biology Direct	0.679	1.316	2.193	2.721	2.87	297504	1,71,000	6,500
Cardiovascular Ultrasound	1.07	0.766	2.043	2.113	2.09	324964	1,91,000	8,700
Head and Face Medicine	1.217	0.659	1.492	1.858	1.85	218868	11,800	652
Health Research Policy and Systems	1.224	0.987	2.365	2.762	2.29	649478	2,33,000	8,380
Human Resources for Health	1.881	1.208	2.929	3.346	2.76	789946	83,90,000	32,100
Implementation Science	2.352	2.872	4.525	5.741	5.5	1676758	18,10,000	6,37,000
Journal of Cardiotho-racic Surgery	0.88	0.581	1.47	1.403	1.39	784566	3,21,000	7,480
Journal of Foot and Ankle Research	1.199	0.625	1.598	1.983	2.02	557773	67,100	4,390
Nutrition Journal	1.535	1.098	3.359	4.63	3.88	1583109	6,07,000	52,700
Population Health Metrics	1.991	1.394	3.328	3.754	3.23	272266	1,67,000	6,730
Reproductive Health	1.407	1.223	2.177	2.836	2.62	1102036	1,89,00,000	18,70,000
Research Involvement and Engagement	1.216	1.159	2.177	2.836	4.4	141769	19,100	826
Trials	0.88	0.98	1.883	2.185	2.12	2854687	21,70,00,000	38,40,000

Table 3. Citation Data and other indicators – Master Table

and Citescore values are moderate. At 0.170, citation indicators and Downloads show a low correlation. A weak correlation is seen between citation indicator, google impact and scholar impact. Similarly, there is a very weak correlation between the indicators other than citations.

4.3. Inferences and Results

The results show that the citation indicators SNIP, 2-year and 5-year impact have a good correlation. Whereas the SNIP, SJR and Citescore correlation values are moderate. There is a low correlation between citation indicators and downloads. Additionally, there is a weak correlation between citation data, google data, and the scholar data. Lastly there is a weak correlation between downloads, google impact and scholar impact.

4.4. Comparing with earlier Altmetrics Study

Previous studies on citations and other indicators have reported low, medium, and high correlation. Citation-based indicators in our study have revealed scientific impact. However, the downloads data does not show any research impact. The google impact reveals only the popularity of the journal.

5. Limitations of Altmetrics

The limitations of altmetrics are as follows:

• It lacks in objectivity.

• The coverage is incomplete.

• Non-scholarly evaluation.

• Lack of quality control. This is because altmetrics data is available for all kinds of journals irrespective of whether they are high- or low-quality journals.

5.1. Limitations of this Study

1. The number of Journals under the Transparent and Open Peer Review category were less, therefore the dataset was small.

2. Also, the social media data was not available for all the Journals.

What do the various Indicators Measure?

SNIP, SJR and Citescore measure the scientific impact of a Journal. Whereas Downloads measure the academic usage. Google impact measures the popularity of a Journal and Google scholar also measures the scientific impact.

6. Conclusion

Even if citation-based indicators have certain limitations and disadvantages they are much better than altmetrics. Altmetrics may indicate the popularity of the Journal but it is not much useful when we want to measure the scientific value of the Journal.

References

[1] Featherstone, R.M. (2014). Scholarly tweets: Measuring research impact via altmetrics. *Journal of the Canadian Health Libraries Association / Journal de l'Association des Bibliothèques de la Santé du Canada*, 35, 60–63 [DOI: 10.5596/c14-015].

[2] Peters, I., Kraker, P., Lex, E., Gumpenberger, C. & Gorraiz, J. (2015). *Research Data Explored: Citations Versus Altmetrics. ArXiv Preprint* [DOI: doi]: [arXiv:1501.03342].

[3] Scotti, V. (2014) What is altmetrics? The impact of Altmetrics on San Matteo researchers and on librarians' professional life. 14th EAHIL 2014 Conference.

[4] Troia, L. (2017). *Altmetrics and the Evolution of Scholarly Impact Assessment*.

[5] Wang, X., Liu, C., Fang, Z., Mao, W. (2014). *From Attention to Citation, What and How Does Altmetrics Work? doi*: [arXiv:1409.4269].

[6] Williams, A. E. (2017). Altmetrics: An overview and evaluation. *Online Information Review*, 41, 311–317 [DOI: 10.1108/OIR-10-2016-0294].