Impact of country self-citation on the ranking of the top 50 countries in clinical neurology

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ABSTRACT

Objectives: To examine the factors that influence country self-citation rate (SCR) in clinical neurology and to assess the impact of self-citation on the ranking of the top 50 countries.

Methods: Scimago Journal & Country Rank was used to collect data for the 50 most cited countries in clinical neurology during 1996–2019. Country SCR was correlated with several productivity parameters and examined statistically. Countries that dropped in their ranking after the exclusion of self-citations were identified.

Results: The median (range) country SCR for the 50 most cited countries was 11.3% (5.3%–47%). Country SCR correlated significantly with total citable documents and total cites numbers and rankings. The exclusion of self-citations led to a drop in the ranking of 8(16%) countries only. No significant difference between the total and net total cites rankings was observed.

Conclusions: Self-citation can be appropriate and reflect an expansion on earlier research. Highly cited productive countries tend to have high country SCR. Excluding self-citations had minimal impact on the ranking of the top 50 countries. Our findings indicate that self-citation is unlikely to influence country standing amongst the top 50 and does not support the argument for eliminating self-citations from citation-based metrics. A more global- ization through international collaboration in research is encouraged.

1. Introduction

Citation rates are used for calculating journal impact factor and for evaluating researchers’ productivity which can affect careers and funding. They can also influence the academic standing of scholars, institutions, journals, and countries [1,2]. Citation-based bibliometrics could be prone to manipulation by practices that make them appear imperfect [3].

Self-citation in all its forms may be considered one of these tactics and consequently it has become a matter of interest in recent years [2]. Self-citation may well be appropriate and may be even necessary. In fact, the non-use of proper self-citation could be considered an attempt to conceal that the new work is not as novel as it is claimed [1,4]. Self-citation can function as a promoting tool giving more visibility to the researcher’s work and leads to more citations by others. It is regarded inappropriate when it is misleading as it can propagate erroneous theories. Furthermore, excessive, and improper self-citation can distort the scientific literature and may impact the citation metrics [3,4]. The literature on self-citation has been evolving in the last few years. Self-citation rate (SCR) can be quantified at the level of the author, journal, and country. Some of the publications that calculated self-citations reported an author SCR ranging from 2.2% [5] to 18% [6], a journal SCR ranging from 6.35% to 11.85% [7] and a country SCR ranging from 17.8% to 54.9% [8]. Country SCR has been increasing consistently during 1996–2008 in most countries particularly China, USA, and Iran [9].

The impact of country self-citation on bibliometric indicators utilizing publications from the Scopus database was examined in a recent publication [8]. However, the study was restricted to the 10 most productive countries, was specialty indiscriminate and did not included data beyond 2015 [8]. The lack of an up-to-date data concerning the factors that influence country SCR in clinical neurology and information relating to the impact of self-citations on country worldwide ranking prompted us to do this study.

Scimago Journal & Country rank (SJR) [10] is a portal that updated annually and uses Scopus database and provides free information relating to the performance of countries and journals in a variety of scientific disciplines. The purpose of the study is to to assess the factors

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that influence country SCR by calculating the SCR for the 50 most highly cited countries in clinical neurology during 1996–2019 and correlating it with several productivity indices. The study also aimed to assess the impact of country SCR on the total cites ranking of the top 50 countries in clinical neurology by examining the effect of the exclusion of self-citations on the countries’ world ranking.

2. Methods

2.1. Search and data source

This study was carried out at King Khalid National Guards Hospital, Jeddah, Saudi Arabia. No ethical approval was necessary as the study was based on data obtained from open access sources. The SJR [10] was searched on 1st November 2020 using the items: subject area (medicine), subject category (clinical neurology), country (all regions) and year (1996–2019). The 50 countries with the highest total cites in clinical neurology during the period were selected and ranked based on their total cites. The following productivity indices were collected for each of the top 50 countries: total citable documents, total cites, total self cites, total citable documents world ranking, and total cites world ranking. The country self-citation rate (SCR) was calculated by dividing the total self cites by the total cites and expressed as a percentage. The net total cites number was calculated by subtracting the total self cites from the total cites. The net total cites scores for the 50 countries was used to make a new ranking. The total cites and net total cites rankings were compared and changes in rankings were documents. A country was considered to have been impacted by self-citation if it dropped a rank or

| Country          | Citable Doc. | Total cites | Self cites | SCR (b/a) | Net total cites | Citable Doc. | Total cites rank | Net cites world rank | Net cites rank change |
|------------------|--------------|-------------|------------|-----------|----------------|--------------|------------------|---------------------|----------------------|
| United States    | 225,408      | 8,096,325   | 3,801,699  | 47%       | 4,294,626     | 1            | 1                | 1                   | 0                    |
| United Kingdom   | 52,408       | 2,224,365   | 455,569    | 20.5%     | 1,768,796     | 4            | 2                | 2                   | 0                    |

Table 1

Productivity parameters for the 50 most cited countries in clinical neurology during 1996–1999 showing total documents, total cites, total self cites, self-citation rate, net total cites, worldwide ranking based on total documents, total cites, and net total cites as well as the net change in total cites ranking following the exclusion of self cites.

Abbreviations: SCR: Self-Citation Rate, Doc: documents.
more after the exclusion of its self-citations.

2.2. Data analysis

The country SCR results in clinical neurology during 1996–2019 was correlated with the findings from the four bibliometric factors which were total citable documents number and ranking as well as total cites number and ranking. The correlations were done using the Pearson correlation coefficient. Furthermore, the extent of the variation between the total cite and net total cite country rankings was ascertained by correlating the two variables using Wilcoxon Signed –Rank Test. The correlation analyses were done using Social Sciences Statistics [11] with significance being reached when \( P < 0.05 \).

3. Results

The productivity parameters in clinical neurology during 1996–2019 for the selected 50 highly cited countries are summarized in Table 1. The median (range) values for total citable documents, total cites, total self cites, net total cites, SCR, total citable documents and total cites worldwide rankings for the 50 and the 10 most productive countries are summarized in Table 2.

Table 2. The country SCR in clinical neurology during 1996–2019 correlated significantly positively with total citable documents (\( R = 0.8005 \) (\( P < 0.0001 \)) and total cites (\( R = 0.7335 \) (\( P < 0.0001 \). It also correlated significantly negatively with total citable documents ranking (\( R = -0.6509 \) (\( P < 0.0001 \)) and with total cites ranking (\( R = -0.5395 \) (\( P = 0.0005 \)). However, there was no significant difference between the total cite and the net total cites rankings for the 50 most cited countries (\( Z = -0.1738 \) (\( P = 0.865 \). The impact of excluding self-cites on the total cites ranking amongst the 50 most highly cited countries in clinical neurology during 1996–2019 is demonstrated in Table 1. The median (range) net cites range was 0 ([-2] – [4]). Table 1 shows that eliminating the self-citations had no effect on the total cites ranking for 29 (58%) countries and led to an improvement in the ranking of 13 (26%) countries by one-rank gain (12 countries) and a two-rank gain (1 country). However, it led to a drop in the ranking of 8 (16%) countries by a one-rank drop (4 countries), a two-rank drop (2 countries) and a four-rank drop (one country). These 8 countries were considered to have been impacted by self-citation. They (and their SCR) were Japan (21.7%), China (35.5%), South Korea (15%), Brazil (22%), India (21.6%), Czech Republic (15%), Iran (25.6%) and Slovakia (11%). The median (range) productivity parameters result for the 8 countries whose total cites ranking was impacted by self cites is also summarized in Table 2.

4. Discussion

4.1. Country self-citation rate

There are several legitimate reasons to self-cite especially for scholars working over a long-time frame on the same topic, building on their previous research. Self-citation is a phenomenon that could boost the impact of the author, journal, and country. Self-citation was found to significantly impact the h-index of researchers [5]. It is also more frequent in specialty compared to general journals [7]. Self-citation is believed to correlate significantly with the total number of citations [1,12], number of publications [5,13] and number of authors [1,3,12]. The median country SCR in clinical neurology during 1996–2019 for the 50 and 10 most cited counties that had higher median country SCR of 11.3% and 18.2% respectively. The latter is slightly lower than the median country SCR of 22.9% that was reported for the 10 most productive countries during 1996–2015 [8]. There is a slight variation in the top tier countries according to whether the ranking was based on total citable documents or total cites as in Table 1. It is recognized that countries with a bigger a share of world publications self-cite more [6,9]. The estimated country SCR here was higher than most reported author and journal SCR.

[5,7]. This is not surprising as country SCR reflects the summation of self-citations by single and groups of authors as well as institutions from the same country. High country SCR may come from local collaboration networks, meetings and people knowing about each other work locally and choosing to cite it. However, a significant part of country SCR can be attributed to authors citing their previous work [14].

In this study, the 10 countries that had the highest country SCR in clinical neurology during 1996–2019 (and their SCR) were: USA (47%), China (35.5%), Iran (25.6%), Germany (22.3%), Brazil (22%), Japan (21.7%), India (21.6%), Italy (20.1%) and UK (20.5%).

This result differs slightly from another publication [15] that also utilized SJR and found the countries with the highest SCR during 1996–2017 to be: China (55.6%), USA (45.6%), Iran (36.6%), India (34.3%), Brazil (33.1%), Russia (31.7%), Ukraine (27%), Japan (26.7%), Malaysia (26.1%) and Pakistan (25.8%). One more study [8] reported country SCR for the 10 most productive countries during 1996–2015 to be as follows: China (54.9%), USA (46.5%), Japan (26.7%), Germany (24.6%), Spain (23%), UK (22.8%), Italy (22.8%), France (21.3%), Australia (20.8%) and Canada (17.8%). The variation between the various reports could be accounted for by the duration of the study period, the specialty/field covered, the data source and the country inclusion criteria. Nevertheless, all the reports share the common observation that USA and China have the highest country SCR in the world.

4.2. Correlation between country SCR and productivity indices

We have observed a significant correlation between country SCR and total citable documents and total total cites which is consistent with other reports [1,8,9]. The median country SCR for the 10 most cited countries was considerably higher than the median for the 50 countries (18.2% vs. 11.3%). As expected, the 10 most cited countries had a considerably higher median total citable documents (39,322 vs. 5112) and total cites (1,772,165 vs. 104,886).

A significant negative correlation between country SCR and the total citable documents rankings and total cites rankings was also seen. The 10 most cited countries that had higher medium country SCR (18.2%) had lower median total cites rankings (5.5) while the 50 most cited countries that had lower median country SCR (11.3%) had higher median total
cites rankings (25.5). The association between country SCR and the number of cites per documents was not examined in this study. It has been observed that country SCR correlated negatively with the average net-citation per paper and the publications per capita [8]. Furthermore, the influence of international collaboration on country SCR was also not addressed in this study. It has been documented that broadening the network through international collaboration could influence country SCR significantly [8,9].

4.3. The impact of self-cites on the total cites ranking of the top 50 countries

We found no significant difference between the total cites rankings and the net total cites rankings for the top 50 countries in clinical neurology. The exclusion of self-citations had no impact on the country total cites ranking in 58% and led to an improvement in the ranking in 26%. It impacted the ranking negatively in 16% only. The 8 affected countries were Japan, China, South Korea, Brazil, India, Czech Republic, Iran, and Slovakia. They had median SCR that was considerably higher than that for the 50 most cited countries (21.7% vs. 11.3%) and slightly higher than the median for the 10 most cited countries (21.7% vs. 18.2%).

Compared to the 10 most cited countries, these countries had a considerably lower medians for total citable documents (13,790 vs. 39,322), total cites 203,415 vs. 1,172,165), total citable documents ranking (15.5 vs. 5.5) and total cites ranking (21 vs. 5.5). Each of the 8 countries has its language and many of them have a large population. It is recognized that country SCR is more likely to be high in countries with large population and those facing language barrier [9]. Our findings indicate that self-citation is unlikely to influence a country large population and those facing language barrier [9]. Our findings indicate that self-citation is unlikely to influence a country's scientific standing amongst the top 50 countries in clinical neurology. Hence, the results do not support the argument that was suggested by some authors [3,7,8] to exclude or modify the use of self-citations in citation-based metrics.

4.4. Study limitation

There are several limitations to the study. The study was heavily reliant on the precision of the search engine SJR. It is possible that there were inaccuracies particularly with multi-national publications. The selection of the top 50 countries based on their total cites could have influenced the inclusion of a few of the lower performing countries. Also, with the study being restricted to the top 50 countries it was not possible to make observations about the global, continental, or regional trends in country SCR. Furthermore, even though many international clinical neuroscience journals are categorized under clinical neurology in SJR, the site does not provide data about different topics in clinical neurology such as stroke and multiple sclerosis which may have allowed for a more in-depth analysis. The association between country SCR and the number of cites per documents and h-index as well as the influence of international collaboration on country SCR were not addressed.

5. Conclusions

Self-citation can be appropriate and may reflect an expansion on earlier research.

In this study the median country SCR in clinical neurology during 1996–2019 was found to be 11.3% for the 50 most highly cited countries. Country SCR correlated significantly with total citable documents, total cites, total citable documents ranking, and total cites world ranking. No significant difference between the total cites rankings and net total cites rankings was observed. Our results indicate that country self-citation is unlikely to significantly influence its scientific standing amongst the top 50 countries and nothing objectionable about country self-citation was observed. The findings therefore do not support the argument for the exclusion or modification in the utilization of self-citations in citation-based metrics. Nevertheless, a more globalization through international collaboration in scientific research is encouraged.

Conflict of interest statement

The authors declare that they have no competing interests, and no funding was received.

Authors' contribution

AMB: Data collection, literature, and manuscript review
AABJ: Data collection, literature, and manuscript writing
MAS: Data collection, literature, and manuscript review
ABJ: Study design, methodology, data analysis and manuscript writing

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