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JOURNAL SELF-CITATION RATES AND IMPACT FACTORS IN DENTISTRY, ORAL SURGERY, AND MEDICINE: A 3-YEAR BIBLIOMETRIC ANALYSIS

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ABSTRACT

Objectives

The objective of this study was to evaluate the evolution of journal self-citation rates (SCRs) and impact factors (IFs) over time in the dental journals.

Materials and Methods

The journals listed under the category "dentistry, oral surgery, and medicine" in the Journal Citation Reports for the years 2014-2016 were screened for the following: citations and self-citations to years used in IF calculation, IF, IF without self-citations (corrected IF), SCR, and quartile of the IF distribution the journal occupied (Q1-Q4). Additional data regarding the number of issues published annually, journal's access options, and country of publication were extracted from the "Journal Profile Page."

Results

The median SCR significantly declined between 2014 and 2016 (13.725 [0-57.049], 12.687 [0-52.326], and 10.667 [0-53.208], respectively [$P < .05$]), while at the same time, IFs and corrected IFs significantly increased. SCR was significantly higher in subspecialty journals than that in general journals, as well as in the ones publishing more issues per year. Open-access journals tended to present lower SCR compared to journals requiring payment. No statistically significant differences in SCR were observed with respect to the origin and quartile. Nonsignificant correlations ($r < 0.3$, $P > .05$) were found for SCR-IF and SCR-corrected IF for all years.

Conclusions

There was a statistically significant decrease in SCR during the observation period. SCR was not correlated to IF of dental journals. Subspecialty journals and journals publishing more frequently presented significantly higher SCRs. These findings suggest favorable publishing conditions and citation practices in the dental literature.

INTRODUCTION

Bibliometrics, also referred to as scientometrics, describes "the application of quantitative analysis and statistics to publications such as journal articles and their accompanying citation counts."[1] This set of methods is nowadays routinely used in assessing the quality of scientific journals by all the contributors to the research process, publishers, department chairs, librarians, and researchers. The impact factor (IF), originally introduced to compare journals regardless of their size,[2,3] remains

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currently the most established bibliometric indicator at the journal level. IF reflects the number of citations to the journal in a given year to items published in the preceding 2 years, divided by the total number of scholarly items (ie, articles, reviews, and proceeding articles) published in the journal in the preceding 2 years.[4] Despite the voices warning against the use of IFs in the assessment of single articles, researchers, or research programs,[5] IFs affect gradually more careers, funding, and the reputation of individuals, institutions, and journals.[6] Subsequently, the annual release of the Journal Citation Reports (JCR) by Clarivate Analytics (formerly by Thomson Reuters), which includes updated IFs and journal ranks by subject category, is an eagerly awaited event in the academic world.

IF can be artificially inflated by excessive journal self-citations,[7] which occurs when authors repeatedly cite articles published in the same journal, authored by themselves or others. This phenomenon results in a significant distortion of IF and ranking that does not accurately represent the journal's citation performance. A self-citation rate (SCR) exceeding 20% is perceived by Thomson Reuters as high and suspect of abuse.[7] In this context, 13 journals were omitted from 2016 JCR due to anomalous citation patterns identified in citation data, in which excessive SCRs accounted for 10 titles.[8] More strikingly, a record number of 66 journals were banned for boosting IF with self-citations 3 years earlier.[9] A relatively high SCR may be due to the novelty or specificity of the area of interest of the journal, authors' awareness of relevant literature, or editorial policies aimed to enhance IFs.[10]

Controversies have been found in various medical specialties regarding the possible effect of self-citation on IF. Although a significant correlation was observed by studies in anesthesiology,[11,12] orthopedics,[13] gastroenterology, and hepatology,[14] research in dermatology,[15] ophthalmology,[16] and otolaryngology[17] confirmed no such correlation.

Little has been published so far about self-citation in the dental literature.[18] In addition, evaluation of SCR and IF trends in dental journals over an extended period of time is currently lacking. Therefore, the objectives of this study were to (1) assess the SCR in dental journals listed in 2014-2016 JCR; (2) compare the SCR of journals as classified by the journal type (specialty and general dental journals), geographic origin, access, IF quartile, and size (number of issues per year); and (3) investigate the association between SCR, IF, and corrected IF.

MATERIALS AND METHODS

Data Collection

The JCR for the years 2014, 2015, and 2016 were accessed (https://clarivate.com/products/incites/), and the total of journal titles grouped under the banner "dentistry, oral surgery, and medicine" was retrieved. The following parameters were studied and extracted from the JCR of each journal: total citations (TCs) to years used in IF calculation, self-citations (SCs) to years used in IF calculation, IF, IF without self-citations (corrected IF), SCR (number of self-citations divided by the total number of citing articles × 100), and quartile (Q1, Q2, Q3, and Q4). From the "Journal Profile page", the number of issues published per year (0-4, 6-8, or more than 10 issues), full access details (open access or not), and the country of journal publishing were extracted. Journals were classified by geographic location into 3 regions: North America (USA/Canada), Europe, and Asia/Australia/South America.[18] Only titles present in JCR throughout the 3-year observation period with available data for all categories were analyzed for the purposes of the study.

Statistical Analysis

Statistics was performed using IBM SPSS Statistics 20 (SPSS, Chicago, IL). The Mann–Whitney *U* test and Kruskal–Wallis H test, when appropriate, were used to compare differences in the SCR between the different journal categories, that is, the type, origin, access, IF quartile, and number of issues per year. Differences in journals' SCR, IF, corrected IF, total citations, and self-citations over time were compared using the Friedman test. Spearman's correlation coefficient was used to analyze the association between SCR, IF, and corrected IF. Correlations (ρ) < 0.3 were interpreted as poor, 0.3–0.6 as moderate, 0.6–0.8 as good, and >0.8 as excellent.[19] *P* values $< .05$ were considered statistically significant.

RESULTS

The lists of JCR in 2014, 2015, and 2016 included 88, 91, and 90 journals, respectively. After excluding the journals that were not consistently present in all 3 lists (ie, *International Journal of Computerized Dentistry*, *Journal of Evidence-Based Dental Practice*, Seminars in Orthodontics, and the former title of the *Journal of Oral & Facial Pain and Headache* and *Journal of Orofacial Pain*) and the ones with incomplete data (ie, *Implantologie*, *Journal of Oral & Facial Pain and Headache*), 85 unique titles were pooled for analysis.

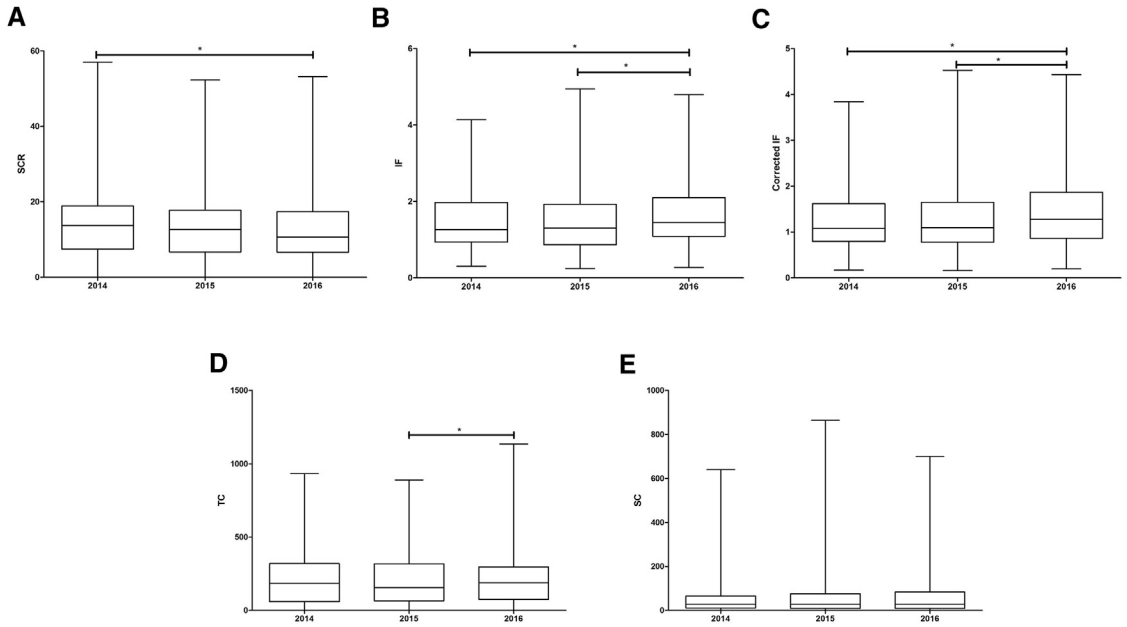
Descriptive statistics (median, range) for citation metrics and IFs per year are displayed in Table 1. The median SCR significantly declined between 2014 and 2016, whereas the IFs and corrected IFs gradually increased (Figures 1A-C, respectively). The percentage of journals with high SCRs shifted from 20% in the first 2 years to 15.29% in 2016. There was also a significant increase in TC from 2015 to 2016 (Figure 1D), whereas the number of SC remained stable over time (Figure 1E).

Table 1. Summary statistics (median, range [min-max]) of the journals' characteristics.

Year	TC	SC	SCR	Corrected IF	IF
2014	238 (23-2035)	28 (0-640)	13.725 (0-57.049)	1.079 (0.168-3.840)	1.261 (0.305-4.139)
2015	224 (16-1943)	28 (0-864)	12.687 (0-52.326)	1.096 (0.160-4.526)	1.303 (0.248-4.949)
2016	245 (18-2035)	28 (0-700)	10.667 (0-53.208)	1.278 (0.197-4.435)	1.452 (0.274-4.794)

SC = self-citation; SCR = self-citation rate; TC = total citation.

Figure 1. Box and whisker plots illustrating the distribution of (A) SCR, (B) IF, (C) corrected IF, (D) TC, and (E) SC for the years 2014-2016.* Indicates statistical significance, P < .05



There was an overall decrease over time in SCR regardless of the journal type. SCR was significantly higher in subspecialty than general journals in 2015 ($P < .05$, Table 2). Journals publishing more than 4 issues per year had significantly higher SCR than the ones publishing less frequently ($P < .05$, Table 2).

No statistically significant differences in SCR were found in journals with respect to the origin, access, and quartile ($P > .05$, Table 2). Mixed fluctuation patterns were observed in SCR among regions, in which journals originating from Asia/Australia/South America published gradually less self-citations. SCR appeared consistently higher throughout the observation period in journals charging access fees than open-access journals, but this difference reached statistical significance only in 2014 (Table 2). Opposite trends were seen between Q1 and Q2/Q3 journals with the latter containing from 2014 to 2016 progressively fewer self-citations.

Nonsignificant correlations ($r < 0.3$, $P > .05$) were found for SCR-IF and SCR-corrected IF for all years.

The *Journal of Dental Education* presented the highest SCR during all observation years (2014: 57.049, 2015: 52.326, and 2016: 53.208). Zero percent SCR was assigned to the *Swedish Dental Journal* for all 3 years (2014: ranking 74/80; 2015: ranking 87/91; and 2016: 83/90), Oral and Maxillofacial Surgery Clinics of North America for 2015-2016 (2015: ranking 82/91 and 2016: 43/90), and *Australian Orthodontic Journal* for the last year under examination (2016: ranking 87/90).

Table 2. Median (min-max) SCR of journals according to the type, region, access, and number of issues.

	2014			2015			2016		
Journals' characteristics	n	SCR	P	n	SCR	P	n	SCR	P
Type									
General	38	16.98 (6.16-52.33)	>.05	38	10.03 (0.00-35.48)	<.05*	38	8.85 (0.00-37.9)	>.05
Subspecialty	47	16.87 (3.23-57.05)		47	14.75 (0.00-52.33)		47	13.89 (0.00-53.21)	
Region									
Europe	44	11.57 (0.00-54.01)	>.05	43	11.77 (0.00-35.45)	>.05	42	9.63 (0.00-37.9)	>.05
North America	27	14.85 (4.17-57.05)		27	13.34 (0.00-52.33)		28	13.67 (0.00-53.21)	
Asia/Australia/South America	14	11.52 (1.05-28.00)		15	9.56 (0.49-30.93)		15	8.20 (0.00-38.47)	
Access									
Open	8	5.38 (1.05-12.30)	<.05*	8	9.45 (0.49-15.62)	>.05	8	6.23 (3.94-17.01)	>.05
Fee required	77	14.10 (0.00-57.05)		77	13.18 (0.00-52.33)		77	10.84 (0.00-53.21)	
Quartile									
Q1	22	12.68 (2.44-54.01)	>.05	20	13.22 (0.49-44.47)	>.05	19	13.23 (3.25-35.73)	>.05
Q2	21	14.10 (2.91-40.96)		22	12.44 (1.62-40.15)		24	10.50 (0.00-46.28)	
Q3	22	16.10 (5.64-57.05)		22	13.73 (2.54-28.87)		21	7.76 (3.45-38.46)	
Q4	20	11.29 (0.00-45.00)		21	10.81 (0.00-52.33)		21	11.58 (0.00-53.21)	
Issues no.									
0-4	27	9.62 (0.00-34.05)	<.05*	28	8.32 (0.00-3.33)	<.05*	29	7.26 (0.00-30.00)	<.05*
6-8	34	11.51 (3.78-45.00)		35	13.37 (2.54-35.48)		33	10.84 (4.38-46.28)	
10 or more	24	17.44 (4.17-57.05)		22	16.68 (6.16-52.32)		23	14.60 (6.73-53.21)	

*Indicates statistical significance, $P < .05$.

DISCUSSION

Dental journals followed an upward trend in citation counts and IFs (calculated with and without self-citations), whereas SCR significantly decreased from 2014 to 2016. This is in accordance with a previous dental study that found a significant growth in citations and aggregate IF in addition to total number of titles, articles, and especially originally research articles within a 10-year window.[20] Developments in academic publishing, like the prerelease of "online first" or "advance articles" ahead of the print publication date that prolongs their availability, the increase of the volume of published systematic reviews,[21] and the prevailing "publish or perish culture" in the academia, which mandates increased productivity,[22] may account for the rise in citations of dental articles.

Journal self-citation is a common referencing practice in scientific literature and should not be condemned by default. In fact, reference to prior work, published in the same journal or elsewhere, is fully legitimate since the author needs to present fairly and precisely similar

research.[23] The observed SCRs in dentistry, oral surgery, and medicine journals resemble reports in medical specialties[15,16] but lag behind the median rate of 9.04 across the Thomson Reuters Citation database.[10] Owing to differences in statistical reporting, no direct comparison can be made to the results of Elangovan and Allareddy.[18] Nonetheless, fewer journals with high SCRs were found in 2016 JCR compared to 18.04% reported by the abovementioned article. A closer look, though, shows that self-citations contributed to a lesser extent to the increase of IFs of dental journals in 2016 than in 2013 (ie, 13.62% vs 20.96%),[18] which may indicate a healthy scientific publishing environment.

SCR was significantly higher in journals publishing more than 4 issues per year. Citation analysis in 9 top gastroenterology and hepatology journals revealed that SCR was highly correlated with the total number of articles. Journals publishing more frequently may have a lead in the race for IF by getting more readily available articles for citation and self-citation too.[24] After all, as IF is an average citation-based measure, it may vary due to statistical effects related to the number of items being averaged, that is, the size of the journal in terms of published articles or the size of the measurement window (ie, 2 years for JCR IF).[25]

Subspecialty journals contained significantly more journal self-citations than general dental journals for a single year. Likewise, SCR was significantly affected in subspecialty journals in dermatology[15] and ophthalmology.[16] It can be assumed that the limited variety of journals in scientific subfields increases the likelihood of self-citation.[15] Still, due to the mixed SCR trends and lack of statistical significance in the results of 2014 and 2016 JCR lists, it needs to be further monitored how SCR evolves in dentistry, oral surgery, and medicine journals over time in relation to the journal type.

Publishing openly has been associated with higher citation rates,[26] and more interestingly, with higher JCR rank of dental journals.[27] In this study, journals with open-access policies had consistently lower SCR compared to those requiring fees. However, the low availability of open-access journals should be kept in mind in the interpretation of the results. Furthermore, and in line with a previous study, no geographic influence in the SCR was observed,[18] though journals published in North America had constantly higher SCR.

Interestingly, SCR of the dental journals listed in 2014-2016 JCR did not correlate to IFs and corrected IFs. This outcome is in agreement with dermatologic,[15] ophthalmologic,[16] and otolaryngologic studies[17] but contradicts findings in other medical fields.[11,14] A cross-sectional study on JCR metric data of dental journals for the year 2013 revealed no statistically significant differences in self-citations between high- and low-IF journals.[18] Except for discrepancies in the size of investigated samples, one needs to consider that citation habits and dynamics (like number of references, speed of development of the research field, and so forth) can vary highly in different research areas making comparisons on the basis of citation rate difficult.[28]

To the best of our knowledge, this is the first study identifying changes in SCR, IFs, and corrected IFs of dental journals over time, which methodologically outperforms cross-sectional studies on the same topic. This study, however, reviewed only journals listed under the subject category "dentistry, oral surgery, and medicine" in JCR, and thus, the results cannot be generalized to the whole dental literature. As noted earlier, the JCR database includes a rather small fraction, that is, less than 4%, of the available journals worldwide (approximately 5000 journals of an estimated total of 126,000).[29] Nevertheless, all journals assigned with IF were reviewed and not just a limited sample (viz. 6-9), like researchers in other fields previously did [11-14].

CONCLUSIONS

Citation analysis of 2014-2016 JCR lists revealed a favorable publishing environment in the dental literature in terms of SCR and IFs. SCR was not significantly correlated to the IF of dental journals. SCR was significantly higher in journals publishing more frequently and in subspecialty journals. More longitudinal studies are necessary to elucidate the incidence and patterns of journal self-citation in dentistry, oral surgery, and medicine.

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