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Letter to the Editor

Bibliometric analysis and evaluation of the Journal of Prosthodontic Research from 2009 to 2021

Dear Editor,

The *Journal of Prosthodontic Research* (JPR), the official Journal of Japan Prosthodontic Society, is a leading prosthodontic journal worldwide, ranking in the first quartile (Q1) with an impact factor of 4.642 according to the Journal Citation Report 2020. JPR publishes on a quarterly basis, and the first issue was published in January 2009. Demonstrating the trends and impact of a journal in its field is essential[1]. One approach to this is the "bibliometric analysis," through which the core research areas, authors, countries, journals, and their relationships can be identified by covering of all the publications related to a given topic, field, or journal[2,3]. In a bibliometric analysis, a citation analysis shows how frequently other authors cite a publication[4]. A bibliometric study provides tools to assess scientific production. Several bibliometric studies have been published in the field of dentistry[5–11], including prosthodontics[12–15], although most focused on the most cited articles. No bibliometric analysis of the research output of JPR has been conducted to date. Therefore, the present bibliometric study aimed to dissect the published documents, research areas, citation index, contributing authors, countries, and organizations as well as the references and sources cited by JPR since its inception.

Data on articles published by JPR from its inception (2009) through May 2021 were searched through the Web of Science (WoS) Core Collection[12] and Scopus databases, extracted, and analyzed[16]. The data were exported as text files (tab-delimited file format) with the option "Full Record and Cited References." For the Scopus database, all data elements were selected and exported as a comma-separated values file. All data were managed in a spreadsheet (Microsoft Excel 2016). Only articles and reviews were selected for the analyses.

The software program VOS viewer (Leiden University) was used[17]. Eight categories were considered: keywords and terms used by JPR, cited documents published in JPR, authors, countries, organizations published in JPR, and references and sources cited by JPR (**Supplementary file 1, Table 1**). The top 10 ranks from each category are tabulated and presented. Mapping analyses are presented as the network, density, and overlay visualization maps of occurrence. The items are presented in circles connected by lines; the larger the circle, the higher the item's weight. The items in the network visualization map are allocated in clusters with different colors based on their links. The items are shown as two different colors – blue and yellow – in the density visualization map, on which the higher an item's weight, the closer the color is to yellow. In the overlay visualization map, the items are presented as different colors based on their time of appearance/use, and the more recent an item's use, the closer the color is to yellow.

We will focus mainly on presenting the results of the data retrieved from the WoS. (The supplementary tables and figures present detailed results of data retrieved from Scopus.) A total of 588 records were retrieved from WoS and analyzed (527 [89.6%] articles, 61 [10.4%] reviews). A total of 604 records were retrieved from Scopus (545 [91.98%] articles, 59 [9.02%] reviews). The fewest works were published in 2015 (n=30), while the most were published in 2018 (n=79; **Table 1**).

The total number of citations for these publications was 7220; when self-citations were excluded, there were 6838 citations. The "h-index" was 38, and the citation average was 12.28 times per item. The number of citations increased incrementally throughout the study period (**Table 1**).

A total of 2931 keywords were used by JPR; of them, 63 met the threshold (**Table 2**). In 1st place was "CAD/CAM," with a frequency of 41 times, while 5 different keywords with a frequency of 24 times each were in 10th place. Surprisingly, keywords extracted from Scopus were completely different, with much more frequency times. According to the overlay map (**Supplementary file 2; Appendix Figs. 1A and 1B**), the most frequent keywords were mostly related to digital dentistry (e.g., CAD/CAM, zirconia, digital impression, precision).

A total of 1813 terms were used by JPR; of them, 21 met the threshold (**Table 2**). The term "effect" was in 1st place at 101 times, while "zirconia" was in 10th place at 15 times. In contrast to keywords, terms extracted from Scopus were somewhat similar to those extracted from WoS. According to the overlay map (**Supplementary file 2; Appendix Figs. 2A and 2B**), the most recently used terms were "implant," "accuracy," "zirconia," and "quality."

A total of 588 documents were published by JPR; of them, 195 met the threshold (**Table 2**). The paper authored by Miyazaki T (2013) was in 1st place with 300 citations, while the paper authored by Hori (2009) was in 10th place with 78 citations. Most of the cited documents were published between 2012 and 2016 (**Supplementary file 2; Appendix Figs. 3A and 3B**).

A total of 2023 authors published in JPR, of whom 14 met the threshold. To have 10 different ranks of publishing authors, the number of published documents per author was decreased to 8 (7 in Scopus), which led to 28 publishing authors. Sakurai K was in 1st place with 17 documents, while 6 different authors with 8 documents were in 10th place (**Table 3**). Most of the published documents of these authors were published between 2014 and 2017 (**Supplementary file 2; Appendix Figs. 4A and 4B**).

The work published in JPR was affiliated with 52 countries; of them, 11 met the threshold. To have 10 different ranks of countries, the number of published documents was decreased to 9, which led to 12 countries. Japan was in 1st place with 362 documents, while Switzerland was in 10th place with 9 documents (**Table 3**). The overlay map showed that authors in Germany, Italy, and Switzerland published in JPR in recent years (**Supplementary file 2; Appendix Figs. 5A and 5B**).

Table 1. Total records published in JPR based on WoS databases

Total records	658	Total publications (included records)	588
Excluded	82	Sum of times cited with self-citation	7220
Included	588	Sum of times cited w/o self-citation	6838
Article	527	h-index	38
Review	61	Average citation per item	12.28
Records per year (included records)		Citations per year*	
2009	34	2009	21
2010	33	2010	40 (90.5)
2011	41	2011	70 (75)
2012	36	2012	145 (100.7)
2013	39	2013	243 (67.5)
2014	36	2014	333 (37)
2015	30	2015	425 (27.6)
2016	42	2016	568 (33.6)
2017	57	2017	676 (19)
2018	79	2018	905 (33.9)
2019	69	2019	1330 (47)
2020	73	2020	1831 (38)
2021	19	2021	633

*Numbers in parenthesis refer to percentage of increase in citations relative to the previous year.

Table 2. Top 10 keywords, terms, and cited documents published in JPR based on WoS database

Keyword	N	Term	N	Document	Citations
CAD/CAM	41	Effect	101	Miyazaki (2013)	300
Zirconia	36	Implant	60	Rakhmatia (2013)	219
Strength	34	Influence	53	Najeeb (2016)	214
In-Vitro	33	Patient	45	Egusa (2012b)	168
Bond Strength	31	Evaluation	30	Li (2014)	157
Mechanical-Properties	30	Denture	27	Alghazzawi (2016)	125
Dental	28	Comparison/Teeth	24	Egusa (2012a)/Carlsson (2009)	99
Implants/Titanium Restorations	26	Complete Denture	22	Shibata (2015b)	83
Complete Denture	25	Accuracy/Removable Partial Denture	18	Nakamura (2010)	81
Rank10*	24	Zirconia	15	Hori (2009)	78

*More than 3 keywords; N: number of occurrence

Table 3. Top 10 authors, countries, and organizations published in JPR based on WoS database

Author	N	Country	N	Organization	N
Sakurai, K	17	Japan	362	Tokyo Med & Dent Univ	55
Matsuka, Y/Minakuchi, S	16	USA	52	Nihon Univ	48
Ohkubo, C	15	Brazil	44	Osaka Univ	42
Sasaki, K	14	Germany	38	Tokyo Dent Coll	27
Yatani, H	13	Peoples R China	27	Tohoku Univ	26
Shiga, H	12	Italy	20	Tsurumi Univ	25
Rank7*	11	India	17	Okayama Univ	23
Baba, K/Koyano, K/Kuboki, T	10	Sweden	11	Showa Univ	21
Rank9*	9	Iran/South Korea/Turkey	10	Hiroshima Univ/Iwate Med Univ	20
Rank10*	8	Switzerland	9	Univ Tokushima	19

*More than 3 authors; N: number of published documents

The work published in JPR was affiliated with 483 organizations/institutes. Of them, 23 organizations met the threshold. Tokyo Medical and Dental University was in 1st place with 55 documents, while the University of Tokushima was in 10th place with 19 documents (**Table 3**). Scopus appears to use the department name, not the university name, to refer to an affiliation, a matter that led to more than 1000

Table 4. Top 10 references and sources cited by JPR based on WoS database

Cited Reference	Citations	Source	Citations
Denry I, 2008	17	J Prosthet Dent	2016
Adell R, 1981/Miyazaki T, 2009/Piconi C, 1999	14	J Oral Rehabil	1003
Manly Rs, 1950/Slade G D, 1994	13	Dent Mater	887
Ender A, 2013	12	Clin Oral Implan Res	763
Flugge Tv, 2013	11	Int J Prosthodont	721
Rank6*	10	J Dent Res	564
Rank7*	9	J Dent	508
Rank8*	8	Int J Oral Max Impl	489
Rank9*	7	J Prosthodont Res	413
Rank10*	6	J Prosthodont	399

*More than 3 references

departments being identified from different or similar universities, rendering linking these departments to their respective universities challenging. The most productive departments in publishing in JPR were the Department of Fixed Prosthodontics, Department of Removable Prosthodontics, and Division of Advanced Prosthodontics. Notably, Osaka and Tohoku Universities recently started publishing in JPR (**Supplementary file 2; Appendix Figs. 6A and 6B**).

There were 1575 references cited in JPR, of which 15 met the threshold. To have 10 different ranks of references, the number of citations per reference was decreased to 6 (3 in Scopus) citations, yielding 110 references cited by JPR (**Table 4**). Denry I (2008) was in 1st place with 17 citations, while 45 different references cited 6 times each were in 10th place (**Supplementary file 2; Appendix Figs. 7A and 7B**).

There were 2764 sources cited by JPR; of them, 211 met the threshold. The Journal of Prosthetic Dentistry was in 1st place (2016), while the Journal of Prosthodontics ranked 10th (399 times; **Table 4**). There were slight differences from Scopus. For example, JPR was in 9th place in WoS (cited 413 times), whereas it ranked 10th in Scopus (cited 402 times) (**Supplementary file 2; Appendix Figs. 8A and 8B**).

Here we sought to analyze JPR records from its inception year (2009) to its recent volume (2021) to demonstrate its interest, trends, and impact and highlight the most frequently published/cited authors, countries, organizations, and institutes by using the most famous indexing databases, WoS and Scopus. The average annual records per year was 47.4, a relatively small number, which can be attributed to the fact that the journal is published on a quarterly basis. This also reflects that the journal is highly selective of the submissions subjected to the review process, which results in a small number of accepted records per year. The age of the journal, started in 2009, cannot be overlooked; it is still growing but definitely with firm and definitive steps. The number of records varied over time, although there has been a remarkable increase since 2017. This result might be due to the international reputation of the journal and, hence, the confidence of researchers submitting their work to the journal for publication.

The records published by JPR in 2009–2019 (n=496) are equal to approximately one-fourth of those published by the Journal of Prosthetic Dentistry (JPD; n=1996)[12], the oldest prosthodontic journal (dated 1951), which is published monthly and represents the official

journal for 24 leading US and international prosthodontic organizations. However, this was a source of pride. The image differs slightly when it comes to citations. The total citations of JPR for 2010–2019 were 4716, a figure that is almost equal to one-third of that of JPD for the same period (n=14104 citations)[12]. In contrast, the h-index scores for JPR and JPD were not substantially different at 38 and 47, respectively. Moreover, the average citation per item is higher for JPR; 12.28 vs. 8.34, a matter that simply reflects the small number of published records (denominator) relative to the larger number of citations (numerator). Collectively, these two bibliometric parameters are the real sources of interest.

In fact, the citation parameters are valid and reliable indicators of the high quality of published records and, hence, the extent of the impact on and attractiveness of the journal in the scientific community. In this bibliometric analysis, the number of citations increased steadily between 2009 and 2020. In that 12-year period, JPR has impressively jumped into Q1 with an impact factor of 4.642, ranking as the highest prosthodontic journal. Journals usually take a long time along with hardworking and committed editorial boards to achieve such a prestigious position. Such achievements reflect a commitment from the journal to publish only high-quality, novel, and innovative content.

The top 10 keywords in WoS comply with new dental materials and technologies, such as CAD/CAM, zirconia, bond strength, mechanical properties, and dental implants. In contrast, the top 10 keywords in Scopus were completely different and not intimately related to prosthodontics (human, male, female, aged, adult, and middle-aged). The top 10 terms based on WoS were related to patients such as implant, influence, patient, evaluation, and accuracy as well as to dental materials such as dentures, removable partial dentures, and zirconia, indicating that JPR published both clinical and experimental research. However, those in Scopus were related to dental materials such as bond strength, dental prosthesis, removable partial denture, and zirconia. There was almost complete agreement between the two databases regarding the top 10 cited records. The record of Miyazaki (2013) was in 1st place in both databases. The above record was on zirconia, which has recently gained considerable attention and popularity owing to its mechanical and physical properties.

Sakurai K, a researcher from Japan affiliated with Tokyo Dental College, was in 1st place with 17 publications related to dentures of different designs and materials. As mentioned earlier, because JPR is

the formal journal of the Japan Prosthodontic Society, it is expected to feature most of the publishing authors from Japan. When it comes to the top 10 countries and organizations published in JPR, the above statement applies again: Japan and Japanese Universities (Tokyo Medical and Dental University) came in 1st place. Simply, authors prefer to support the country and organization they are affiliated with; hence, they publish their work in the formal journals of these national organizations, which explains the vast difference between the number of records from Japan in 1st place (n=352) and the number of records from the USA in 2nd place (n=52) by more than 7 times.

Regarding the top 10 cited references, Denry I (2008)[18] came in 1st place with 17 citations in WoS; this is mostly ascribed to his work on zirconia materials. More than 3 references ranked first in Scopus, and Miyazaki T ranked 2nd for the same reason (zirconia). Concerning the top 10 cited sources, most if not all of these sources are related to prosthodontics and implantology, main themes that will be of interest to the readership of any prosthetic journal like JPR and, hence, sources of citations.

In summary, this bibliometric analysis revealed that JPR is now a leading journal in prosthodontics worldwide: selective regarding what it publishes and cites and reputable about how others cite its contents. JPR publishes a blend of laboratory and clinical research and focuses on the current trend of digitalized prosthodontics.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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