Article

The top 100 most cited articles published in dentistry: 2020 update

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1. **Abstract:** This bibliometric review is aimed to analyze the top 100 most-cited publications in dentistry and to compare its outcomes with similar analysis done by Feijoo et al., [1]. A literature search was performed using the Elsevier's Scopus without any restriction of language, publication year or study design. Of 336381 articles, the top 100 were included based on their citation count which ranged from 638 to 4728 citations (Feijoo et al., 326 to 2050). Most productive decade was the 2000s with 40 articles on the list (Feijoo et al., 1980s: 26). Marx RE (7%) was the major contributor in this study (Feijoo et al., Socransky SS: 9%) and a whopping 48% articles generated from the USA. 26% of top 100 articles focused periodontology (Feijoo et al., periodontology: 43%), while 17% of the total were published in the *Journal of Dental Research* (Feijoo et al., *Journal of Clinical Periodontology*: 20%). Most of the publications were narrative reviews/expert opinion (36%), (Feijoo et al., case series: 22%) and were within the evidence level V (64%) (Feijoo et al., 54%). The citation count that a paper secures is not necessarily a reflection of research's quality, however, the current analysis provides latest citation trends in dentistry.

2. **Keywords:** bibliometric analysis; citation analysis; dentistry; most cited

1. Introduction

As a science, dentistry has reached a high maturity level in recent decades [2]. In academia, journals play a crucial role by disseminating technical and scholarly work, peer-review and evaluating research, archiving of such research, and providing a foundation for scholarly credits [3]. In 2004, Olk and Griffith stated that journals serve as the primary source of knowledge in a particular specialty. They argued that the boundaries of a given discipline are pushed by scholars, however, journals are essential to advance the main body of knowledge [4]. The *American Journal of Dental Science*, the world's first dental journal, began its publication in 1839 [5]. Since then, the journals in dentistry have been performing as a mode of communication and source of knowledge within the dental community and other related fields. Hence, valid and reliable tools are necessary to analyze and document several changes that may occur in the lifetime of a single academic journal or group of journals [3].

Citations are potential indicators of a publication's impact in this expanding scientific literary environment [6]. A citation is an alphanumeric expression that acknowledges a particular subject contribution to others' research [7,8]. Citation analysis is a bibliometric method to identify articles with the greatest impact on research and clinical community in a given discipline [9], providing the foundation for developing new research lines, techniques, and theories. This method has been adopted in different dentistry subfields including endodontics, orthodontics, periodontology, implant dentistry, prosthodontics, oral and maxillofacial surgery, dental traumatology, dental caries, oral squamous cell carcinoma, oral submucous fibrosis, oral leukoplakia, cleft lip and palate, and medication-related osteonecrosis of the jaw (MRONJ) [1,10-22]. The definition of "classic article" has been a controversial topic across disciplines—the most commonly suggested criterion has been the securing of a certain citation count, for instance, at least 400 citations [9,23,24]. However, a publication having accomplished 100 or more citations can also be termed as a "classic publication," depending upon the field under consideration, such as dentistry [25].

This bibliometric review aimed to identify and analyze the scientific activity of dental sciences till 2020. The Elsevier's Scopus (ES) database was utilized to accomplish three specific objectives: (a) characterize the dental research in association with output, impact, geographic origin, authorship, topic, methodology design, and evidence level; (b) thematically characterizing research in dental areas, analyzing their interactions and evaluating their up-to-date trends; and (c) assess any changes in citation trends of dentistry articles when compared with a similar study published by Feijoo et al., [1] in 2013.

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2. Results

2.1. Citation count, citation density and current citation index

The primary characteristics of the top 100 most-cited articles in dentistry are shown in Supplementary Table 1. Overall, the 100 most-cited articles published in dentistry journals achieved a total of 113482 (ES) and 214642 (GS) citations; with the citation count varying between 638 and 4728 (ES), and 138 and 8281 (GS). According to ES, 33 articles exceeded 1000 citations; with 33 articles securing more than 2,000 citations as per GS. The most cited article, with a total of 4728 (ES), 8281 (GS) citations, was as clinical trial titled "Periodontal Disease in Pregnancy II. Correlation Between Oral Hygiene and Periodontal Condition" [27], and was published in the *Acta Odontologica Scandinavica*. Its citation density was 84, with the current citation index (CCI) of 269. The second most cited article, with a total of 4062 (ES), 7873 (GS) citations, was similar to the first article but was published one year earlier titled "Periodontal disease in pregnancy I. Prevalence and severity" [28], and was also published in the *Acta Odontologica Scandinavica*. Its citation density was 71, with the CCI of 232. The third most cited article, with a total of 3392 (ES), 6257 (GS) citations, was also a clinical trial titled "A 15-year study of osseointegrated implants in the treatment of the edentulous jaw" [29] and was published in the *International Journal of Oral & Maxillofacial Surgery*. Its citation density was 117, with the CCI of 96.

As per citation density, review by Guo and DiPietro [30] has the highest score, i.e., 186. The second rank, having a citation density of 181, is occupied by an article related to the category of classification or tools for assessing results [31]. The third ranked article having a citation density of 167 is a position paper by Ruggiero et al., [32]. According to the CCI 2020, the top-ranked article was a review published in 2010, securing 345 citations [30]. The second-ranked article was a recommendation paper related to the category of classification or tools for assessing results written by Schiffman et al., [33] in 2014, with 299 citations. The third-ranked article was a clinical trial by Silness J and Löe H, which counted 269 new citations [27].

According to the Shapiro-Wilk test, the distribution of data regarding citation count, citation density, and article age were not normal ($p<0.01$). A significant trend towards a higher citation count with article age was observed ($r=0.832$, $p<0.01$) (Figure 1A). However, a non-significant trend towards an increased citation density with the age of publication was observed ($r=0.176$, $p=0.129$) (Figure 1B).

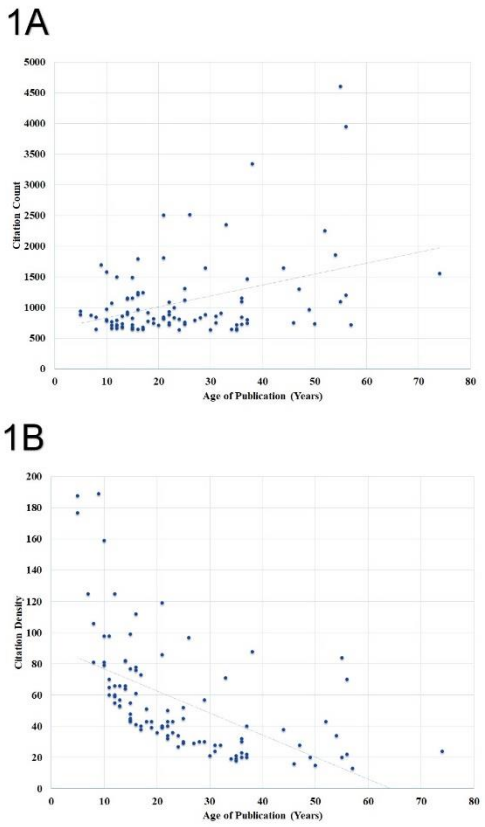

Figure 1: Association of (A) citation count and (B) citation density with age of publication.

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2.2. Distribution by year

The top 100 most-cited articles were published between 1955 [34] and 2014 [31, 32]. The most prolific year in terms of publications was 2004, with seven publications, followed by 1997, 1998, 2003, and 2007 with five articles each. The year with most citations was 1998, with 6829 citations, followed by 2004 and 2003, with 6190 and 5879 citations, differently. The decade with most publications (n=40) and citations (n=35743) was 2000s (Figure 2A).

2.3. Contribution of countries

The top 100 most-cited publications originated from 15 countries, including Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Sweden, Switzerland, the United Kingdom (UK) and the United States of America (USA) (Figure 2B). According to the number of publications, most of the articles originated from the United States of America (n=48), followed by Sweden (n=14), Belgium (n=6), Switzerland (n=6), UK (n=5), Denmark (n=4), Canada (n=3), Finland (n=2), France (n=2), Germany (n=2), Italy (n=2), Netherlands (n=2), Norway (n=2), Australia (n=1), and Brazil (n=1).

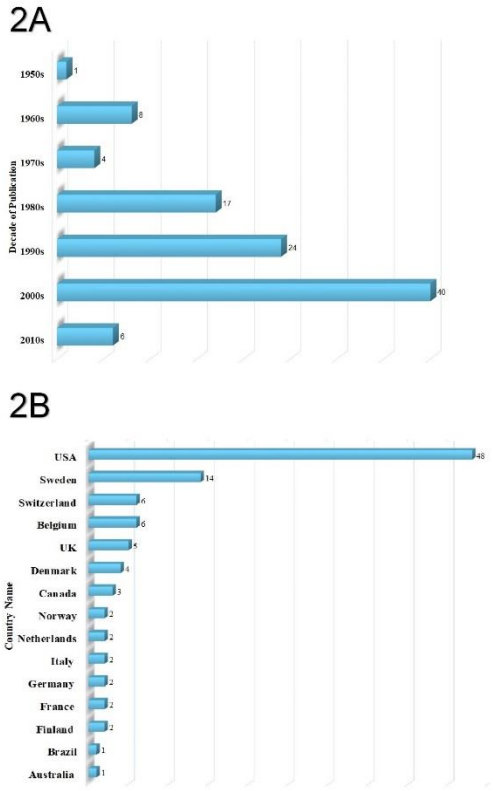

Figure 2: (A) Citation analysis of the top 100 most-cited articles over the decades. (B) The contribution of countries to the top 100 articles.

2.4. Contribution of authors

A total of 264 authors contributed to the top 100 most-cited articles. Many of the articles (n=84) had between one and six authors, but publications with two authors were the most common (n=27). The majority of the contributions were made by Marx RE (n=7, 8230 citations), followed by Löe H (n=4, 12668), Lekholm U (n=4, 6654), Haffajee AD (n=4, 5313), Socransky SS (n=4, 4843), Albrektsson T (n=4, 4658), De Munck J (n=4, 3772), and Genco RJ (n=4, 3014) (Table 1).

Table 1. Contribution of authors to the top 100 most-cited articles in dentistry*

Author Name	Number of Article	Citation Count
Marx RE	7	8230
Löe H	4	12668
Lekholm U	4	6654
Haffajee AD	4	5313

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Socransky SS	4	4843
Albrektsson T	4	4658
De Munck J	4	3772
Genco RJ	4	3014
Brånemark PI	3	6140
Mehrotra B	3	3183
Ruggiero SL	3	3183
Lambrechts P	3	3156
Van Landuyt K	3	3049
Van Meerbeek B	3	3049
Yoshida Y	3	2620
Sjögren U	3	2444
Sundqvist G	3	2444
Lindhe J	3	2439
Zambon JJ	3	2144
Berglundh T	3	2112

*Due to high number of contributing authors to the top 100 most-cited articles, it was not posssible to mention all the authors in a table. Hence, the authors who contributed to ≥3 articles were considered in the table.

2.5. Journal of publication

Overall, the top 100 most-cited articles in dentistry were published in both specialized and comprehensive periodicals (n=31) (Table 2). The journal with the greatest number of publications was the *Journal of Dental Research* (n=17, 17836 citations), followed by *Journal of Periodontology* (n=11, 12141), *Journal of Clinical Periodontology* (n=9, 8461), *Journal of Oral and Maxillofacial Surgery* (n=8, 8873), *Dental Materials* (n=7, 6220), *Journal of Endodontics* (n=5, 3927), and *Periodontology 2000* (n=4, 3391).

A statistically non-significant trend ($p=0.204$) was observed between a journal age and the number of articles published in that journal. However, a statistically significant trend ($p<0.05$) was observed between the impact factor of the journal and the number of articles published in that journal.

Table 2. List of journals in which the top 100 most-cited articles were published

Journal Name	Impact Factor	No. of Articles	Citation Count
Journal of Dental Research	4.914	17	17836
Journal of Periodontology	3.742	11	12141
Journal of Clinical Periodontology	5.241	9	8461
Journal of Oral & Maxillofacial Surgery	1.642	8	8873
Dental Materials	4.495	7	6220
Journal of Endodontics	3.118	5	3927
Periodontology 2000	7.718	4	3391
International Journal of Oral & Maxillofacial Surgery	2.068	3	4200
Oral Surgery, Oral Medicine, Oral Pathology, & Oral Radiology	1.601	3	3345
Journal of Prosthetic Dentistry	2.444	3	2915
Acta Odontologica Scandinavica	1.573	2	8549

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International Journal of Oral & Maxillofacial Implants	2.320	2	3996
Community Dentistry & Oral Epidemiology	2.135	2	2310
Journal of Oral Pathology & Medicine	2.495	2	2166
Community Dental Health	0.679	2	2064
Journal of the American Dental Association	2.803	2	1816
American Journal of Orthodontics & Dentofacial Orthopedics	1.960	2	1814
Clinical Oral Implants Research	3.723	2	1723
European Journal of Oral Sciences	2.220	2	1667
International Dental Journal	2.038	1	1651
Oral Oncology	3.979	1	1585
Operative Dentistry	2.213	1	1248
International Journal of Periodontics & Restorative Dentistry	1.513	1	968
Journal of Oral & Facial Pain & Headache	1.260	1	941
Implant Dentistry	1.452	1	781
Archives of Oral Biology	1.931	1	752
Journal of Canadian Dental Association	1.200	1	735
Journal of Dentistry	3.242	1	725
International Endodontic Journal	3.801	1	721
International Journal of Prosthodontics	1.490	1	678
Journal of Dental Education	1.322	1	649

2.6. Field of interest

According to the field of interest of the 100 most-cited articles, the majority were related to Periodontology (n=26, 32410 citations), adhesive restorations (n=14, 11915), implantology (n=13, 15592), oral medicine/pathology (n=12, 12785), endodontics (n=8, 5936), oral hygiene (n=8, 10643), bone morphology/histology (n=7, 6943), oral biology/morphology (n=4, 5862), regenerative dentistry (n=2, 2228), orthodontics (n=2, 1814), saliva/biochemistry (n=1, 917), pain dysfunction/orofacial pain syndrome (n=1, 941), dental radiology (n=1, 735), and behavior management (n=1, 735) (Table 3).

2.7. Methodological design of publication

The most common methodological design in the top 100 publications was literature review/expert opinion (n=36, 34628 citations), followed by clinical trial (n=24, 34296), classification or tool for assessing results (n=11, 14072), systematic review/meta-analysis (n=9, 6627), in vitro study (n=7, 7561), animal study (n=4, 4063), new material or technique (n=4, 3048), cohort study (n=2, 1879), consensus report (n=1, 767), randomized controlled trial (n=1, 717), and letter to editor (n=1, 1798) (Table 3).

2.8. Evidence level of publication

The top 100 most-cited publications could be classified into all evidence levels (ELs) (Table 3). Most of the articles were within evidence level V (n=64, 65937 citations), followed by EL IV (n=24, 34296), EL 1 (n=9, 6627), EL III (n=2, 1879), and EL II (n=1, 717). Among these ELs, the total citation counts (r=-0.226, p=0.078) and the citation density (r=0.082, p=0.633) did not vary significantly.

Table 3. Distribution of fields of interest, study designs and evidence levels of the top 100 most-cited articles

Variable	No. of Publication	Citation Count	Median (min - max)	p-value

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Field of Interest				
Periodontology	26%	32410	818.5 (638-4728)	
Adhesive Restorations	14%	11915	724 (638-1560)	
Implantology	13%	15592	838 (649-3341)	
Oral Medicine/Pathology	12%	12785	927.5 (662-1798)	
Oral Hygiene	8%	10643	1157.5 (717-1311)	
Endodontics	8%	5936	780 (656-883)	
Bone morphology/Histology	7%	6943	845 (692-1813)	
Oral Biology/Morphology	4%	5862	1450.5 (756-2517)	
Regenerative Dentistry (Stem cells)	2%	2228	1114 (979-1249)	p=0.274
Orthodontics	2%	1814	907 (719-1095)	
Pain dysfunction/Orofacial pain syndrome	1%	941	941 (941)	
Saliva/Biochemistry	1%	917	917 (917)	
Behavior Management	1%	735	735 (735)	
Dental Radiology	1%	735	735 (735)	
Study Design				
Narrative review/Expert opinion	36%	34628	831.5 (637-2517)	
Clinical trial	24%	34296	952 (638-4602)	
Classification or tool for evaluating results	11%	14072	1099 (703-2350),	
Systematic review/Meta-analysis	9%	6627	713 (664-845)	p=0.145
In vitro study	7%	7561	808 (656-1813)	
Animal study	4%	4063	884.5 (831-1463)	
New material or technique	4%	3048	741.5 (655-910)	
Cohort study	2%	1879	939.5 (883-996)	
Letter to editor	1%	1798	1798 (1798)	
Consensus report	1%	767	767 (767)	
Randomized controlled trial	1%	717	717 (717)	

2.9. Comparison with the bibliometric analysis by Feijoo et al.

Table 4 depicts the main differences between the present study and the bibliometric analysis performed by Feijoo et al., [1]. In the current study, for screening and identifying the most-cited articles, the author utilized the ES as the benchmark database and used WoS and GS to crossmatch the citation data. On the contrary, Feijoo et al., [1] employed WoS as the benchmark database only. A total of 10 bibliometric parameters were evaluated in the current analysis as compared to Feijoo et al., [1] in which 7 bibliometric variables were assessed. For an unknown reason, the journal *Acta Odontologica Scandinavica* was not included in the study by Feijoo et al., [1]. Interestingly, the 1st and 2nd ranked articles

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in the present analysis were published in the *Acta Odontologica Scandinavica*. In the present analysis, 48 articles present in the study conducted by Feijoo et al., [1], could secure their position. In the present analysis, an increase of almost two-folds in the total citation counts of the top 100 most-cited articles (113482 citations) was observed as compared to Feijoo et al., [1] (52635 citations). According to the WoS, the range of citation count in the present study varied between 3 and 4321 as compared to Feijoo et al., [1] in which the range was between 326 and 2050. According to the WoS, 4 and 35 articles could secure ≥1000 and ≥500 citations, respectively in the study conducted by Feijoo et al., [1]. However, in the current analysis, 33 and 100 articles secured ≥1000 and ≥500 citations, respectively. The decade with the majority of publications was the 2000s (40%) in the present analysis as compared to the study by Feijoo et al., [1] in which the 1980s was the most productive decade in terms of the number of top-cited articles (26%). In the present study, publications having two authors (27%) were the most common as compared to the study by Feijoo et al., [1] in which single-author papers (25%) were the most frequent. The majority of the contribution was made by Marx RE (7%) in the current study as compared to Feijoo et al., [1] in which Socransky SS made the most contribution (9%). The *Journal of Dental Research* (17%) was the most prolific in the current analysis as compared to Feijoo et al., [1] in which the *Journal of Clinical Periodontology* (20%) was the most prolific in terms of publishing the most number of highly cited articles. In both the analyses, articles related to periodontology were the most cited ones. In terms of study design, narrative review/expert opinion (36%) was the most commonly cited methodological design in the current study as compared to analysis by Feijoo et al., [1] in which case series (22%) was the most frequently cited study design. In terms of evidence level (EL) of the publications, articles having EL V were the most cited in both the studies.

Table 4. Comparative analysis of the differences between the present study and Feijoo et al., [1].

Feijoo et al., [1]	Present study
Employment of Database	
Clarivate Analytics' Web of Science (Benchmark)	Elsevier's Scopus (Benchmark)
-	Google Scholar
-	
Bibliometric Parameters Assessed	
7	10
Citation Count	
Total citation count:	Total citation count:
52635 (WoS)	113482 (ES)
-	214642 (GS)
-	
Range of citation count:	Range of citation count:
326 – 2050 (WoS)	638 and 4728 (ES)
-	138 and 8281 (GS)
-	
Articles with ≥ 1000 citations: 4	Articles with ≥ 1000 citations: 33
Articles with ≥ 500 citations: 35	Articles with ≥ 500 citations: 100
Authorship	
Articles with single author: 25	Articles with single author: 20
Articles with two authors: 18	Articles with two authors: 27
Articles with more than 6 authors: 12	Articles with more than 6 authors: 16
Leading author: Socransky SS (n=9)	Leading author: Marx RE (n=7)
Year of Publication	
Decade with most publications: 1980s (26%)	Decade with most publications: 2000s (40%)
Field of Interest	
1st = Periodontology (43%)	1st = Periodontology (26%)

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2nd = Implantology (11%)	2nd = Adhesive restorations (14%)
3rd = Adhesive restorations (8%)	3rd = Implantology (13%)
Study Design	
1st = Cases series (22%)	1st = Narrative review/expert opinion (36%)
2nd = Narrative review/expert opinion (19%)	2nd = Clinical trial (24%)
3rd = Classifications or tools for evaluating results (13%)	3rd = Classifications or tools for evaluating results (11%)
Evidence Level	
EL V = 54%	EL V = 64%
Journal of Publication	
Total number of journals: 22	Total number of journals: 32
1st = *Journal of Clinical Periodontology* (20%)	1st = *Journal of Dental Research* (17%)
2nd = *Journal of Periodontology* (18%)	2nd = *Journal of Periodontology* (11%)
3rd = *Journal of Dental Research* (16%)	3rd = *Journal of Clinical Periodontology* (9%)

[1] Feijoo JF, Limeres J, Fernàandez-Varela M, Ramos I, Diz P. The 100 most cited articles in dentistry. Clinical Oral Investigations. 2014;18:699-706.

3. Discussion

Authors' bibliometric analysis allows readers to gain historical insight and development of a particular specialty by identifying and analyzing the most-cited publications that could assist researchers in understanding the emerging themes and future trends for a particular discipline [35,36]. For instance, the number of citations a publication receives could indicate other researchers` interest in using the information for their own research. Highly cited articles could display a tendency in clinical practice and may, therefore, be considered to produce greater research and clinical interest in the reported disciplines [37]. Being "most-cited" article reflects its more frequent contribution to the studies published afterward; however, this characteristic alone does not provide sufficient information regarding its current impact and scientific quality as the main motive of citers in selection of reference is establishing the utility within research rather than scientific quality [38-40]. As per definition of a "classic article", all the articles included in this study are called as "classic articles" [9,23,24].

The accuracy of bibliometric analyses might be negatively influenced by the limitations of the search engine used. Elsevier's Scopus (ES), Google Scholar (GS) and Clarivate Analytics' Web of Science (WoS) may differ quantitatively or qualitatively with respect to the citation count of a publication depending upon the discipline of the study [12,16,41], journals [42], and years [43] in which they were published. Additionally, some publications might not be available in all of these search engines [16,25,44,45]. There were several reasons for not selecting either GS or WoS databases as the benchmark for this analysis. For instance, GS includes citations from non-scholarly publications including dissertations and thesis, conference papers, technical reports, books, and preprints, that may affect the analysis of the most-cited articles when the target is more specific, as in the present study [45]. However, in WoS, missing references are a considerable issue [46], which is a likely reason why Buonocore's highly cited paper [34] in GS (4367 citations) and ES (1560 citations) was so under cited in WoS (427 citations). Similarly, Löe's [47] highly cited article in GS (4019 citations) and ES (2257 citations) received only 3 citations in WoS. It is important to note that both the abovementioned articles were present in WoS 'All Databases' section, and not in WoS 'Core Collection'. One of the several reasons for selecting ES as the benchmark database was that it combines the features of PubMed and WoS. These combined characteristics enable for improved utility for medical literature research and academic requirements (i.e., citation analysis) [44]. Moreover, ES is regarded as the largest citation and abstract search engine of peer-reviewed literature. It is devised to aid researchers in not only accessing scientific information but screening literature for the purpose of analysis [48], and it has been employed in numerous published bibliometric analyses [25,49]. In ES, citation analysis is faster and includes more publications than that of WoS [50]. In a recently performed study for evaluating the accuracy of citation information in WoS and ES databases, the authors stated that the former database includes 16.7% incorrect references, also called as phantom references, 26.7% error in references (i.e., incorrect volume number or publication year), and 55% missing references

[47]. Overall, the author thought Scopus to be the better tool for this study as compared to the similar study by Feijoo et al., [1] that employed WoS as the benchmark database.

In many bibliometric studies, it was reported that relevant studies were distributed among journals in accordance with Bradford`s law [51-53]. According to this bibliometric law, a few prolific journals account for a considerable percentage of all publications in a given discipline [54]. The studies published in these core journals are more probable to be referred to most commonly by successive articles [55]. Interestingly, in this study, the journal distribution pattern of the most-cited publications does not completely fit this law, as the list also features journals such as the *Acta Odontologica Scandinavica* and the *Journal of Dental Research*, which are not considered as the specialized journals in the field of periodontics and adhesive restorations, respectively but published few of top cited articles. Hence, the application of this law for conducting bibliometric analysis in some disciplines may cause inaccurate inferences. In this study, a statistically significant association was found between the number of the most-cited articles published in a journal and the impact factor of that journal. This finding is in accordance with the findings of some bibliometric studies [40,52-54], but contrary to those of several others [42,56].

As with several "most-cited" publications in dentistry [9,41,57-61], this study reported that most of the most-cited articles in dentistry originated from the United States. This significant contribution can be attributed to a larger scientific population, active researchers, and ample financial resources [10,17,62-67]. Additionally to an unparalleled research work, an increased tendency among authors to cite articles originating from the US has been observed [17,68]. It is noteworthy that approximately 47% of the most cited dentistry articles, including the 1st and 2nd ranked articles in this study, originated from European institutions despite their small population size. Importantly, a lack of multicenter studies was noticeable, reflecting a need to escalate the international collaboration.

Overall, after the US, European countries, including Sweden, Belgium, Switzerland, UK, and Denmark have been prominent in this list of contributing authors. Additionally to this study, several other bibliometric analyses have reported that authors from Asia, Africa, and the Middle East, whether being the first or the corresponding author made a negligible contribution which could be considered a top cited article [17,62,63,69,70]. Potential reasons might include language barriers, gaps in conducting research, and professional networking, as well as limited information access [71]. International organizations such as the World Health Organization [WHO] and the United Nations [UN] could play a vital role in bolstering these health care developments.

The particular subject area of the highly cited papers fluctuates from one decade to another. Overall, in the present study, there was a domination of articles related to periodontology, specifically on the topic of microbiology, although other disciplines of dentistry, including adhesive restorations and implantology have been progressively incorporated. A considerable portion of our analysis comprised of narrative reviews (36%). It might be argued that this category of publication does not follow the concept of reproducible science [72] as a systematic review does [73]. Interestingly, the findings of this study are in opposition of this concept of being narrative review or systematic review. When compared to the baseline references, randomized controlled trails, a narrative review appeared to secure higher citations than a systematic review. One possible explanation might be that narrative reviews aim to explain the mechanisms of diseases or hypothesis generation; hence, a systematic method to synthesize the evidence in these cases may be irrelevant. Furthermore, as these narrative reviews are authored by the experts in the respective specialty and supported by reputed institutions, readers tend to believe that these articles are not overly sensitive to bias. Nevertheless, in opposition to the previous concerns about the non-reproducibility of narrative reviews, future research is, therefore, required to explain the extent to which scientific advancement is encouraged through systematic compared with narrative reviews. Interestingly, the dental journal with current highest impact factor, *Periodontology 2000*, is focused on publishing narrative reviews. After narrative reviews, clinical trials are the most frequently cited study design (24%). This finding is in agreement with the results of several other bibliometric studies conducted in other medical fields including orthopedic surgery [74], anesthesia [62] and general surgery [63].

A distinctive characteristic of this analysis was that it included 10 evidence level-1 studies, including systematic reviews, meta-analyses, and RCTs. These findings do not coincide with the findings of several other bibliometric analyses performed on various specialties within dentistry and medicine [17,25,41,49,74-76]. Recently, these high evidence level studies have been performed and are securing high citations, despite only being published in the recent years [77]. Such reports are useful for facilitating decision making, directing practice, and advancing research, so a high amount of such studies in the current study is not surprising and provides further proof of the maturation of the discipline [78].

This bibliometric analysis has several limitations. First, for a given research field, many factors may influence the citation count, including the age of the publication, journal of publication, reputation of author, institution, and country of origin as well as the original language. Second, the analysis of self-citations and citations in textbooks and lectures was not performed. Moreover, the fact that some authors may be inclined to cite the articles from a particular journal in which they

intend to publish an article [79]. Third, the analysis of the contributing countries was based on the address of the corresponding author. A statistical bias may occur once the address of the corresponding author is changed [80]. Furthermore, for corresponding authors working in multiple institutions, we only considered the first institution.

4. Materials and Methods

4.1. Materials Search Strategy

A total of 91 journals included in the category "Dentistry, Oral Surgery, and Medicine" in the database of the 2019 edition of the Journal Citation Report: Science Edition, a section of the Clarivate Analytics (www.jcr.clarivate.com) were selected. An electronic literature search on the ES (www.scopus.com) database was performed on 1st January 2021. The journals American Journal of Orthodontics, now called as the *American Journal of Orthodontics and Dentofacial Orthopedics*, the *International Journal of Oral Surgery*, now called as the *International Journal of Oral and Maxillofacial Surgery*, and *Critical Reviews in Oral Biology and Medicine*, now affiliated with the *Journal of Dental Research*, were also reviewed.

As the search strategy for each journal, the journal's title was written in the 'source title' section without any restriction of language, publication year and study design of article. Using the 'documents' tool of the ES, the citation counts of all the articles published in all dentistry journals was identified.

4.2. Article selection

According to the selected database, 336381 articles were retrieved, out of which, the top 100 most-cited publications were further selected for this bibliometric analysis. The top 100 most-cited articles were selected and ranked based on their citation count. After ranking these articles, their cross-matching was performed with the citation data from the Google Scholar (GS) to evaluate any fluctuation in citation counts.

4.3. Data extraction and bibliometric variables

A total of 100 articles were included in this study, and their complete text was downloaded. The following bibliometric variables were extracted: publication title, citation count, current citation count (i.e., the total number of citation count collected by an article in 2020) [25], citation density (i.e., the total number of citation count/age of publication) [26], publication year, authorship, country of origin, study design, field of interest, evidence level, and journal of publication.

Based on the study design, the articles were categorized as: animal study, classification or tool for assessing the results, case-control study, cohort study, consensus report, in vitro study, letter to editor, narrative review/expert opinion, new material or technique, randomized controlled trial, and systematic review/meta-analysis. Based on the field of interest, the articles were classified as: adhesive restorations/dental materials, bone morphology/histology, behavior management, dental caries, endodontics, implantology, oral biology/morphology, oral pathology/medicine, oral radiology, orthodontics, oral hygiene, periodontology, pediatric dentistry, pain dysfunction/orofacial pain syndrome, regenerative dentistry, and saliva/biochemistry.

4.4. Statistical analysis

Descriptive and bivariate analyses were performed using a statistical software package, i.e., IBM SPSS Statistics version 24.0 (IBM, Chicago, IL). To assess the normality of the data, the Shapiro-Wilk test was conducted. Mean (standard deviation) or median (interquartile range) were calculated based on normality and distribution of data. To evaluate the median differences between the independent groups, the Kruskal-Wallis test was performed. Post hoc testing was performed to assess the median differences within each group. Any decrease or increase in the time-dependent trends was analyzed by performing the Mann-Kendall trend test. The Spearman-rank test was performed to assess the correlation between the publication count of the journal and the age of the journal. A value of $p<0.05$ was considered statistically significant.

5. Conclusions

An appropriate selection of search engine and search strategy are extremely important to conducted a thorough bibliometric analysis. In this study, changing the search database resulted in several prominent differences when compared with the outcomes of a similar analysis performed by Feijoo et al., [1] in 2013. The current study reported that narrative reviews/expert opinions related to periodontology having evidence level V were the most-cited articles in dentistry.

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