Brazilian Dental Journal (2019) 30(2): 96-105
http://dx.doi.org/10.1590/0103-6440201902529

ISSN 0103-6440

Top-100 Most Cited Dental Articles with Authors from Brazil

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This study analyzes the characteristics of the top-100 most cited articles published in international dental journals with at least one coauthor affiliated to Brazil. A search in Scopus database for articles published between 1996 and 2017 was carried out in the 178 journals belonging to the category "Dentistry" identified in SCImago Journals & Country Rank. From the top-100 most cited articles, variables related to the journal, article, and authors were collected. Annual citation averages (ACA) and relative citation ratios (RCR) were calculated. Data were analyzed descriptively. There were 75 original reports and 25 reviews in the sample. The number of citations ranged between 124 and 657 (mean=202, median=168). The papers were published in 31 different journals (46% in only four journals), none based in Brazil. The most frequent subjects (61%) were Dental Materials, Endodontics, and Periodontology, which accounted for 63.6% of the total citations. The subject with the highest ACA was Oral and Maxillofacial Surgery and the subject with the highest RCR was Oral Radiology. Only 12 articles were cited more than 300 times. International collaboration was present in 61 articles and funding was reported in 49 articles. The first author was from Brazil in 70% and corresponding author in 55% of the papers. Southeast (83%) and South (20%) were the regions of Brazil with most presence of coauthors. This top-100 list is presented to provide an overview of the most cited articles and aid in supporting further analyses regarding publication and citation behaviors of Brazilian dentistry.

Key Words: journal article, bibliometrics, journal Impact Factor, database.

Introduction

Bibliometric studies apply mathematics and statistics to quantitatively evaluate the scientific literature in many different ways and for a varied of purposes (1). Bibliometrics can be used to highlight publishing trends in a scientific field, for instance, or evaluate the impact of journals, articles, and researchers (2). Many bibliometric tools were developed in the last decades, most considering the number of citations received by an article in a given database and timeframe. The citation process has links with intellectual heritage (3) and it is part of the incremental process of science. Research supporting agencies also use citation rates and other publication metrics to evaluate budgetary spending and distribute financial resources (4).

It has been debated whether the number of citations received by an article may reflect or not its actual influence in the literature or whether it is a fair appraisal since it does not represent the whole complexity of the research work (5,6). However, citations rates remain widely used as indicator of the influence of papers and journals in science. Other scientific indicators consider not only the absolute number of citations but also the length of time that an article has been available to possible citers (7) or the number of articles published in a given timeframe (8,9). The number of international peer-reviewed papers published with (co)-authors from Brazil has increased substantially in the last 20 years. According to data from SCImago (10), Brazil is the country in Latin America with the largest number of dental articles published yearly and the second country in the world in number of published dental articles since 2006. In 2017, a total of 1,876 dental citable documents were published in Scopus database with coauthor(s) based in Brazil.

Different subareas in a particular field have different citation rates and coauthorship behaviors (11) because the chances of an article be cited depend on many variables such as the number of publications in that particular field. The number of investigators and journals in a subarea may also influence the number of papers published yearly. A recent survey with Brazilian researchers with recognized significant scientific output indicated that they consider four as the ideal number of coauthors in order to potentiate the scientific production (12). In addition, the study showed that dental articles have an average of 5.3 authors (12). The connection between authors has increased over time, leading to smaller distances between researchers in the network and a larger number of coauthors (13). The health sciences area is the collaboration network with the largest number of coauthors in Brazil (13).

A study published in 2013 analyzed the 100 top-cited

papers in dentistry available in the Web of Science database (14). The study showed that articles with low evidence level, such as case series, expert opinions and narrative reviews, were predominant in the list. Most papers were published in dental journals with high bibliometric indicators in the field, particularly addressing topics in periodontology and implantology. There is no similar report in the literature analyzing the top-cited papers published by authors affiliated to Brazilian institutions. Such analysis could aid in drawing the current panorama of Brazilian dentistry with regard to the most cited dental articles, as well as areas and topics that attract international attention. The purpose of this study was to analyze the characteristics of the top-100 most cited dental articles published in scientific journals with international coverage with coauthor(s) affiliated to Brazilian institutions. The study hypothesis was that most papers would be published in the top-tier, peer-reviewed dental journals and would derive from collaborations with international institutions.

Material and Methods

Search Strategy and Eligibility Criteria

In this cross-sectional study, the 178 journals belonging to the category "Dentistry" that were identified in SCImago Journals & Country Rank, which is powered by the Scopus database, were investigated. In order to obtain the most cited papers published in these journals, a search in Scopus was carried out in January 2018 using the 178 journals as source titles, and limited to year of publication between 1996-2017. The starting publication year was 1996 because the citation records in Scopus start at that year; the citations were counted up to 2017 since this is the last year with complete citation counts. The resulting list of articles was organized from highest to lowest citation counts and the 100 top-cited papers with at least one author affiliated to any Brazilian institution were selected. Articles without authors linked to a Brazilian institution, letters, and editorials were excluded. The position of the author among the coauthors (i.e., first author or corresponding author, for instance) was not a reason for exclusion.

Data Collection and Analysis

Two independent reviewers analyzed each article for eligibility (APRG and ALOP). The opinion of a third reviewer (RRM) was decisive whenever a doubt was present. The following variables were collected and divided into variables related to the journal that published the article and variables related to the article and authors.

Variables Related to The Journal: Journal Impact Factor (JIF) 2017 obtained from the Journal of Citation Reports (JCR); CiteScore 2017 obtained from Scopus; publisher; access type (for subscribers, open access, or mixed); and journal subject.

Variables Related to the Article and Authors: affiliation of the first author (country); number of authors; presence of international collaboration (yes/no); year of publication; number of citations received up to 2017; relative citation ratio (RCR); annual citation average (ACA); type of title (descriptive, affirmative, or interrogative); number of characters in the title; number of pages; article type (original research/review); funding type (sponsorship, research grant, donation of materials, more than one); hypothesis type (null, alternative, or none); use of subtitles in the Experimental section (yes/no); existence of a conclusion statement as a separate section (yes/no); article subject.

ACA was the average number of citations received by an article each year since it was published until 2017. RCR was obtained using the iCite tool from the National Institute of Health, USA (icite.od.nih.gov). RCR is a field-normalized metric that uses citation rates to measure the influence at the article level by quantifying the influence of an article or group of articles based on their co-citation network. RCR has been reported to be less vulnerable to number effects than averaging the citation rates of articles in the co-citation network (7). The main subject of the articles and journals was categorized. Studies that addressed microbiology and cell biology were grouped in the Oral Biology category, while studies that addressed restorative and rehabilitation topics were categorized in the Restorative Dentistry category. Data were analyzed descriptively using the software Stata v.12.0 (StataCorp, College Station, TX, USA).

Results

Table 1 lists the top-100 most cited articles along with ACA and RCR indicators. The oldest article in the sample was published in 1996 and the newest was published in 2013. The number of citations received by the articles ranged between 124 and 657 (mean=202, median=168). Table 1 also indicates the top-10 articles based on ACA and RCR. The RCR indicator was better aligned with the total citation counts: the top-10 RCR papers were in the top-18 total citation counts list. Evaluation of the number of citations corrected by the number of years since the article was published provided a different picture: the top-10 ACA articles were positioned up to #66 in the total citation counts list. Table 1 also indicates the presence of international collaboration in the articles and whether the first author was from Brazil.

Table 1. The top-100 cited dental articles with coauthors from Brazil

Article	Cites*	ACA	RCR	Brazil alone?	First author?
Dimensional ridge alterations following tooth extraction. An experimental study in the dog. Araújo et al., J Clin Periodontol 32:212-8, 2005.	657	49.0•	17.5◆	N	Y
Collagen degradation by host-derived enzymes during aging. Pashley et al., J Dent Res 83:216-21, 2004.	524	40.3•	23.5◆	N	N
Single-step adhesives are permeable membranes. Tay et al., J Dent 30:371-82, 2002.	400	26.7	18.2◆	N	N
Ridge alterations following implant placement in fresh extraction sockets: an experimental study in the dog. Araújo et al., J Clin Periodontol 32:645-52, 2005.	389	32.4•	17.5◆	N	Y
The microtensile bond test: a review. Pashley et al., J Adhes Dent, 1(4):299-309, 1999.	382	21.2	14.4	N	N
Dentine permeability and dentine adhesion. Pashley et al., J Dent 25:355-72, 1997.	382	19.1	22.0◆	N	N
Dynamics of bone tissue formation in tooth extraction sites: an experimental study in dogs. Cardaropoli et al., J Clin Periodontol 30:809-18, 2003.	341	24.3	12.6	N	N
An evaluation of microbial leakage in roots filled with a thermoplastic synthetic polymer-based root canal filling material (Resilon). Shipper et al., J Endod 30:342-7, 2004.	331	25.5	17.8◆	N	N
Mechanisms of antimicrobial activity of calcium hydroxide: a critical review. Siqueira Jr et al., Int Endod J 32:361-9, 1999.	329	18.3	15.7◆	Y	Y
Chlorhexidine arrests subclinical degradation of dentin hybrid layers in vivo. Hebling et al., J Dent Res 84(8):741-46, 2005.	324	27.0	15.6	N	Y
State of the art etch-and-rinse adhesives. Pashley et al., Dent Mater 27:1-16, 2011.	318	53.0•	25.7◆	N	N
The adhesion between fiber posts and root canal walls: comparison between microtensile and push-out bond strength measurements. Goracci et al., Eur J Oral Sci 112:353-61, 2004.	317	24.4	15.0	N	N
In vivo preservation of the hybrid layer by chlorhexidine. Carrilho et al., J Dent Res 86(6):529-33, 2007.	294	29.4•	15.5	N	Y
Analysis of the accuracy of linear measurements obtained by cone beam computed tomography (CBCT-NewTom). Lascala et al., Dentomaxillofac Radiol 33(5):291-4, 2004.	294	22.6	15.6	Y	Y
Aetiology of root canal treatment failure: Why well-treated teeth can fail. Siqueira Jr., Int Endod J 34(1):1-10, 2001.	290	18.1	14.6	Y	Y
Water sorption/solubility of dental adhesive resins. Malacarne et al., Dent Mater 22(10):973-80, 2006.	279	25.3	15.7◆	Y	Y
Factors involved in the development of polymerization shrinkage stress in resin-composites: A systematic review. Braga et al., Dent Mater 21(10):962-70, 2005.	278	23.2	13.3	N	Y
A review of polymerization contraction: The influence of stress development versus stress relief. Carvalho et al., Oper Dent 21(1):17-24, 1996.	269	12.8	18.3◆	N	Y
Comparisons of subgingival microbial profiles of refractory periodontitis, severe periodontitis, and periodontal health using the human oral microbe identification microarray. Colombo et al., J Periodontol 80(9):1421-32, 2009.	261	32.6•	12.8	N	Y
Microorganisms from canals of root-filled teeth with periapical lesions. Pinheiro et al., Int Endod J 36(1):1-11, 2003.	250	17.8	12.4	Y	Y
Clinical implications and microbiology of bacterial persistence after treatment procedures. Siqueira Jr et al., J Endod 34(11):1291-301, 2008.	248	27.5•	15.1	Y	Y
Association of *Enterococcus faecalis* with different forms of periradicular diseases. Rôças et al., J Endod 30(5):315-20, 2004.	246	18.9	9.5	Y	Y
Polymerase chain reaction-based analysis of microorganisms associated with failed endodontic treatment. Siqueira Jr et al., Oral Surg Oral Med Oral Pathol Oral Radiol Endod 97(1):85-94, 2004.	237	18.2	10.5	Y	Y
Regional measurement of resin-dentin bonding as an array. Shono et al., J Dent Res 78(2):699-705, 1999.	237	13.1	11.2	N	N
Longevity of posterior composite restorations: Not only a matter of materials. Demarco et al., Dent Mater 28(1):87-101, 2012.	235	47.0•	26.2◆	N	Y
In vitro antimicrobial activity of propolis and Arnica montana against oral pathogens. Koo et al., Arch Oral Biol 45(2):141-8, 2000.	234	13.8	8.0	Y	Y
In vitro antimicrobial activity of several concentrations of sodium hypochlorite and chlorhexidine gluconate in the elimination of *Enterococcus faecalis*. Gomes et al., Int Endod J 34(6):424-8, 2001.	229	14.3	11.8	Y	Y

Destructive and protective roles of cytokines in periodontitis: A re-appraisal from host defense and tissue destruction viewpoints. Garlet, J Dent Res 89(12):1349-63, 2010.	228	32.5•	11.1	Y	Y
Chlorhexidine preserves dentin bond in vitro. Carrilho et al., J Dent Res 86(1):90-4, 2007.	223	22.3	11.4	N	Y
Accuracy of cone beam computed tomography and panoramic and periapical radiography for detection of apical periodontitis. Estrela et al., J Endod 34(1):273-9, 2008.	222	24.7	13.5	N	Y
Saliva composition and functions: A comprehensive review. De Almeida et al., J Contemp Dent Pract 9(3):72-80, 2008.	218	24.2	8.7	Y	Y
In vitro effects of therapeutic ultrasound on cell proliferation, protein synthesis, and cytokine production by human fibroblasts, osteoblasts, and monocytes. Doan et al., J Oral Maxillofac Surg 57(4):409-20, 1999.	212	11.8	6.4	N	N
A study of the fate of the buccal wall of extraction sockets of teeth with prominent roots. Nevins et al., Int J Periodontics Restorative Dent 26(1):18-29, 2006.	211	19.2	8.2	N	N
Fracture resistance of roots endodontically treated with a new resin filling material. Teixeira et al., J Am Dent Assoc 135(5):646-52, 2004.	211	16.2	11.8	N	Y
The role of sucrose in cariogenic dental biofilm formation - New insight. Paes Leme et al., J Dent Res 85(10):878-87, 2006.	206	18.7	8.9	N	Y
Modeling of the buccal and lingual bone walls of fresh extraction sites following implant installation. Araújo et al., Clin Oral Implants Res 17(6):606-14, 2006.	205	18.6	11.3	N	Y
Activation of gelatinolytic/collagenolytic activity in dentin by self-etching adhesives. Nishitani et al., Eur J Oral Sci 114(2):160-6, 2006.	201	18.3	10.0	N	N
Impact of traumatic injuries to the permanent teeth on the oral health-related quality of life in 12-14-year-old children. De Sousa Cortes et al., Community Dent Oral Epidemiol 30(3):193-8, 2002	201	13.4	10.2	N	Y
Determinants of masticatory performance in dentate adults. Hatch et al., Arch Oral Biol 46(7):641-8, 2001.	201	12.6	9.7	N	N
Reaction of rat connective tissue to implanted dentin tubes filled with mineral trioxide aggregate or calcium hydroxide. Holland et al., J Endod 25(3):161-6, 1999.	190	10.5	10.3	Y	Y
Direct comparison of the bond strength results of the different test methods: A critical literature review. Scherrer et al., Dent Mater 26(2):e78-e93, 2010.	189	27.0	13.4	N	N
Effectiveness of 2% chlorhexidine gel and calcium hydroxide against *Enterococcus faecalis* in bovine root dentine in vitro. Gomes et al., Int Endod J 36(4):267-75, 2003.	188	13.4	9.8	Y	Y
Chemokines in oral inflammatory diseases: Apical periodontitis and periodontal disease. Silva et al., J Dent Res 86(4):306-19, 2007.	187	18.7	6.6	Y	Y
The clinical success of all-ceramic restorations. Della Bona et al., J Am Dent Assoc 139(9s):8s-13s, 2008.	185	20.5	10.6	N	Y
Contraction stress related to degree of conversion and reaction kinetics. Braga et al., J Dent Res 81(2):114-8, 2002.	178	11.9	6.9	N	Y
The role of matrix metalloproteinases in the oral environment. Hannas et al., Acta Odontol Scand 65(1):1-13, 2007.	175	17.5	8.0	N	Y
Effect of etching and airborne particle abrasion on the microstructure of different dental ceramics. Borges et al., J Prosthet Dent 89(5):479-88, 2003.	174	12.4	9.6	N	Y
From dry bonding to water-wet bonding to ethanol-wet bonding. A review of the interactions between dentin matrix and solvated resins using a macromodel of the hybrid layer. Pashley et al., Am J Dent 20(1):7-20, 2007.	170	17.0	8.4	N	N
Clinical application of stereolithographic surgical guides for implant placement: Preliminary results. Di Giacomo et al., J Periodontol 76(4):503-7, 2007.	169	14.1	7.9	Y	Y
Chemomechanical reduction of the bacterial population in the root canal after instrumentation and irrigation with 1%, 2.5%, and 5.25% sodium hypochlorite. Siqueira Jr et al., J Endod 26(6):331-4, 2000.	168	9.9	8.6	Y	Y
Prevalence and risk variables for peri-implant disease in Brazilian subjects. Ferreira et al., J Clin Periodontol 33(12):929-35, 2006.	167	15.2	8.7	Y	Y
Response of the pulp of dogs to capping with mineral trioxide aggregate or a calcium hydroxide cement. Faraco Junior et al., Dent Traumatol 17(4):163-6, 2001.	167	10.4	7.0	Y	Y
Cone-beam computed tomography for routine orthodontic treatment planning: A radiation dose evaluation. Silva et al., Am J Orthod Dentofacial Orthop 133(5):640e1-e5, 2008.	166	18.4	11.1	N	Y
Patterns of chemokines and chemokine receptors expression in different forms of human periodontal disease. Garlet et al., J Periodont Res 38(2):210-7, 2003.	166	11.8	4.9	Y	Y

SHED differentiate into functional odontoblasts and endothelium. Sakai et al., J Dent Res 89(8):791-6, 2010.	164	23.4	7.4	N	Y
Bonding of self-etch and total-etch adhesives to carious dentin. Yoshiyama et al., J Dent Res 81(8):556-60, 2002.	164	10.9	6.7	N	N
In vitro evaluation of the antimicrobial activity of chlorhexidine and sodium hypochlorite. Vianna et al., Oral Surg Oral Med Oral Pathol Oral Radiol Endod 97(1):79-84, 2004.	163	12.5	6.7	Y	Y
Chlorhexidine stabilizes the adhesive interface: A 2-year in vitro study. Breschi et al., Dent Mater 26(4):320-5, 2010.	161	23.0	11.7	N	N
Biofilms and apical periodontitis: Study of prevalence and association with clinical and histopathologic findings. Riucci et al., J Endod 36(8):1277-88, 2010.	158	22.6	9.7	N	N
Tissue modeling following implant placement in fresh extraction sockets. Araújo et al., Clin Oral Implants Res 17(6):615-24, 2006.	158	14.4	8.2	N	Y
Biochemical composition and cariogenicity of dental plaque formed in the presence of sucrose or glucose and fructose. Cury et al., Caries Res 34(6):491-7, 2000.	153	9.0	6.7	Y	Y
The influence of Bio-Oss collagen on healing of an extraction socket: An experimental study in the dog. Araújo et al., Int J Periodontics Restorative Dent 28(2):123-35, 2008.	152	16.9	8.0	N	Y
Endodontic infections: Concepts, paradigms, and perspectives. Siqueira Jr, Oral Surg Oral Med Oral Pathol Oral Radiol Endod 94(3)281-93, 2002.	152	10.1	6.1	Y	Y
Effect of non-surgical periodontal therapy on glycemic control in patients with type 2 diabetes mellitus. Rodrigues et al., J Periodontol 74(9):1361-7, 2003.	151	10.8	5.6	Y	Y
Disinfection of immature teeth with a triple antibiotic paste. Windley III et al., J Endod 31(6):439-43, 2005.	148	12.3	6.6	N	N
Optimizing dentin bond durability: Control of collagen degradation by matrix metalloproteinases and cysteine cathepsins. Tjaderhane et al., Dent Mater 29(1):116-35, 2013.	147	36.7•	15.3	N	N
Composition of supra- and subgingival biofilm of subjects with healthy and diseased implants. Shibli et al., Clin Oral Implants Res 19(10):975-82, 2008.	147	16.3	7.9	Y	Y
PTCH gene mutations in odontogenic keratocysts. Barreto et al., J Dent Res 79(6)1418-22, 2000.	146	8.6	3.4	N	Y
Biomineralization ability and interaction of mineral trioxide aggregate and white Portland cement with dentin in a phosphate-containing fluid. Reyes-Carmona et al., J Endod 35(5):731-6, 2009.	144	18.0	10.7	N	Y
Effect of smear layers on the bonding of a self-etching primer to dentin. Tay et al., J Adhes Dent 2(2):99-116, 2000.	144	8.5	5.3	N	N
In vivo antimicrobial activity of 2% chlorhexidine used as a root canal irrigating solution. Leonardo et al., J Endod 25(3):167-71, 1999.	143	7.8	9.1	Y	Y
Psychometric properties of the Brazilian version of the Oral Health Impact Profile - Short form. Oliveira et al., Community Dent Oral Epidemiol 33(4):307-14, 2005.	139	11.6	8.2	Y	Y
Diversity of endodontic microbiota revisited. Siqueira Jr. et al., J Dent Res 88(11):969-81, 2009.	138	17.2	8.2	Y	Y
Fluid movement across the resin-dentin interface during and after bonding. Hashimoto et al., J Dent Res 83(11):843-8, 2004.	138	10.6	7.1	N	N
Matrix metalloproteinases, their physiological inhibitors and osteoclast factors are differentially regulated by the cytokine profile in human periodontal disease. Garlet et al., J Clin Periodontol 31(8):671-9, 2004.	138	10.6	4.3	Y	Y
Epidemiological analysis of maxillofacial fractures in Brazil: A 5-year prospective study. Brasileiro et al., Oral Surg Oral Med Oral Pathol Oral Radiol Endod 102(1):28-34, 2006.	136	12.4	11.1	Y	Y
Causes and prevalence of traumatic injuries to the permanent incisors of school children aged 12 years in Jaragua do Sul, Brazil. Marcenes et al., Int Dent J 50(2):87-92, 2000.	136	8.0	8.5	N	N
Microbial causes of endodontic flare-ups. Siqueira Jr., Int Endod J 36(7)453-63, 2003.	135	9.6	6.3	Y	Y
In vitro assessment of the antimicrobial action and the mechanical ability of chlorhexidine gel as an endodontic irrigant. Ferraz et al., J Endod 27(7):452-5, 2001.	135	8.4	7.3	Y	Y
Ridge preservation with the use of Bio-Oss collagen: A 6-month study in the dog. Araújo et al., Clin Oral Implants Res 20(5):433-40, 2009.	134	16.7	9.6	N	Y
Salivary gland tumors in a Brazilian population: A retrospective study of 496 cases. Ito et al., Int J Oral Maxillofac Surg 34(5):533-6, 2005.	134	11.2	4.6	Y	Y
Calcium hydroxide pastes: Classification and clinical indications. Fava et al., Int Endod J 32(4):257-82, 1999.	134	7.4	7.4	N	Y

Histological evaluation of the effectiveness of five instrumentation techniques for cleaning the apical third of root canals. Siqueira Jr et al., J Endod 23(8):499-502, 1997.	134	6.7	8.6	Y	Y
Root-coverage procedures for the treatment of localized recession-type defects: A Cochrane systematic review. Chambrone et al., J Periodontol 81(4):452-78, 2010.	133	19.0	9.5	Y	Y
Evaluation of the effectiveness of sodium hypochlorite used with three irrigation methods in the elimination of *Enterococcus faecalis* from the root canal, in vitro. Siqueira Jr et al., Int Endod J 30(4):279-82, 1997.	132	6.6	4.5	Y	Y
Evaluation of the adhesion of fiber posts to intraradicular dentin. Goracci et al., Oper Dent 30(5):627-35, 2005.	131	10.9	5.4	N	N
Single-bottle adhesives behave as permeable membranes after polymerization. I. In vivo evidence. Tay et al., J Dent 32(8):611-21, 2004.	131	10.1	6.4	N	N
Prognosis in periradicular surgery: A clinical prospective study. Zuolo et al., Int Endod J 33(2):91-8, 2000.	131	7.7	7.0	N	Y
Monolithic CAD/CAM lithium disilicate versus veneered Y-TZP crowns: Comparison of failure modes and reliability after fatigue. Guess et al., Int J Prosthodont 23(5):434-42, 2010.	129	18.4	9.2	N	N
The effect of material characteristics, of surface topography and of implant components and connections on soft tissue integration: A literature review. Rompen et al., Clin Oral Implants Res 17(S2):55-67, 2006.	128	11.6	5.1	N	N
Microtensile bond strength of a resin cement to glass infiltrated zirconia-reinforced ceramic: The effect of surface conditioning. Amaral et al., Dent Mater 22(3):283-90, 2006.	128	11.6	7.5	N	Y
Prevalence and correlates of traumatic injuries to the permanent teeth of schoolchildren aged 9-14 years in Belo Horizonte, Brazil. Cortes et al., Dent Traumatol 17(1):22-6, 2001.	128	8.0	7.1	N	Y
Direct effect of intracanal medicaments on survival of stem cells of the apical papila. Ruparel et al., J Endod 38(10):1372-5, 2012.	127	25.4	13.0	N	N
Bone reformation and implant integration following maxillary sinus membrane elevation: An experimental study in primates. Palma et al., Clin Implant Dent Relat Res 8(1):11-24, 2006.	127	11.5	7.5	N	Y
Overweight and obesity as risk indicators for periodontitis in adults. Dalla Vecchia al., J Periodontol 76(10):1721-8, 2005.	126	10.5	4.8	N	Y
Lipomas of the oral cavity: Clinical findings, histological classification and proliferative activity of 46 cases. Fregnani et al., Int J Oral Maxillofac Surg 31(1):49-53, 2003.	126	9.0	7.5	Y	Y
Mechanical properties of resin cements with different activation modes. Braga et al., J Oral Rehabil 29(3):257-62, 2002.	126	8.4	6.5	Y	Y
Healing of extraction sockets and surgically produced - Augmented and non-augmented - Defects in the alveolar ridge. An experimental study in the dog. Cardaropoli et al., J Clin Periodontol 32(5):435-40, 2005.	125	10.4	5.5	N	N
Adhesion to tooth structure: A critical review of "micro" bond strength test methods. Armstrong et al., Dent Mater 26(2):e50-e62, 2010.	124	17.7	8.2	N	N
The effect of mineral trioxide aggregate on the apexification and periapical healing of teeth with incomplete root formation. Felippe et al., Int Endod J 39(1):2-9, 2006.	124	11.3	5.7	Y	Y

*Number of citations in Scopus up to 2017. •Top-10 list based on annual citation averages (ACA). ◆Top-10 list based on relative citation ratios (RCR).

The 100 papers were published in 31 different journals, none of them based in Brazil. Nine journals published three or more papers in the list; these nine journals contained 69% of the articles in the sample (Table 2). Among the 100 top-cited articles, 46% were published in only four journals: Journal of Dental Research (14 articles), Journal of Endodontics (13 articles), International Endodontic Journal (10 articles), and Dental Materials (9 articles). These are top-tier dental journals, as shown by their bibliometric indicators in Table 2. Almost all journals in the sample have a mixed access type, i.e. they publish either closed or open-access papers. The publishers from the journals are either based in the Netherlands or USA.

The journals were categorized according to their subject, which was defined based on the main topics of the articles published in the journals. Most journals containing articles from the sample had a specific subject, i.e. they publish articles that usually can be defined in a dental specialty, namely: Restorative Dentistry (4), Periodontology (3), Oral and Maxillofacial surgery (2), Endodontics (2), Implantology (2), Dental Materials (2), Cariology (1), Oral Biology (1), Orthodontics (1), Public Health (1), and Oral Radiology (1). Eleven journals in the sample were categorized as Multidisciplinary since they publish papers from many different topics.

The articles also were classified by their subject, as

shown in Table 3. The most frequent subjects addressed were Dental Materials, Endodontics, and Periodontology (61% of the sample). These three subjects had a total of 12649 citations, which represent 63.6% of the total citation counts for all articles included here. The subject with the highest ACA was Oral and Maxillofacial Surgery, whereas papers from Cariology had the least ACA. The subject with the highest RCR was Oral Radiology, whereas Oral Pathology had the lowest RCR in the sample. Only 12 articles were cited more than 300 times. The article with the largest number of citations was published in 2005 and addresses dimensional ridge alterations after tooth extraction. However, the paper with the highest ACA and RCR was published in 2011 and addresses the state of art of dental adhesives. From these 12 top-cited papers, eight addressed dental materials topics and four articles are reviews.

Table 2. Journals that published three or more papers included in the sample (N=100)

Journal	Articles	JCR IF 2017	CiteScore 2017	Access type	Journal subject	Publisher (country)
J Dent Res	14	5.38	5.05	Mixed	Multidisciplinary	SAGE Publications (USA)
J Endod	13	2.88	3.72	Mixed	Endodontics	Elsevier (Netherlands)
Int Endod J	10	3.01	3.08	Mixed	Endodontics	John Wiley & Sons (USA)
Dent Mater	9	4.03	4.53	Mixed	Dental Materials	Elsevier (Netherlands)
J Clin Periodontol	6	4.04	4.14	Mixed	Periodontology	John Wiley & Sons (USA)
Clin Oral Implant Res	5	4.30	3.81	Mixed	Implantology	John Wiley & Sons (USA)
J Periodontol	5	3.39	2.85	Closed	Periodontology	American Academy of Periodontology (USA)
Oral Surg Oral Med Oral Pathol Oral Radiol	4	1.71	1.47	Mixed	Multidisciplinary	Elsevier (Netherlands)
J Dent	3	3.77	4.13	Mixed	Multidisciplinary	Elsevier (Netherlands)

JCR IF: Journal Citation Reports Impact Factor.

Table 3. Subject of the articles in the sample (N=100)

Subject	Articles	Cites		ACA	RCR (SEM)
		Total	Mean (SD)		
Dental Materials	27	5848	217 (88)	19.7	12.4 (1.1)
Endodontics	22	4096	186 (60)	14.5	9.6 (0.7)
Periodontology	12	2595	216 (107)	20.7	8.5 (1.1)
Oral Biology	11	2215	201 (76)	18.8	11.2 (1.5)
Oral and Maxillofacial Surgery	7	1825	261 (189)	23.0	9.2 (1.1)
Implantology	5	749	150 (21)	13.4	7.5 (0.6)
Oral Radiology	3	682	227 (64)	21.9	13.4 (1.3)
Restorative Dentistry	3	640	213 (100)	19.5	10.6 (2.9)
Pediatric Dentistry	3	465	155 (40)	9.8	8.6 (0.9)
Oral Pathology	3	359	120 (37)	13.9	5.2 (1.2)
Cariology	2	406	203 (10)	9.6	7.9 (1.1)
Public Health	2	275	138 (72)	12.0	9.6 (1.4)

SD: standard deviation; ACA: annual citation average; RCR (SEM): mean of relative citation ratio (standard error of the mean).

Table 4 presents the findings for variables related to the article and authors. There were 75 original research reports, including clinical, epidemiological, and basic research, and 25 reviews, including narrative and systematic reviews. The first author was affiliated to a Brazilian institution in 70% of the papers, whereas the corresponding author was affiliated to Brazil in 55%. The regions of Brazil with most presence in the top-100 papers were the Southeast and South, whereas the other three regions were present only 7 times. Most studies were written by a maximum of 6 authors (82%) and usually had less than 10 pages (66%). International collaboration was present in 61% of the articles. The main collaboration countries were USA (29 articles), Finland and Italy (8 articles each). The authors reported that the study was supported by funding in 49 articles. A descriptive title was used in 97 articles, 58% having 100 or less characters. Only 19 articles stated the hypothesis tested. Most articles used up to 5 tables (55%), no color figure (71%), and no separate conclusion section (64%).

Table 5 presents a list of the Brazilian universities and other institutions that coauthored the 100 top-cited articles. The five universities most often present were University of São Paulo (USP), University of Campinas (UNICAMP), Estácio de Sá

Table 4. Variables related to the article and authors (N=100)

Variable	Outcomes	n
Article type	Review	25
	Original research	75
First author affiliation	Brazil	70
	Other	30
Corresponding author affiliation	Brazil	55
	Other	40
	Not reported	5
Region of Brazil*	Central-West	3
	North	1
	Northeast	3
	South	20
	Southeast	83
Number of authors	1	4
	2-6	78
	≥7	18
Number of pages	<10	66
	>10-20	34
Collaboration with other countries	0	39
	1	35
	≥2	26
Main collaboration countries*	Finland	8
	Italy	8
	USA	28
Funding	Sponsorship	2
	Research grant	33
	Donation of materials	5
	More than one	9
	Not reported	51
Type of title	Descriptive	97
	Declarative	3
Number of characters in the tile	≤100	58
	>100	42
Hypothesis type	Null	8
	Alternative	11
	None	82
Use of subtitles in Experimental section	Yes	53
	No	47
Number of tables	0	18
	1-5	76
	≥ 6	6
Number of figures	0	19
	1-5	55
	≥6	26
Use of color figures	Yes	29
	No	71
Conclusion as separate section	Yes	36
	No	64

*N is not 100 since more than one region or country could be present.

Table 5. Brazilian institutions coauthoring the 100 top-cited articles

Institution (acronym)*	n**
University of São Paulo (USP)	35
University of Campinas (UNICAMP)	23
Estácio de Sá University	12
State University of Maringá (UEM)	9
São Paulo State University (UNESP)	8
Federal University of Minas Gerais (UFMG)	6
Federal University of Rio de Janeiro (UFRJ)	6
Other institutions (not universities or schools)	6
Bandeirante University of São Paulo (UNIBAN)	3
Federal University of Goiás (UFG)	3
Federal University of Santa Catarina (UFSC)	2
University of Ribeirão Preto (UNAERP)	2
University of Guarulhos (UNG)	2
Federal University of Amazonas (UFAM)	1
Federal University of Maranhão (UFMA)	1
Federal University of Pelotas (UFPel)	1
Federal University of Rio Grande do Norte (UFRN)	1
Federal University of Rio Grande do Sul (UFRGS)	1
Federal University of Santa Maria (UFSM)	1
Federal University of São Paulo (UNIFESP)	1
Federal University of Uberlândia (UFU)	1
Fluminense Federal University (UFF)	1
Gama Filho University (UGF)	1
Lutheran University of Brazil (ULBRA)	1
Pontifical Catholic University of Minas Gerais (PUC-MG)	1
Pontifical Catholic University of Paraná (PUC-PR)	1
Pontifical Catholic University of Rio Grande do Sul (PUC-RS)	1
Sacred Heart University (USC)	1
State University of Rio de Janeiro (UERJ)	1
University of Cuiabá (UNIC)	1
University of Passo Fundo (UPF)	1
University of Santo Amaro (UNISA)	1
University of Taubaté (UNITAU)	1
University of Uberaba (UNIUBE)	1
Not reported	1

*Obtained from the institutional websites. **The number is higher than 100 because some articles are coauthored by more than one institution.

University, State University of Maringá (UEM), and São Paulo State University (UNESP). From the 138 institutions coauthoring the articles, 73.9% are public and 26.1% private institutions.

Discussion

This is the first study to draw attention to the top-cited articles of the Brazilian dentistry. The hypothesis tested was accepted, since most papers included in the list were published in top-tier dental journals and 61% presented coauthorship from authors affiliated to international institutions. In total, 70% of the papers had first authors based in Brazil, but 40% had corresponding authors affiliated to international institutions. This is an indication that these 40 articles derived from studies carried out majorly in other countries and may reflect collaborations between Brazilian and foreign research groups or even were generated by Brazilian researchers working as visiting scholars abroad. One may argue if those articles may actually reflect the work of the Brazilian dentistry. We believe they do because collaborations with international groups in the past were extremely important to place the Brazilian dental research in the position it is currently occupying in the dental literature. The foreign country most often present in the sample was the USA, which is a world leader in many scientific fields and the country with most papers published yearly in Dentistry (10). Studies suggest that the international collaborations might result in coauthored publications with higher citation rates and increased visibility than purely domestic articles (15,16). A possible "country-of-origin" effect for article citations rates also may be in place, although this has yet to be validated. These findings have not been explored in the Brazilian dentistry so far and will be investigated in a future study.

Eighty-three percent of the sample was composed by articles with coauthors affiliated to institutions located in the Southeast region of Brazil. The North, Northeast, and Central-West regions were present in only 7% of the papers. This finding indicates an asymmetry in the Brazilian dental research and might be related to several aspects, including the lower density of researchers in North, Northeast, and Central-West, and the fact that these regions often present younger dental graduate programs compared to the South and Southeast. It has also been shown that most dentists, dental schools, graduate programs, and continuing education courses are located in the Southeast region (17,18). In addition, this region is known for presenting the major state research funding agencies in Brazil and investing more financial resources for research grants than other regions. Government funding is of utmost importance to foment independent research; 73.9% of the institutions coauthoring the articles in the present list are public. Science should be properly funded because it is good for the economy of the country, may benefit its society, and reduce inequalities (19). However, it is interesting to notice that a funding statement was reported in only 51% of the sample, which suggests that the presence of funding may not be associated with higher article citations counts. This is another finding worth being explored in a future investigation.

The three dental subareas most present in the sample were Dental Materials, Endodontics, and Periodontology. Most journals in the list with most articles in the sample (Table 2) publish articles on these three topics mainly. These findings corroborate those of a previous study, which reported Operative Dentistry, Endodontics, and Periodontology as the most prolific subareas in the Brazilian dental research (20). In addition, these findings are in line with those of Feijoo et al. (14) when analyzing the 100 most cited articles in dentistry worldwide. One difference between the cited study (14) and the present report is that the articles present in the worldwide list had greater citation counts since there was no date of publication restriction, the studies were available in a different database, and even opinion articles were included. The presence of several *in vitro* studies in the present study is also interesting, as only 13 articles reported data from clinical trials.

Literature reviews are known for usually gathering more citations than regular research articles (21). However, 3/4 of the articles in the sample were original reports. Similarly, only 1/3 of papers with above 300 citations were reviews. These results, although not expected, might be considered positive because original reports are necessary for the incremental process of science and to promote further knowledge development. From the 75 original articles, only 19 articles stated the hypothesis tested clearly. This finding could be related to a more recent journal practice to ask authors to provide the study hypothesis along with its objective. In addition, 58% of the articles had titles with 100 or less characters. According to a recent study, papers with shorter titles received a larger number of citations and journals that publish papers with shorter titles tended to receive more citations *per* paper (22). This might be the case for the *Journal of Dental Research*, one of the main international dental journals, since it asks authors to use titles with up to 75 characters (including spaces) and was the journal with most articles figuring the present list. In corroboration, another study observed that articles with longer titles were downloaded slightly less than those with shorter titles and that titles with colon tended to be longer and receive fewer downloads and citations (23). The same study reported that the number of downloads and citations of articles were positively correlated.

Considering that the present study assessed the most

cited papers published since 1996, the main limitation is that the total number of citations may favor older articles, as the total number of citations received by an article can only increase over time. This assumption is corroborated by differences observed in the top-10 papers when the articles were listed according to total citations, ACA, or RCR (Table 1). It has been reported that an article citation peak occurs between 2 and 6 years after its publication, and that the yearly citation number begins to decrease afterwards (24). The newest article in the sample has a lifespan of five years, thus it may not have reached its citation peak yet. Other limitations are the fact that only one database was used and that basic science studies related to dentistry were not included if the article was not published in dental journals. Although the sample is composed by articles coauthored by at least one author affiliated to Brazil, none of the included papers was published in Brazilian journals. This confirms the fact that most of the evidence and information for domestic researchers in the health care area are available in international journals (25). The Brazilian dental research went international in the last decades but an actual internationalization of the peer-reviewed Brazilian dental journals is still in progress. Many efforts have been made recently by scientific societies, editors, publishers, and even governmental agencies to speed up the internationalization process and attract attention from international authors. Another strategy would be to encourage national authors to see Brazilian journals with international coverage as main target journals to submit their main studies.

In conclusion, this top-100 list is presented to provide an overview of the most cited dental articles with Brazilian coauthors and aid in supporting further analyses regarding publication and citation behaviors of the Brazilian dentistry.

Resumo

Este artigo analisa as características dos 100 artigos mais citados publicados em periódicos internacionais de odontologia com ao menos um co-autor afiliado ao Brasil. Uma busca na base de dados Scopus por artigos publicados entre 1996 e 2017 foi realizada nos 178 periódicos pertencentes à categoria "Dentistry" identificados no SCImago Journals & Country Rank. Dos 100 artigos mais citados, variáveis relacionadas ao periódico, artigo e autores foram coletadas. Médias anuais de citação (MAA) e razões de citação relativa (RCR) foram calculadas. Os dados foram analisados descritivamente. A amostra foi composta por 75 artigos originais e 25 revisões. O número de citações variou entre 124 e 657 (média=202, mediana=168). Os artigos foram publicados em 31 periódicos diferentes (46% em apenas quatro periódicos), nenhum do Brasil. Os temas mais frequentes (61%) foram Materiais Dentários, Endodontia e Periodontia, somando 63,6% do total de citações. O tema com maior MAA foi Cirurgia Oral e Maxilofacial e o tema com maior RCR foi Radiologia Oral. Apenas 12 artigos foram citados mais de 300 vezes. Colaboração internacional estava presente em 61 artigos e financiamento foi reportado em 49 artigos. O primeiro autor era do Brasil em 70% e o correspondente em 55% dos artigos. As regiões do Brasil com mais co-autores presentes foram Sudeste (83%) e Sul (20%). Esta lista é apresentada para prover uma fotografia dos 100 artigos mais citados e ajudar a fomentar análises posteriores em relação a comportamentos de citação e publicação da odontologia brasileira.

Acknowledgements

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Brazil (Finance Code 001). The authors also acknowledge the support from CAPES/PROCAD, Brazil (grant #3001/2014). A.P.G. (CAPES), A.L.P (CAPES), and B.R. (CNPq) thank the funding agencies for the scholarships.

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Received September 28, 2018
Accepted December 5, 2018