Review Article

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Dentistry Section

The 100 Most Cited Publications on Dental Ceramics between 1980 to 2020: A Bibliometric Analysis

NAISARGI SHAH[1], PRAVEEN BADWAIK[2], PRAKRUTI SHAH[3], SHEETAL JADHAV[4], VISHRUT BHATNAGAR[5], ARSHAD IDRISI[6]

ABSTRACT

Introduction: Evidence-based dentistry provides clinically oriented decisions with the help of available scientific data and literature. The significance of an article is reflected by its citation count, the impact it has on clinical practice. This is where bibliometric studies play an important role by providing an overview of research and scientific activity by calculating bibliometric indicators that give information about the quantity of published research in a specific field. The citation index is considered an important parameter for measuring relevance in a specific field. Articles that are heavily cited are considered important in the field of dental ceramics as they can provide basic information, recent advances, and the areas that are extensively researched.

Aim: To perform a bibliometric analysis of the 100 most cited publications in the field of dental ceramics, in the past 40 years from 1980-2020.

Materials and Methods: The Scopus database was used to retrieve all publications with titles containing the term “Dental Ceramics”. Thereafter, the data obtained was arranged in a descending order and a list of the 100 most cited publications were prepared. The data was analysed for the number of citations, the journals in which they were published, its impact factor, the work of the author, country in which it was published, document type retrieved, university affiliation, funding sponsors, area of subject in study, and the number of articles published per year. Prediction of future growth trend was also analysed using data gathered in Microsoft Excel software.

Results: Out of the retrieved data, 3815 was the highest number of citations recorded. Two of the articles received more than 1000 citations and 32 articles were cited less than 100 times. These 100 publications were documented from the year 1986-2018. Largest number of publications were made in the Journal of Dental Materials (n=31), followed by the Journal of Prosthetic Dentistry (n=12) and Journal of Dental Research (n=10). 85 of the total documents were original articles, 12 were reviews, two cited publications were books and one was a conference paper.

Conclusion: The bibliometric analysis of the 100 most cited articles revealed a marked change in the trends and progress that has taken place in the field of dental ceramics amongst the researchers, clinicians and technicians.

Keywords: Bibliographies, Dental material, Growth trend, Statistical bibliographies

INTRODUCTION

Evidence-based dentistry provides clinically oriented decisions with the help of available scientific data and literature. Publication of papers in scientific journals is the most commonly used strategy to promulgate research findings. The published literature is extensive and although easily accessible, clinicians, researchers as well as technicians cannot always gauge the quality of the publications they read. Furthermore, the areas in which the research has been made shows dramatic progress that may be difficult to identify. Research in this field has increased largely because of increasing esthetic demands amongst patients and scientific knowledge regarding clinical procedures and equipment amongst the researchers, clinicians and technicians. The significance of an article is reflected by its citation count, the impact it has on clinical practice and the discussions it generates which triggers research in new directions. Citations are potential markers of a paper's influence in this growing scientific research arena. This is where Bibliometric studies play an important role by providing an overview of research and scientific activity by calculating bibliometric indicators that give information about the quantity of published research in a specific field. The citation index is considered an important parameter for measuring relevance in a specific field [1,2]. Articles that are heavily cited are considered important in the field of dental ceramics as they can provide basic information, recent advances, and the areas that are extensively researched. Also they can predict the future direction of the research field [3].

Eugene Garfield introduced the term citation classic in 1955 to identify the top cited scientific articles in the Institute for Scientific Information (ISI) Web of Knowledge now known as the Web of Science database [4]. Most of the literature can be assessed from different databases like Google Scholar, PubMed, Scopus, and Web of Science. Similarly, in the field of Medicine, National Library of Medicine (NLM) in United States was introduced in 1971 and later on in 1997, PubMed was launched by combining the ‘Old Medline’ and ‘Medline’ databases. PubMed is widely used and most reliable database for clinical and research purposes [5].

Citation analysis of a particular paper determines the number of times a research paper has been cited by other authors. It imparts knowledge about the ongoing research and the importance of the topic in a particular field. Bibliometric analysis is a quantitative science, applying mathematical and statistical methods like citation analysis, to gauge the performance of a research article [6]. Bibliometrics contributes to the citation-based metrics like Journal impact factor, H-index, Citation classics to quantify the impact of a particular journal or a paper or an individual [6].

H-index was introduced by Hirsch, which is used as a tool for evaluating the scientific work of a researcher and can be defined as: A scientist has index h if h of his or her Np (number of papers) have minimum of h citations each, and the other (Np-h) papers have ≤ h citations each [6]. Besides determining the scientific career of a researcher the use of H-index can be extended to evaluate the impact of the journal, contribution of scientific institutions and countries in the field of research. H-classic is based on the concept of H-index, which considers both the number of papers published and their impact on the scientific field [7]. H-classic provides a more reliable scientific method to determine the citation classic. The classic papers identified provides the basic knowledge in a particular field that will then help to develop the concepts and understanding of the topic in a better way among the clinicians. It provides information on the most researched topic and the contribution of top researchers in that discipline [7].

Bibliometric studies provide academic knowledge and development in various fields. Eugene Garfield first performed a study in 1987 to identify the 100 citation classic articles in the field of medicine in the Journal of the American Medical Association [8]. Extensive bibliometric studies have been undertaken in fields of biomedical research to analyse the highly cited articles, in different fields of dentistry like Orthodontics, Endodontics, Oral and Maxillofacial Surgery, Pedodontics and Periodontics, General Dentistry, Implant Dentistry [1,9-17]. Although, not many Bibliometric studies have been undertaken in the field of Prosthodontics, Fardi A et al., published an article describing top cited articles in the field of Implant Dentistry in 2017 [13]. Recently in 2020, Gadde P et al., published an article on the 100 most cited articles in prosthodontic journals from the year 1980 to 2019 [17].

The first ever scientific laboratory experiments on ceramic material were carried out in the year 1708 which became the basis for Pierre Fauchard to introduce the modern day ceramics in dentistry in 1728. In 1903, Charles H Land introduced the first ceramic crowns in the field of dentistry and since then a prodigious amount of development has taken place in this field, in terms of manufacturing processes, the composition of the material used as well as its wide range of applications to rehabilitate as well as re-design the human dentition [18,19]. Dental ceramics are a material used for fabricating highly esthetic lifelike restorations which justifies the need for extensive research being carried out on this topic [20]. Thus, this study aimed to analyse the characteristics of the 100 most cited publications in the field of dental ceramics, from the year 1980-2020 to reveal valuable and interesting information about scientific advancements, evolution and also highlight the current trends in this field.

MATERIALS AND METHODS

Bibliometeric analysis is an electronic search that describes the patterns of publication. An electronic search was carried out on 20th July 2020. There was no restriction applied for the study process. Search was carried out in Scopus database. All the articles published from July 1980-July 2020 were selected for the study. A total of 1714 publications were retrieved from Science Citation Index- Expanded Tool from Scopus Database. The documents were searched using 'Dental Ceramics' as the keyword. A search was performed in July 2020 using the Scopus database. All the literature published from 1980-2020 were included in the study. Articles published in different languages were excluded.

This provided a citation count ranking of all the literature thus gathered. Later, the resulting list was sorted by the number of citations in descending order. Two researchers (JS, SP) performed paper selection and data extraction. The title and abstracts were reviewed to assure the relevance of the topic. Any disagreement on data extraction was resolved through discussion and consensus of all the authors. The assessment stopped at the 100th most cited paper. The documents retrieved were analysed for the number of citations, and also, the authors were analysed according to their work. No restriction on the type of journal was applied. The journal in which they were published and the impact factor for each was recorded along with the H-index and quartile was obtained from Scimago Journal and Country Rank. The following information was extracted for each paper: the country of publication, the type of documents retrieved, affiliations of the authors to the university, and the funding sponsors were also assessed. The area of the subject in the study and the number of articles published per year was also taken into consideration. Using the currently available data the future growth trend was predicted with the help of Microsoft Excel software.

STATISTICAL ANALYSIS

The data was retrieved from Scopus database directly that was downloaded in Microsoft Excel software. Further the data was grouped according into different categories depending on its source of retrieval, authors involved, country in which study was conducted, and funding sources if they acquired any.

RESULTS

A total of 1714 documents were retrieved from the following search strategy with H-index of 86. The H-index of the 100 most cited articles thus retrieved was calculated to be 82 after excluding self-citations. The top 100 cited publications in the field of dental ceramics have been arranged in descending order as seen in [Table/Fig-1].

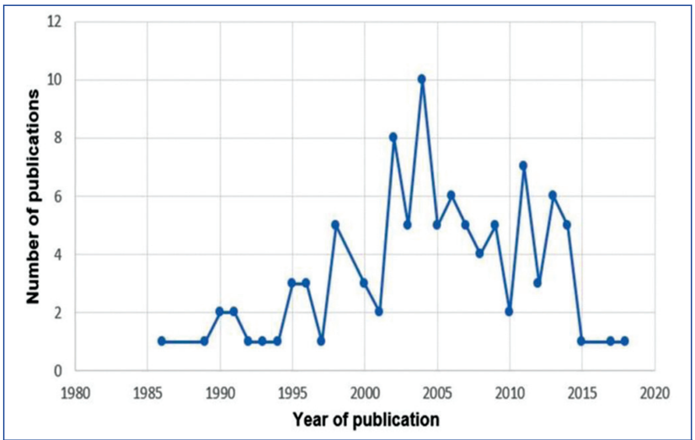
S. No.	Articles	Citation count
1	Hench LL. Bioceramics-from concept to clinic. J Am Ceram Soc 1991;74(7):1487-510	3815
2	Denry I, Kelly JR. State of the art of zirconia for dental applications. Dent Mater. 2008;24(3):299-307.	1061
3	Kelly JR, Denry I. Stabilised zirconia as a structural ceramic: an overview. Dent Mater. 2008;24(3):289-98.	583
4	Blatz MB, Sadan A, Kern M. Resin-ceramic bonding: a review of the literature. J Prosthet Dent. 2003;89(3):268-74.	579
5	Kern M, Wegner SM. Bonding to zirconia ceramic: adhesion methods and their durability. Dent Mater. 1998;14(1):64-71.	539
6	Guazzato M, Albakry M, Ringer SP, Swain MV. Strength, fracture toughness and microstructure of a selection of all-ceramic materials. Part II. Zirconia-based dental ceramics. Dent Mater. 2004;20(5):449-56.	531
7	Ozcan M, Vallittu PK. Effect of surface conditioning methods on the bond strength of luting cement to ceramics. Dent Mater. 2003;19(8):725-31.	425
8	Kelly JR, Nishimura I, Campbell SD. Ceramics in dentistry: historical roots and current perspectives. J Prosthet Dent. 1996;75(1):18-32.	390
9	Lughi V, Sergo V. Low temperature degradation- aging- of zirconia: A critical review of the relevant aspects in dentistry. Dent Mater. 2010;26(8):807-20.	336
10	Tinschert J, Zwez D, Marx R, Anusavice KJ. Structural reliability of alumina-, feldspar-, leucite-, mica- and zirconia-based ceramics. J Dent. 2000;28(7):529-35.	326
11	Holand W, Beall GH. Glass-Ceramic Technology. 2nd Edition. Hoboken, New Jersey: John Wiley & Sons, Inc; 2012. Pp. 414.	316
12	Guazzato M, Quach L, Albakry M, Swain MV. Influence of surface and heat treatments on the flexural strength of Y-TZP dental ceramic. J Dent. 2005;33(1):09-18.	305
13	Zhang Y, Lawn BR, Rekow ED, Thompson VP. Effect of sandblasting on the long-term performance of dental ceramics. J Biomed Mater Res B Appl Biomater. 2004;71(2):381-86.	302
14	Kosmac T, Oblak C, Jevnikar P, Funduk N, Marion L. Strength and reliability of surface treated Y-TZP dental ceramics. J Biomed Mater Res. 2000;53(4):304-13.	295
15	Miyazaki T, Nakamura T, Matsumura H, Ban S, Kobayashi T. Current status of zirconia restoration. J Prosthodont Res. 2013;57(4):236-61.	278

16	Kelly JR, Tesk JA, Sorensen JA. Failure of all-ceramic fixed partial dentures in vitro and in vivo: analysis and modeling. J Dent Res. 1995;74(6):1253-58.	262
17	Atsu SS, Kilicarslan MA, Kucukesmen HC, Aka PS. Effect of zirconium-oxide ceramic surface treatments on the bond strength to adhesive resin. J Prosthet Dent. 2006;95(6):430-36.	235
18	Borges GA, Sophr AM, de Goes MF, Sobrinho LC, Chan DC. Effect of etching and airborne particle abrasion on the microstructure of different dental ceramics. J Prosthet Dent. 2003;89(5):479-88.	227
19	Zarone F, Russo S, Sorrentino R. From porcelain-fused-to-metal to zirconia: clinical and experimental considerations. Dent Mater. 2011;27(1):83-96.	224
20	Kelly JR.Ceramics in restorative and prosthetic dentistry. Annu Rev Mater Sci. 2003;27(1):443-68.	224
21	Thompson JY, Anusavice KJ, Naman A, Morris HF. Fracture surface characterisation of clinically failed all-ceramic crowns. J Dent Res. 1994;73(12):1824-32.	219
22	Kelly JR, Giordano R, Pober R, Cima MJ. Fracture surface analysis of dental ceramics: clinically failed restorations. Int J Prosthodont. 1990;3(5):430-40.	201
23	Kokubo T. Bioceramics and their Clinical Applications.1st Edition. Cambridge England:Woodhead publishing limited; 2008. Pp. 1-760	195
24	Sundh A, Molin M, Sjögren G. Fracture resistance of yttrium oxide partially-stabilised zirconia all-ceramic bridges after veneering and mechanical fatigue testing. Dent Mater. 2005;21(5):476-82.	191
25	Krell, Andreas & Hutzler, Thomas & Klimke, Jens. Transmission physics and consequences for materials selection, manufacturing, and applications. Journal of the European Ceramic Society. 2009;29:207-21.	189
26	Paravina RD, Ghinea R, Herrera LJ, Bona AD, Igiel C, Linninger M, et al. Color difference thresholds in dentistry. J Esthet Restor Dent. 2015;27(Suppl 1):S1-9.	188
27	Denry I, Kelly JR. Emerging ceramic-based materials for dentistry. J Dent Res. 2014;93(12):1235-42.	188
28	Rekow ED, Silva NR, Coelho PG, Zhang Y, Guess P, Thompson VP. Performance of dental ceramics: challenges for improvements. J Dent Res. 2011;90(8):937-52.	188
29	Kelly JR, Campbell SD, Bowen HK. Fracture-surface analysis of dental ceramics. J Prosthet Dent. 1989;62(5):536-41.	187
30	Guazzato M, Proos K, Quach L, Swain MV. Strength, reliability and mode of fracture of bilayered porcelain/zirconia (Y-TZP) dental ceramics. Biomaterials. 2004;25(20):5045-52.	175
31	Oh WS, Delong R, Anusavice KJ. Factors affecting enamel and ceramic wear: a literature review. J Prosthet Dent. 2002;87(4):451-59.	173
32	Ghinea R, Pérez MM, Herrera LJ, Rivas MJ, Yebra A, Paravina RD. Color difference thresholds in dental ceramics. J Dent. 2010;38(Suppl 2):e57-64.	172
33	Peterson IM, Pajares A, Lawn BR, Thompson VP, Rekow ED. Mechanical characterisation of dental ceramics by hertzian contacts. J Dent Res. 1998;77(4):589-602.	169
34	Kelly JR, Benetti P. Ceramic materials in dentistry: historical evolution and current practice. Aust Dent J. 2011;56 (Suppl 1):84-96.	165
35	Derand T, Molin M, Kvam K. Bond strength of composite luting cement to zirconia ceramic surfaces. Dent Mater. 2005;21(12):1158-62.	165
36	Curtis AR, Wright AJ, Fleming GJ. The influence of surface modification techniques on the performance of a Y-TZP dental ceramic. J Dent. 2006;34(3):195-206.	162
37	Piwowarczyk A, Lauer HC, Sorensen JA. In vitro shear bond strength of cementing agents to fixed prosthodontic restorative materials. J Prosthet Dent. 2004;92(3):265-73.	159
38	Seghi RR, Sorensen JA. Relative flexural strength of six new ceramic materials. Int J Prosthodont. 1995;8(3):239-46.	157
39	Ardlin BI. Transformation-toughened zirconia for dental inlays, crowns and bridges: chemical stability and effect of low-temperature aging on flexural strength and surface structure. Dent Mater. 2002;18(8):590-95.	155
40	Kelly JR. Dental ceramics: current thinking and trends. Dent Clin North Am. 2004;48(2):513-30.	151
41	Willems G, Celis JP, Lambrechts P, Braem M, Vanherle G. Hardness and Young's modulus determined by nanoindentation technique of filler particles of dental restorative materials compared with human enamel. J Biomed Mater Res. 1993;27(6):747-55.	141
42	Moszner N, Klapdohr S. Nanotechnology for dental composites. Int J Nanotechnol. 2004;1(1/2):130-56.	138
43	Lawn BR, Pajares A, Zhang Y, Deng Y, Polack MA, Lloyd IK, et al. Materials design in the performance of all-ceramic crowns. Biomaterials. 2004;25(14):2885-92.	138
44	Seghi RR, Rosenstiel SF, Bauer P. Abrasion of human enamel by different dental ceramics in vitro. J Dent Res. 1991;70(3):221-25.	138
45	Li RW, Chow TW, Matinlinna JP. Ceramic dental biomaterials and CAD/CAM technology: state of the art. J Prosthodont Res. 2014;58(4):208-16.	134
46	Cattani-Lorente M, Scherrer SS, Ammann P, Jobin M, Wiskott HW. Low temperature degradation of a Y-TZP dental ceramic. Acta Biomater. 2011;7(2):858-65.	134
47	Hooshmand T, van Noort R, Keshvad A. Bond durability of the resin-bonded and silane treated ceramic surface. Dent Mater. 2002;18(2):179-88.	134
48	Papanagiotou HP, Morgano SM, Giordano RA, Pober R. In vitro evaluation of low-temperature aging effects and finishing procedures on the flexural strength and structural stability of Y-TZP dental ceramics. J Prosthet Dent. 2006;96(3):154-64.	132
49	Seghi RR, Denry IL, Rosenstiel SF. Relative fracture toughness and hardness of new dental ceramics. J Prosthet Dent. 1995;74(2):145-50.	132
50	Morena R, Beaudreau GM, Lockwood PE, Evans AL, Fairhurst CW. Fatigue of dental ceramics in a simulated oral environment. J Dent Res. 1986;65(7):993-97.	125
51	Jung YG, Peterson IM, Kim DK, Lawn BR. Lifetime-limiting strength degradation from contact fatigue in dental ceramics. J Dent Res. 2000;79(2):722-31.	124
52	Studart AR, Filser F, Kocher P, Gauckler LJ. In vitro lifetime of dental ceramics under cyclic loading in water. Biomaterials. 2007;28(17):2695-705.	123
53	Zhang Y, Sailer I, Lawn BR. Fatigue of dental ceramics. J Dent 2013;41(12):1135-47.	120
54	Fischer H, Marx R. Fracture toughness of dental ceramics: comparison of bending and indentation method. Dent Mater. 2002;18(1):12-19.	120
55	Pittayachawan P, McDonald A, Petrie A, Knowles JC. The biaxial flexural strength and fatigue property of Lava Y-TZP dental ceramic. Dent Mater. 2007;23(8):1018-29.	119
56	Deng Y, Lawn BR, Lloyd IK. Characterisation of damage modes in dental ceramic bilayer structures. J Biomed Mater Res. 2002;63(2):137-45.	119
57	Deany IL. Recent advances in ceramics for dentistry. Crit Rev Oral Biol Med. 1996;7(2):134-43.	117
58	Anusavice KJ. Degradability of dental ceramics. Adv Dent Res. 1992;6:82-89.	116
59	McLean JW. Evolution of dental ceramics in the twentieth century. J Prosthet Dent. 2001;85(1):61-66.	114
60	Zhang Y, Lee JJ, Srikanth R, Lawn BR. Edge chipping and flexural resistance of monolithic ceramics. Dent Mater. 2013;29(12):1201-08.	112

61	Piascik JR, Swift EJ, Thompson JY, Grego S, Stoner BR. Surface modification for enhanced silanation of zirconia ceramics. Dent Mater. 2009;25(9):1116-21.	111
62	Anusavice KJ, Kakar K, Ferree N. Which mechanical and physical testing methods are relevant for predicting the clinical performance of ceramic-based dental prostheses. Clin Oral Implants Res. 2007;18(3):218-31.	110
63	Guazzato M, Albakry M, Quach L, Swain MV. Influence of surface and heat treatments on the flexural strength of a glass-infiltrated alumina/zirconia-reinforced dental ceramic. Dent Mater. 2005;21(5):454-63.	110
64	Della Bona A, Shen C, Anusavice KJ. Work of adhesion of resin on treated lithia disilicate-based ceramic. Dent Mater. 2004;20(4):338-44.	110
65	Quinn JB, Sundar V, Lloyd IK. Influence of microstructure and chemistry on the fracture toughness of dental ceramics. Dent Mater. 2003;19(7):603-11.	109
66	Matinlinna JP, Vallittu PK. Bonding of resin composites to etchable ceramic surfaces- an insight review of the chemical aspects on surface conditioning. J Oral Rehabil. 2007;34(8):622-30.	106
67	Della Bona A, Anusavice KJ. Microstructure, composition, and etching topography of dental ceramics. Int J Prosthodont. 2002;15(2):159-67.	104
68	Wang F, Takahashi H, Iwasaki N. Translucency of dental ceramics with different thicknesses. J Prosthet Dent. 2013;110(1):14-20.	102
69	Kern M. Resin bonding to oxide ceramics for dental restorations. J Adhes Sci Technol. 2009;23(7-8):1097-111	99
70	Denry IL, Holloway JA. Microstructural and crystallographic surface changes after grinding zirconia-based dental ceramics. J Biomed Mater Res B Appl Biomater. 2006;76(2):440-48.	97
71	Yin L, Jahanmir S, Ives LK. Abrasive machining of porcelain and zirconia with a dental handpiece. Wear. 2003;255(7-12):975-89.	97
72	Della Bona A, Mecholsky JJ Jr, Anusavice KJ. Fracture behavior of lithia disilicate- and leucite-based ceramics. Dent Mater. 2004;20(10):956-62.	96
73	Lawn BR, Deng Y, Lloyd IK, Janal MN, Rekow ED, Thompson VP. Materials design of ceramic-based layer structures for crowns. J Dent Res. 2002;81(6):433-38.	96
74	Zeng K, Odén A, Rowcliffe D. Flexure tests on dental ceramics. Int J Prosthodont. 1996;9(5):434-39.	95
75	Borba M, de Araújo MD, de Lima E, Yoshimura HN, Cesar PF, Griggs JA, Della Bona A. Flexural strength and failure modes of layered ceramic structures. Dent Mater. 2011;27(12):1259-66.	94
76	Zhang Y, Kim JW. Graded structures for damage resistant and aesthetic all-ceramic restorations. Dent Mater. 2009;25(6):781-90.	92
77	Sundh A, Sjögren G. Fracture resistance of all-ceramic zirconia bridges with differing phase stabilisers and quality of sintering. Dent Mater. 2006;22(8):778-84.	92
78	Taskonak B, Mecholsky JJ Jr, Anusavice KJ. Residual stresses in bilayer dental ceramics. Biomaterials. 2005;26(16):3235-41.	92
79	Antonson SA, Anusavice KJ. Contrast ratio of veneering and core ceramics as a function of thickness. Int J Prosthodont. 2001;14(4):316-20.	92
80	Wendler M, Belli R, Petschelt A, Mevec D, Harrer W, Lube T, et al. Chairside CAD/CAM materials. Part 2: Flexural strength testing. Dent Mater. 2017;33(1):99-109.	90
81	Kim MJ, Oh SH, Kim JH, et al. Wear evaluation of the human enamel opposing different Y-TZP dental ceramics and other porcelains. J Dent. 2012;40(11):979-88.	90
82	Ozcan M, Allahbeickaraghi A, Dündar M. Possible hazardous effects of hydrofluoric acid and recommendations for treatment approach: a review. Clin Oral Investig. 2012;16(1):15-23.	90
83	Zeng K, Odén A, Rowcliffe D. Evaluation of mechanical properties of dental ceramic core materials in combination with porcelains. Int J Prosthodont. 1998;11(2):183-89.	90
84	Jiang L, Liao Y, Wan Q, Li W. Effects of sintering temperature and particle size on the translucency of zirconium dioxide dental ceramic. J Mater Sci Mater Med. 2011;22(11):2429-35.	89
85	Zhang Y, Lawn BR. Novel Zirconia Materials in Dentistry. J Dent Res. 2018;97(2):140-47.	88
86	Scherrer SS, Denry IL, Wiskott HW. Comparison of three fracture toughness testing techniques using a dental glass and a dental ceramic. Dent Mater. 1998;14(4):246-55.	87
87	Chen C, Trindade FZ, de Jager N, Kleverlaan CJ, Feilzer AJ. The fracture resistance of a CAD/CAM Resin Nano Ceramic (RNC) and a CAD ceramic at different thicknesses. Dent Mater. 2014;30(9):954-62.	86
88	Belli R, Geinzer E, Muschweck A, Petschelt A, Lohbauer U. Mechanical fatigue degradation of ceramics versus resin composites for dental restorations. Dent Mater. 2014;30(4):424-32.	86
89	Taskonak B, Yan J, Mecholsky JJ Jr, Sertgöz A, Koçak A. Fractographic analyses of zirconia-based fixed partial dentures. Dent Mater. 2008;24(8):1077-82.	86
90	Lohbauer U, Petschelt A, Greil P. Lifetime prediction of CAD/CAM dental ceramics. J Biomed Mater Res. 2002;63(6):780-85.	86
91	Gonzaga CC, Cesar PF, Miranda WG Jr, Yoshimura HN. Slow crack growth and reliability of dental ceramics. Dent Mater. 2011;27(4):394-406.	84
92	Taskonak B, Sertgöz A. Two-year clinical evaluation of lithia-disilicate-based all-ceramic crowns and fixed partial dentures. Dent Mater. 2006;22(11):1008-13.	84
93	Rizkalla AS, Jones DW. Mechanical properties of commercial high strength ceramic core materials. Dent Mater. 2004;20(2):207-12.	84
94	Schmalz G, Schuster U, Schweikl H. Influence of metals on IL-6 release in vitro. Biomaterials. 1998;19(18):1689-94.	82
95	Ripetchdanond J, Leevailoj C. Wear of human enamel opposing monolithic zirconia, glass ceramic, and composite resin: an in vitro study. J Prosthet Dent. 2014;112(5):1141-50.	80
96	He LH, Swain MV. Nanoindentation derived stress-strain properties of dental materials. Dent Mater. 2007;23(7):814-21.	80
97	Cehreli MC, Kökat AM, Akça K. CAD/CAM Zirconia vs. slip-cast glass-infiltrated Alumina/Zirconia all-ceramic crowns: 2-year results of a randomised controlled clinical trial. J Appl Oral Sci. 2009;17(1):49-55.	78
98	Hattori T, Lwadate Y. Hydrothermal preparation of calcium hydroxyapatite powders. J Am Ceram Soc. 1990;73(6):1803-05.	78
99	Souza RO, Valandro LF, Melo RM, Machado JP, Bottino MA, Ozcan M. Air-particle abrasion on zirconia ceramic using different protocols: effects on biaxial flexural strength after cyclic loading, phase transformation and surface topography. J Mech Behav Biomed Mater. 2013;26:155-63.	77
100	Coldea A, Swain MV, Thiel N. In-vitro strength degradation of dental ceramics and novel PICN material by sharp indentation. J Mech Behav Biomed Mater. 2013;26:34-42.	77

[Table/Fig-1]: List of 100 most cited publications on dental ceramics between 1980 to 2020.

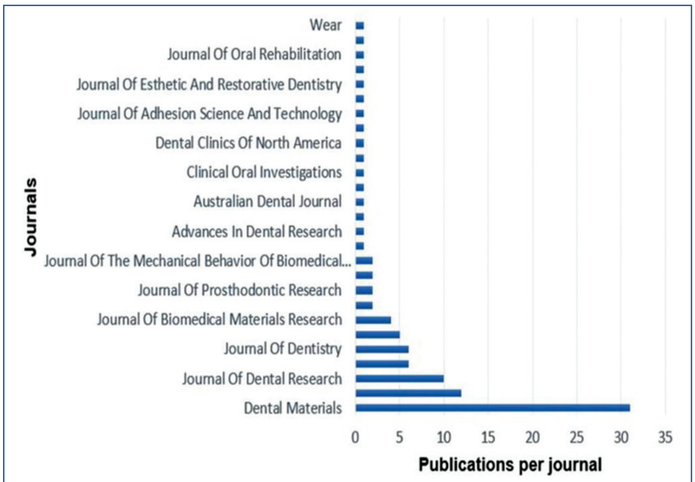
The shortlisted publications included: 85 original articles, 12 reviews, two books, and one conference paper. All the researches included were conducted in the last 32 years from 1986-2018. The number of articles published reached its peak in the year 2004 which accounted for 10% of all the gathered data [Table/Fig-2].



[Table/Fig-2]: Graph depicting year wise distribution of 100 most cited articles.

The least number of citations received was 77 and the maximum number went up to 3815. 'Bioceramics: From Concept to Clinic' was the title of the article published in 1991 that received the highest number of citations (3815) wherein the author has described the extensive use of Bioceramics which may be bioinert, bioactive resorbable, or porous material for tissue connections [Table/Fig-1] [21]. Herein, the author also highlighted that the use of Bioceramics is not just limited to dentistry but can also be used for repair of damaged tissue, orthopaedic surgeries as well as the replacement of maxillofacial and periodontal structures [21]. The second highest cited article with 1061 citations which was titled: 'State of the Art of Zirconia for Dental Application' was published in the year 2008 [22]. The author has emphasised the use and properties of Zirconia in Dentistry. Here the author has described three different types of Zirconia used in dentistry based on their method to undergo transformation toughening, namely, Yttrium cation-doped tetragonal zirconia polycrystals (3Y-TZP), Magnesium Partially Stabilised Zirconia (Mg-PSZ) and Glass infiltrated Zirconia-Toughened Alumina (ZTA). The author has extensively discussed Zirconia and its varied applications as it has excellent mechanical and esthetic properties and is widely used worldwide for the restoration of posterior teeth [22].

These top cited articles were published in 27 different journals. The majority of the studies were published in the Dental Material journal (n=31) followed by the Journal of Prosthetic Dentistry (n=12) and the Journal of Dental Research (n=10). These three journals alone contributed to more than 50% of published articles [Table/Fig-3]. Journal metrics for the distribution of most cited articles can be seen in [Table/Fig-4].



[Table/Fig-3]: Graph depicting number of articles published in top cited journals.

Journal name	Number of articles published	H-Index; SJR 2019	Quartile	Impact factor	Country of origin
Dental Materials	31	142; 1.85	Q1	4.495	Netherlands
Journal of Prosthetic Dentistry	12	119; 1.15	Q1	2.44	US
Journal of Dental Research	10	169; 2.05	Q1	4.914	US
International Journal of Prosthodontics	6	94;0.77	Q2	1.49	US
Journal of Dentistry	6	107; 1.62	Q1	3.47	Netherland
Biomaterials	5	360; 3.07	Q1	10.25	UK

[Table/Fig-4]: Journal metrics for distribution of the most cited articles.

These documents were published by a total of 159 authors, wherein, Anusavice KJ [23-32] and Kelly JR [22,33-41] made the highest contribution of 10 articles, followed by Lawn BR [42-50] with nine articles and Zhang Y [42,44,46,48,50-52] who published seven articles. Swain MV [53-58] published six articles, whereas Rekow ED [42,43,49,51] published four articles. Thompson VP [24,42,43,49,51] made contribution of five articles [Table/Fig-5] [22-39,41,43-62].

Author's name	Publications
Anusavice KJ [23-32]	10
Lawn BR [42-50]	9
Zhang Y [42,44,46,48,50-52]	7
Kelly JR [22,33-41]	10
Swain MV [53-58]	6
Rekow ED [42,43,49,51]	4
Thompson VP [24,42,43,49,51]	5

[Table/Fig-5]: Top most authors with at least 5 publications [22-39,41,43-62].

The research was carried out in 29 different countries. Among the data analysed most of the studies were carried out in the United States (n=50) followed by Germany (n=14) and Brazil (n=10) and most of the research was being conducted at the National Institute of Standards and Technology (n=13) [Table/Fig-6].

Country/Territory		Number of researches
1	United States	50
2	Germany	14
3	Brazil	10
4	Sweden	6
5	Switzerland	6
6	Australia	5
7	Japan	5
8	Turkey	5
9	United Kingdom	4
10	China	3
11	Netherlands	3
12	Spain	3
13	Finland	2
14	Italy	2
15	Norway	2
16	Austria	1
17	Belgium	1
18	Canada	1
19	Chile	1
20	Hong Kong	1
21	Hungary	1
22	Ireland	1
23	Liechtenstein	1

24	New Zealand	1
25	Saudi Arabia	1
26	Slovenia	1
27	South Korea	1
28	Thailand	1
29	Undefined	1

[Table/Fig-6]: Country wise distribution of 100 most cited publications.

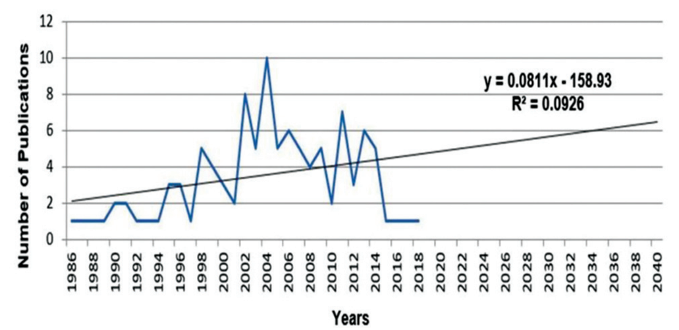
The data analysed from the present study suggests that knowledge and understanding of ceramics is not just confined to dentistry but incorporated a wide variety of study subjects like Dentistry (75), Material Science (55), Engineering (49), Biochemistry, Genetics and Molecular biology, and Chemical Engineering (each 7), Physics and Astronomy (3), Medicine (2), and Chemistry (1).

Eighteen different funding sources were identified that sponsored 38 different researches [Table/Fig-7]. Among them, the National Institute of Dental and Craniofacial Research sponsored nine different researches.

Funding sources		No. of researches that received funding
1	National Institute of Dental and Craniofacial Research	9
2	National Institutes of Health	4
3	Australian Dental Research Foundation	3
4	FundaÃ§Ã£o de Amparo Ã Pesquisa do Estado de SÃ£o Paulo	3
5	National Science Foundation	3
6	Conselho Nacional de Desenvolvimento CientÃfico e TecnolÃ³gico	2
7	CoordenaÃ§Ã£o de AperfeiÃ§oamento de Pessoal de NÃ¬vel Superior	2
8	National Institute of Standards and Technology	2
9	Japan Society for the Promotion of Science	1
10	Ministry of Education, Science and Technology	1
11	National High-tech Research and Development Program	1
12	National Natural Science Foundation of China	1
13	National Research Foundation of Korea	1
14	RTI International	1
15.	Sveriges TandlÃ¤karfÃ¶rbund	1
16	U.S. Department of Health and Human Services	1
17	Universidade Estadual Paulista	1
18	University of Sydney	1

[Table/Fig-7]: Funding sources and number of researches received funding.

The projection of the growth trend as depicted in [Table/Fig-8] has been prepared based on the data collected from the year 1986-2018. According to this a steady rise in the number of publications is seen and by 2040, approximately seven articles per year can be expected to be published.



[Table/Fig-8]: Growth prediction and equation based on previous performance using growth trend seen from 1986-2018.

DISCUSSION

There has been a tremendous amount of revolution that has occurred over the decades in the various concepts, manufacturing processes, and applications of dental ceramics [18]. The bibliometric analysis provides an insight into the development and evolution of dental ceramics with its ever changing concepts and improving properties. It helps in understanding the most explored areas in a particular field as well as highlights the areas which have not been researched as much thus motivating researchers to carry out further studies on those topics. The number of citations received by a particular paper is used to determine its importance in the research field. The citations are collected over a while and the older articles may have received more citations than the recently published data [59]. Thus, the time of publication has to be taken into consideration while studying citation analysis. Citation classics can be determined by two methods: (i) Setting citation threshold; (ii) Choosing papers from the list of highly cited articles [6]. The citation rates differ among various fields of the specialty, hence, no rigid threshold can be applied to determine the citation classic. If any article has received more than 400 citations in a larger research field or more than 100 in a smaller research field it is considered as "Citation Classic" [4,6]. But there is no scientific basis for determining this and different authors may evaluate their work by creating their standards for determining citation classic [6].

There are three popular databases used for bibliometric analysis- Google Scholar, Scopus and Web of Science. Though Google Scholar is the largest database it does not filter the self-citations of the authors that can alter the citation rates or produce false positive citations. Scopus database covers a wide collection of journals from PubMed and Web of Science [5]. It provides more valuable and accurate information for citation analysis. It can be used for both academic as well as research purposes in the medical literature [5].

In the present study, the data was retrieved from the Scopus database, the H-index was calculated to be 82 with the exclusion of self-citation among the 100 retrieved documents. The research was published in 29 different countries and the majority of the studies were executed in the United States (n=50) where most of the leading research centres are located followed by Germany (n=14) and Brazil (n=10). More than 50% of the articles were published in Dental materials journal (n=31), Journal of prosthetic dentistry (n=12), and Journal of dental research (n=10). All three journals are in the first Quartile. The true scientific impact of an article can be determined after at least two decades of its publication. Thus, the article may be cited highly only after 3 to 10 years of its publication [7].

Bradford's Law of Scattering asserts that in a subject field, there are a few journals that are cited more frequently and are thus likely to be of a higher level of interest to researchers in the discipline [60,61]. Bradford's law of scattering which is a theorem, can be used to explain the occurrence of majority of articles in the core group of the journal published on a specific subject [62]. Impact factor of the journal is considered as the driving force for the authors to get their papers published in a good journal. Authors generally prefer to publish articles in journals with a high impact factor and a greater Quartile number [62]. Impact factor as of 2019 for the journals are 4.495 for Dental Material, 2.444 for Journal of prosthetic dentistry, and 4.914 for Dental Research, 1.49 for International Journal Of Prosthodontics, 3.47 for Journal Of Dentistry, 10.25 for Biomaterials. Number of articles published in Dental material journal was 31. This explains the relationship between the impact factor of the journal and the higher number of articles published in those journals. According to the data collected the work of all the authors was published from the year 1986-2018 with the highest surge witnessed in 2004 which marked the year with the highest number of articles published. Also, the prediction of growth trend shows that there is a steady rise in the number of publications which thereby depicts the scope for a substantial amount of growth and development in this field.

The bibliometric analysis provides an objective evaluation of the research. Citation count does not give any information on the quality of the content but provides the data regarding the most researched field. The number of citations varies greatly depending upon the year of publication of an article. It does not necessarily reflect the standard of an article, as it tends to accumulate citations over a period which could result in temporal bias, as the older publications tend to accumulate more citations than the recently published articles [13].

Dental ceramics as we know is an extensive topic and hence we have also taken into consideration non dental journals which have elucidated on the topic from a material science perspective. Thus, the data obtained is heterogeneous. Although citation analysis may come with some drawbacks, it still can be beneficial for academic purposes.

Limitation(s)

Inclusion criteria for this study was not defined adequately. Also, no restrictions were applied to the type of publication to be included in the study.

CONCLUSION(S)

From this bibliometric analysis, it can be concluded that there has been extensive research done to improve the properties of dental ceramics since its introduction to make it successful in long term clinical performance. The basic understanding of these properties enables the clinician to choose from the wide varieties of dental ceramics wisely and prudently under evidence-based dentistry. Also, the growth trend suggests an increase in approximately seven articles per year in the field of dental ceramics by the year 2040. This information will be useful for the aspiring dentists to create a base for their understanding and also motivate various researchers to carry out further research.

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REFERENCES

[1] Tarazona B, Lucas-Dominguez R, Paredes-Gallardo V, Alonso-Arroyo A, Vidal-Infer A. The 100 most-cited articles in orthodontics: A bibliometric study. Angle Orthod. 2018;88:785-96.
[2] Ahmad P, Dummer PMH, Noorani TY, Asif JA. The top 50 most-cited articles published in the International Endodontic Journal. Int Endod J. 2019;52:803-18.
[3] Shamszadeh S, Asgary S, Nosrat A. Regenerative endodontics: A scientometric and bibliometric analysis. J Endod. 2019;45:272-80.
[4] Brandt JS, Hadaya O, Schuster M, Rosen T, Sauer MV, Ananth CV. A bibliometric analysis of top-cited journal articles in obstetrics and gynecology. JAMA Netw Open. 2019;2:e1918007.
[5] Falagas ME, Pitsouni EI, Malietzis GA, Pappas G. Comparison of PubMed, Scopus, Web of Science, and Google Scholar: Strengths and weaknesses. FASEB J. 2008;22:338-42.
[6] Martinez M, Herrera M, Lopez-Gijon J, Herrera-Viedma E. H-Classics: Characterizing the concept of citation classics through H-index. Scientometrics. 2014;98:1971-83.
[7] Baltussen A, Kindler CH. Citation classics in anesthetic journals. Anesth Analg. 2004;98:443-45.
[8] Garfield E. 100 citation classics from the Journal of the American Medical Association. JAMA. 1987;257:52-59.
[9] Aura-Tormos JI, García-Sanz V, Estrela F, Bellot-Arcís C, Paredes-Gallardo V. Current trends in orthodontic journals listed in Journal Citation Reports. A bibliometric study. Am J Orthod Dentofacial Orthop. 2019;156:663-74.e1.
[10] Yilmaz B, Dincol ME, Yalcin TY. A bibliometric analysis of the 103 top-cited articles in endodontics. Acta Odontol Scand. 2019;77:574-83.
[11] Shamszadeh S, Asgary S, Nosrat A. Regenerative endodontics: A scientometric and bibliometric analysis. J Endod. 2019;45:272-80.
[12] Aslam-Pervez N, Lubek JE. Most cited publications in oral and maxillofacial surgery: A bibliometric analysis. Oral Maxillofac Surg. 2018;22:25-37.
[13] Fardi A, Kodonas K, Lillis T, Veis A.Top-cited articles in implant dentistry. Int J Oral Maxillofac Implants. 2017;32:555-64.
[14] Perazzo MF, Otoni ALC, Costa MS, Granville-Granville AF, Paiva SM, Martins-Junior PA. The top 100 most-cited papers in Paediatric Dentistry journals: A bibliometric analysis. Int J Paediatr Dent. 2019;29:692-711.
[15] Ahmad P, Asif JA, Alam MK, Slots J. A bibliometric analysis of Periodontology 2000. Periodontol 2000. 2020;82:286-97.
[16] Gondivkar SM, Sarode SC, Gadbail AR, Gondivkar RS, Chole R, Sarode GS. Bibliometric analysis of 100 most cited articles on oral submucous fibrosis. J Oral Pathol Med. 2018;47:781-87.
[17] Gadde P, Reddy C, Rama Krishna A, Mohammed S, Abdurahiman VT, Akkaloori A. The 100 most cited articles in prosthodontic journals: A bibliometric analysis of articles published between 1951 and 2019. J Prosthet Dent. 2020;123:724-30.
[18] Shenoy A, Shenoy N. Dental ceramics: An update. J Conserv Dent. 2010;13:195-203.
[19] McLean JW. Evolution of dental ceramics in the twentieth century. J Prosthet Dent. 2001;85:61-66.
[20] Dos Santos DM, Moreno A, Vechiato-Filho AJ, Bonatto Lda R, Pesqueira AA, Laurindo Júnior MC, et al. The importance of the lifelike esthetic appearance of all-ceramic restorations on anterior teeth. Case Rep Dent. 2015;2015:704348.
[21] Hench LL. Bioceramics—from concept to clinic. J Am Ceram Soc. 1991;74(7):1487-510.
[22] Denry I, Kelly JR. State of the art of zirconia for dental applications. Dent Mater. 2008;24(3):299-307.
[23] Tinschert J, Zwez D, Marx R, Anusavice KJ. Structural reliability of alumina-, feldspar-, leucite-, mica- and zirconia-based ceramics. J Dent. 2000;28(7):529-35.
[24] Thompson JY, Anusavice KJ, Naman A, Morris HF. Fracture surface characterization of clinically failed all-ceramic crowns. J Dent Res. 1994;73(12):1824-32.
[25] Oh WS, Delong R, Anusavice KJ. Factors affecting enamel and ceramic wear: A literature review. J Prosthet Dent. 2002;87(4):451-59.
[26] Anusavice KJ. Degradability of dental ceramics. Adv Dent Res. 1992;6:82-89.
[27] Anusavice KJ, Kakar K, Ferree N. Which mechanical and physical testing methods are relevant for predicting the clinical performance of ceramic-based dental prostheses. Clin Oral Implants Res. 2007;18(3):218-31.
[28] Della Bona A, Shen C, Anusavice KJ. Work of adhesion of resin on treated lithia disilicate-based ceramic. Dent Mater. 2004;20(4):338-44.
[29] Della Bona A, Anusavice KJ. Microstructure, composition, and etching topography of dental ceramics. Int J Prosthodont. 2002;15(2):159-67.
[30] Della Bona A, Mecholsky JJ Jr, Anusavice KJ. Fracture behavior of lithia disilicate- and leucite-based ceramics. Dent Mater. 2004;20(10):956-62.
[31] Taskonak B, Mecholsky JJ Jr, Anusavice KJ. Residual stresses in bilayer dental ceramics. Biomaterials. 2005;26(16):3235-41.
[32] Antonson SA, Anusavice KJ. Contrast ratio of veneering and core ceramics as a function of thickness. Int J Prosthodont. 2001;14(4):316-20.
[33] Kelly JR, Denry I. Stabilised zirconia as a structural ceramic: An overview. Dent Mater. 2008;24(3):289-98.
[34] Kelly JR, Nishimura I, Campbell SD. Ceramics in dentistry: Historical roots and current perspectives. J Prosthet Dent. 1996;75(1):18-32.
[35] Kelly JR, Tesk JA, Sorensen JA. Failure of all-ceramic fixed partial dentures in vitro and in vivo: analysis and modeling. J Dent Res. 1995;74(6):1253-58.
[36] Kelly JR. Ceramics in restorative and prosthetic dentistry. Annu Rev Mater Sci. 2003;27(1):443-68.
[37] Kelly JR, Giordano R, Pober R, Cima MJ. Fracture surface analysis of dental ceramics: clinically failed restorations. Int J Prosthodont. 1990;3(5):430-40.
[38] Denry I, Kelly JR. Emerging ceramic-based materials for dentistry. J Dent Res. 2014;93(12):1235-42.
[39] Kelly JR, Campbell SD, Bowen HK. Fracture-surface analysis of dental ceramics. J Prosthet Dent. 1989;62(5):536-41.
[40] Kelly JR, Benetti P. Ceramic materials in dentistry: Historical evolution and current practice. Aust Dent J. 2011;56(Suppl 1):84-96.
[41] Kelly JR. Dental ceramics: Current thinking and trends. Dent Clin North Am. 2004;48(2):513-30.
[42] Zhang Y, Lawn BR, Rekow ED, Thompson VP. Effect of sandblasting on the long-term performance of dental ceramics. J Biomed Mater Res B Appl Biomater. 2004;71(2):381-86.
[43] Peterson IM, Pajares A, Lawn BR, Thompson VP, Rekow ED. Mechanical characterization of dental ceramics by hertzian contacts. J Dent Res. 1998;77(4):589-602.
[44] Lawn BR, Pajares A, Zhang Y, Deng Y, Polack MA, Lloyd IK, et al. Materials design in the performance of all-ceramic crowns. Biomaterials. 2004;25(14):2885-92.
[45] Jung YG, Peterson IM, Kim DK, Lawn BR. Lifetime-limiting strength degradation from contact fatigue in dental ceramics. J Dent Res. 2000;79(2):722-31.
[46] Zhang Y, Sailer I, Lawn BR. Fatigue of dental ceramics. J Dent. 2013;41(12):1135-47.
[47] Deng Y, Lawn BR, Lloyd IK. Characterization of damage modes in dental ceramic bilayer structures. J Biomed Mater Res. 2002;63(2):137-45.
[48] Zhang Y, Lee JJ, Srikanth R, Lawn BR. Edge chipping and flexural resistance of monolithic ceramics. Dent Mater. 2013;29(12):1201-08.
[49] Lawn BR, Deng Y, Lloyd IK, Janal MN, Rekow ED, Thompson VP. Materials design of ceramic-based layer structures for crowns. J Dent Res. 2002;81(6):433-38.
[50] Zhang Y, Lawn BR. Novel Zirconia materials in dentistry. J Dent Res. 2018.97(2):140-47.
[51] Rekow ED, Silva NR, Coelho PG, Zhang Y, Guess P, Thompson VP. Performance of dental ceramics: challenges for improvements. J Dent Res. 2011;90(8):937-52.
[52] Zhang Y, Kim JW. Graded structures for damage resistant and aesthetic all-ceramic restorations. Dent Mater. 2009;25(6):781-90.

[53] Guazzato M, Albakry M, Ringer SP, Swain MV. Strength, fracture toughness and microstructure of a selection of all-ceramic materials. Part II. Zirconia-based dental ceramics. Dent Mater. 2004;20(5):449-56.
[54] Guazzato M, Quach L, Albakry M, Swain MV. Influence of surface and heat treatments on the flexural strength of Y-TZP dental ceramic. J Dent. 2005;33(1):09-18.
[55] Guazzato M, Proos K, Quach L, Swain MV. Strength, reliability and mode of fracture of bilayered porcelain/zirconia (Y-TZP) dental ceramics. Biomaterials. 2004;25(20):5045-52.
[56] Guazzato M, Albakry M, Quach L, Swain MV. Influence of surface and heat treatments on the flexural strength of a glass-infiltrated alumina/zirconia-reinforced dental ceramic. Dent Mater. 2005;21(5):454-63.
[57] He LH, Swain MV. Nanoindentation derived stress-strain properties of dental materials. Dent Mater. 2007;23(7):814-21.
[58] Coldea A, Swain MV, Thiel N. In-vitro strength degradation of dental ceramics and novel PICN material by sharp indentation. J Mech Behav Biomed Mater. 2013;26:34-42.
[59] Ahmad P, Alam MK, Jakubovics NS, Schwendicke F, Asif JA. 100 years of the journal of dental research: A bibliometric analysis. J Dent Res. 2019;98:1425-36.
[60] Nash-Stewart CE, Kruesi LM, Del Mar CB. Does Bradford's Law of Scattering predict the size of the literature in Cochrane Reviews?. J Med Libr Assoc. 2012;100:135-38.
[61] Potter J. Mapping the literature of occupational therapy: An update. J Med Libr Assoc. 2010;98:235-42.
[62] Fernandez-Llimos F. Bradford's law, the long tail principle, and transparency in Journal Impact Factor calculations. Pharm Pract (Granada). 2016;14:842.

PARTICULARS OF CONTRIBUTORS:
1. Professor and Head, Department of Prosthodontics Crown and Bridge, Terna Dental College and Hospital, Nerul, Navi Mumbai, Maharashtra, India.
2. Professor, Department of Prosthodontics Crown and Bridge, Terna Dental College and Hospital, Nerul, Navi Mumbai, Maharashtra, India.
3. Postgraduate Student, Department of Prosthodontics Crown and Bridge, Terna Dental College and Hospital, Nerul, Navi Mumbai, Maharashta, India.
4. Postgraduate Student, Department of Prosthodontics Crown and Bridge, Terna Dental College and Hospital, Nerul, Navi Mumbai, Maharashtra, India.
5. Associate Professor, Department of Prosthodontics Crown and Bridge, Terna Dental College and Hospital, Nerul, Navi Mumbai, Maharashtra, India.
6. Assistant Professor, Department of Prosthodontics Crown and Bridge, Terna Dental College and Hospital, Nerul, Navi Mumbai, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Sheetal Jadhav,
TPCT's Terna Dental College, Plot No. 12, Sector-22, Opp. Nerul West Railway Station, Nerul West, Navi Mumbai-400706, Maharashtra, India.
E-mail: sheetaljadhav96@gmail.com

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