

## The 100 most-cited papers in oral medicine and pathology

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**Abstract:** This study aimed to analyze the 100 most-cited papers in the field of oral medicine and pathology over time, identifying the areas of more intense research. Papers in journals of oral medicine and pathology were identified using the Web of Science database. The specified research period was between 1900 and 2019. Descriptive statistics was used to analyze the data. Pearson's correlation analysis was used to explore the relationships among Web of Science citations, Dimensions citations, and Altmetric Attention Score. The number of citations of an article in the top 100 most-cited papers published in 1953 or later ranged from 541 to 3623. The papers were published in 47 different journals. *The New England Journal of Medicine*, *American Cancer Society*, and *Nature Genetics* published the most papers. Authors from 18 different countries published papers on head and neck cancer, craniofacial congenital anomalies, and osteonecrosis. Most of the papers were laboratory and descriptive studies. A correlation analysis showed a strong correlation only between Web of Science and Dimensions citations. In sum, although non-specific journals for pathology and oral medicine published the majority of the 100 most-cited papers, this biometric citation study show that head and neck cancer was the issue with the most citations. Together, these results make an important scientific contribution by providing a historical perspective on the research carried out.

**Declaration of Interests:** The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript.

**Keywords:** Oral Medicine; Pathology, Oral; Bibliometrics.

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## Introduction

The publication of scientific papers in peer-reviewed journals is the most common method of disseminating scientific research, and, therefore, a vast amount of published literature is easily accessible in different fields and disciplines. It is estimated that the number of scientific publications double every 15–20 years.<sup>1</sup> However, readers cannot always assess the quality of the publications they read. For the evaluation of papers, bibliometric indicators have been used and one of the most accepted qualitative assessment of scientific publications is the number of citations.<sup>2</sup> This parameter can help researchers to verify changing research focuses and to detect and acknowledge gaps.<sup>1,2</sup> Moreover, highly cited papers may promote change in clinical practice and trigger discussions, controversies, and additional research.<sup>3</sup>

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The first bibliometric study was performed in 1987 to describe important medical advances reported in the *Journal of the American Medical Association*.<sup>4</sup> After this study, several bibliometric studies have been carried out to evaluate the most-cited papers in different areas.<sup>5,6,7</sup> In dentistry, the subjects of studies in the field of bibliometrics have included dental, oral, and maxillofacial traumatology;<sup>8</sup> endodontics;<sup>9,10,11</sup> general dentistry;<sup>12</sup> implant dentistry;<sup>13,14,15</sup> paediatric dentistry;<sup>16,17</sup> periodontics;<sup>18</sup> and orthodontics.<sup>19,20</sup> However, a bibliometric study has yet to be carried out for oral medicine and pathology. Thus, the objective of this study was to perform a bibliometric analysis of the 100 most-cited papers in oral medicine and pathology. This study will enable oral medicine professionals, pathologists, students, and researchers in the field of oral medicine and pathology to recognize the most commonly discussed research and clinical issues, analyzing the papers most cited. Consequently, the results of this study can shed light on the efforts of the researchers to evaluate and/or find solutions to oral diseases, and can aid in identify studies that serve as references in the field.

## Methodology

This bibliometric study was carried out to identify and analyze the 100 most-cited papers in the field of oral medicine and pathology. The search was conducted using the Thomson Reuters Web of Science (WOS) citation indexing database (<http://www.webofknowledge.com>). Specifically, the work was carried out using the "All databases" option, which includes WOS (the main collection), Derwent Innovations Index, KCI - Korean Journal Database, Russian Science Citation Index, and the SciELO Citations Index. Papers published between 1900 and 2019 were included in the analysis, without restrictions on language.

The search strategy used combined terms with the field tag TS (Topic) and the Boolean operator OR in the advanced search tool: TS: (oral pathology) OR TS: (stomatology) OR TS: (oral medicine) OR TS: (oral oncology) OR TS: (oral disease) OR TS: (dental disease) OR TS: (oral) OR TS: (odont) OR TS: (mouth) OR TS: (teeth) OR TS: (tooth) OR TS: (tongue) OR TS: (oral manifestation) OR TS: (dentistry) OR TS: (dentist) OR TS: (dental). The search was performed in all

databases on November 19, 2019 and retrieved a total of 2,645,482 papers that were ordered by number of citations. Two authors (AJM and RAM), independently, selected the papers using the abstracts, and the full-text versions when necessary. Any disagreement over data extraction was resolved through discussion and consensus. The inclusion criterion was that the paper be on a topic related to the field of oral medicine and pathology. Papers not related to the field of oral medicine and pathology, and papers on periodontology, cariology, anatomic variation, and normal condition were excluded. In cases of disagreement between the two reviewers regarding the inclusion of a paper, a third author (HMJ) made the definitive decision.

After the final list was approved, the following information was extracted for each paper: reference information (authors, title, periodical, year, volume, and page), origin of the paper (as defined by the corresponding author), paper subject, study type, the number of citations in WOS, and the number of citations per year. The International Standard Serial Number (ISSN) and year of creation were also examined for each journal. Additionally, the number of citations in the Dimensions database and Altmetric Attention Score (AAS) were obtained from the Dimensions free app (<https://www.dimensions.ai>).

Descriptive statistics using counts and proportions were used to describe the papers and the journals included in the study. Pearson's correlation analysis was used to examine the relationships between citation counts for individual papers, the AAS, and the Dimensions total citation count. A Pearson's correlation coefficient ( $r$ ) < 0.3 was considered poor, 0.3–0.5 low, 0.5–0.7 moderate, 0.7–0.9 high, and > 0.9 very high. P values < 0.05 were considered statistically significant.

## Results

The most cited papers in oral medicine and pathology are listed in Table 1, in descending order based on the number of citations found in WOS. Average WOS citation per year, Dimensions, and AAS are also shown. The 100 most-cited papers were published between 1953 and 2015, and the most productive period was after 1990, with 78 papers out of 100 (Figure 1). The papers were published in 47

**Table 1.** The 100 most-cited papers in pathology and oral medicine, ordered by number of the citations.

Rank	References	WOS citations	WOS citations/year	Dimensions	AAS
1	Vitali C, Bombardieri S, Jonsson R, Moutsopoulos HM, Alexander EL, Carsons SE, Daniels TE, Fox PC, Fox RI, Kassan SS, Pillemer SR, Talal N, Weisman MH, European Study Group on Classification Criteria for Sjögren's Syndrome. Classification criteria for Sjögren's syndrome: a revised version of the European criteria proposed by the American-European Consensus Group. <i>Ann Rheum Dis.</i> 2002;61(6):554-8.	3623	213.12	3500	17
2	Ang KK, Harris J, Wheeler R, Weber R, Rosenthal DI, Nguyen-Tân PF, Westra WH, Chung CH, Jordan RC, Lu C, Kim H, Axelrod R, Silverman CC, Redmond KP, Gillison ML. Human papillomavirus and survival of patients with oropharyngeal cancer. <i>N Engl J Med.</i> 2010;363(1):24-35.	3002	333.56	3300	58
3	Silman AJ. Criteria for diagnosis of Behçet's disease. International Study Group for Behçet's Disease. <i>Lancet.</i> 1990;335(8697):1078-80.	2859	98.59	2800	3
4	Slaughter DP, Southwick HW, Smejkal W. Field cancerization in oral stratified squamous epithelium - clinical implications of multicentric origin. <i>Cancer.</i> 1953;6(5):963-8.	2283	34.59	2300	32
5	Gillison ML, Koch WM, Capone RB, Spafford M, Westra WH, Wu L, Zahurak ML, Daniel RW, Viglione M, Symer DE, Shah KV, Sidransky D. Evidence for a causal association between human papillomavirus and a subset of head and neck cancers. <i>J Natl Cancer Inst.</i> 2000;92(9):709-20.	1898	99.89	2000	36
6	Pignon JP, Bourhis J, Domenge C, Designé L. Chemotherapy added to locoregional treatment for head and neck squamous-cell carcinoma: three meta-analyses of updated individual data. MACH-NC Collaborative Group. Meta-Analysis of Chemotherapy on Head and Neck Cancer. <i>Lancet.</i> 2000;355(9208):949-55.	1798	94.63	1900	6
7	Chaturvedi AK, Engels EA, Pfeiffer RM, Hernandez BY, Xiao W, Kim E, Jiang B, Goodman MT, Sibug-Saber M, Cozen W, Liu L, Lynch CF, Wentzensen N, Jordan RC, Altekruze S, Anderson WF, Rosenberg PS, Gillison ML. Human papillomavirus and rising oropharyngeal cancer incidence in the United States. <i>J Clin Oncol.</i> 2011;29(32):4294-301.	1647	205.88	1900	770
8	Fakhry C, Westra WH, Li S, Cmelak A, Ridge JA, Pinto H, Forastiere A, Gillison ML. Improved survival of patients with human papillomavirus-positive head and neck squamous cell carcinoma in a prospective clinical trial. <i>J Natl Cancer Inst.</i> 2008;100(4):261-9.	1597	145.18	1700	25
9	D'Souza G, Kreimer AR, Viscidi R, Pawlita M, Fakhry C, Koch WM, Westra WH, Gillison ML. Case-control study of human papillomavirus and oropharyngeal cancer. <i>N Engl J Med.</i> 2007;356(19):1944-56.	1588	132.33	1800	155
10	Vokes EE, Weichselbaum RR, Lippman SM, Hong WK. Head and Neck Cancer. <i>N Engl J Med.</i> 1993; 328:184-194	1459	56.12	1300	6
11	Vitali C, Bombardieri S, Moutsopoulos HM, Balestrieri G, Bencivelli W, Bernstein RM, Bjerrum KB, Braga S, Coll J, de Vita S, et al. Preliminary criteria for the classification of Sjögren's syndrome. Results of a prospective concerted action supported by the European Community. <i>Arthritis Rheum.</i> 1993;36(3):340-7.	1424	54.77	1200	3
12	Cheng AL, Hsu CH, Lin JK, Hsu MM, Ho YF, Shen TS, Ko JY, Lin JT, Lin BR, Ming-Shiang W, Yu HS, Jee SH, Chen GS, Chen TM, Chen CA, Lai MK, Pu YS, Pan MH, Wang YJ, Tsai CC, Hsieh CY. Phase I clinical trial of curcumin, a chemopreventive agent, in patients with high-risk or pre-malignant lesions. <i>Anticancer Res.</i> 2001;21(4B):2895-900.	1419	78.83	1300	70
13	El-Sayed IH, Huang X, El-Sayed MA. Surface plasmon resonance scattering and absorption of anti-EGFR antibody conjugated gold nanoparticles in cancer diagnostics: applications in oral cancer. <i>Nano Lett.</i> 2005;5(5):829-34.	1396	99.71	1300	17
14	Warnakulasuriya S. Global epidemiology of oral and oropharyngeal cancer. <i>Oral Oncol.</i> 2009;45(4-5):309-16.	1350	135.00	1500	139
15	Ruggiero SL, Mehrotra B, Rosenberg TJ, Engroff SL. Osteonecrosis of the jaws associated with the use of bisphosphonates: a review of 63 cases. <i>J Oral Maxillofac Surg.</i> 2004 May;62(5):527-34.	1286	257.20	1400	4
16	Leemans CR, Braakhuis BJ, Brakenhoff RH. The molecular biology of head and neck cancer. <i>Nat Rev Cancer.</i> 2011;11(1):9-22.	1272	159.00	1300	13

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17	Kreimer AR, Clifford GM, Boyle P, Franceschi S. Human papillomavirus types in head and neck squamous cell carcinomas worldwide: a systematic review. <i>Cancer Epidemiol Biomarkers Prev.</i> 2005;14(2):467-75.	1258	89.86	1400	27
18	Blot WJ, McLaughlin JK, Winn DM, Austin DF, Greenberg RS, Preston-Martin S, Bernstein L, Schoenberg JB, Stemhagen A, Fraumeni JF Jr. Smoking and drinking in relation to oral and pharyngeal cancer. <i>Cancer Res.</i> 1988;48(11):3282-7.	1237	39.90	1200	8
19	Cancer Genome Atlas Network. Comprehensive genomic characterization of head and neck squamous cell carcinomas. <i>Nature.</i> 2015;517(7536):576-82.	1234	308.50	1400	225
20	Sakane T, Takeno M, Suzuki N, Inaba G. Behçet's disease. <i>N Engl J Med.</i> 1999;341(17):1284-91.	1225	61.25	1300	5
21	Hong WK, Lippman SM, Itri LM, Karp DD, Lee JS, Byers RM, Schantz SP, Kramer AM, Lotan R, Peters LJ, et al. Prevention of second primary tumors with isotretinoin in squamous-cell carcinoma of the head and neck. <i>N Engl J Med.</i> 1990;323(12):795-801.	1182	40.76	1000	3
22	Mundlos S, Otto F, Mundlos C, Mulliken JB, Aylsworth AS, Albright S, Lindhout D, Cole WG, Henn W, Knoll JH, Owen MJ, Mertelsmann R, Zabel BU, Olsen BR. Mutations involving the transcription factor CBF1 cause cleidocranial dysplasia. <i>Cell.</i> 1997;89(5):773-9.	1146	52.09	1200	13
23	Lupski JR, de Oca-Luna RM, Slauchhaupt S, Pentao L, Guzzetta V, Trask BJ, Saucedo-Cardenas O, Barker DF, Killian JM, Garcia CA, Chakravarti A, Patel PI. DNA duplication associated with Charcot-Marie-Tooth disease type 1A. <i>Cell.</i> 1991;66(2):219-32.	1074	38.36	1000	12
24	Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C. The global burden of oral diseases and risks to oral health. <i>Bull World Health Organ.</i> 2005;83(9):661-9.	1069	76.36	1100	22
25	Petersen PE. The World Oral Health Report 2003: continuous improvement of oral health in the 21st century--the approach of the WHO Global Oral Health Programme. <i>Community Dent Oral Epidemiol.</i> 2003;31 Suppl 1:3-23.	1067	66.69	1300	10
26	Khosla S, Burr D, Cauley J, Dempster DW, Ebeling PR, Felsenberg D, Gagel RF, Gilsanz V, Guise T, Koka S, McCauley LK, McGowan J, McKee MD, Mohla S, Pendrys DG, Raisz LG, Ruggiero SL, Shafer DM, Shum L, Silverman SL, Van Poznak CH, Watts N, Woo SB, Shane E; American Society for Bone and Mineral Research. Bisphosphonate-associated osteonecrosis of the jaw: report of a task force of the American Society for Bone and Mineral Research. <i>J Bone Miner Res.</i> 2007;22(10):1479-91.	1032	86.00	1100	19
27	Marx RE, Sawatari Y, Fortin M, Broumand V. Bisphosphonate-induced exposed bone (osteonecrosis/osteopetrosis) of the jaws: risk factors, recognition, prevention, and treatment. <i>J Oral Maxillofac Surg.</i> 2005;63(11):1567-75.	1008	72.00	1100	11
28	Satokata I, Maas R. Msx1 deficient mice exhibit cleft palate and abnormalities of craniofacial and tooth development. <i>Nat Genet.</i> 1994;6(4):348-56.	980	39.20	945	6
29	Chaturvedi AK, Engels EA, Anderson WF, Gillison ML. Incidence trends for human papillomavirus-related and -unrelated oral squamous cell carcinomas in the United States. <i>J Clin Oncol.</i> 2008;26(4):612-9.	970	88.18	1000	34
30	Loeys BL, Chen J, Neptune ER, Judge DP, Podowski M, Holm T, Meyers J, Leitch CC, Katsanis N, Sharifi N, Xu FL, Myers LA, Spevak PJ, Cameron DE, De Backer J, Hellemans J, Chen Y, Davis EC, Webb CL, Kress W, Coucke P, Rifkin DB, De Paepe AM, Dietz HC. A syndrome of altered cardiovascular, craniofacial, neurocognitive and skeletal development caused by mutations in TGFBR1 or TGFBR2. <i>Nat Genet.</i> 2005;37(3):275-81.	969	69.21	1100	11
31	Züchner S, Mersiyanova IV, Muglia M, Bissar-Tadmouri N, Rochelle J, Dadali EL, Zappia M, Nelis E, Patitucci A, Senderek J, Parman Y, Evgrafov O, Jonghe PD, Takahashi Y, Tsuji S, Pericak-Vance MA, Quattrone A, Battaloglu E, Polyakov AV, Timmerman V, Schröder JM, Vance JM. Mutations in the mitochondrial GTPase mitofusin 2 cause Charcot-Marie-Tooth neuropathy type 2A. <i>Nat Genet.</i> 2004;36(5):449-51.	969	64.60	1100	9
32	Henke M, Laszig R, Rube C, Schäfer U, Haase KD, Schilcher B, Mose S, Beer KT, Burger U, Dougherty C, Frommhold H. Erythropoietin to treat head and neck cancer patients with anaemia undergoing radiotherapy: randomised, double-blind, placebo-controlled trial. <i>Lancet.</i> 2003;362(9392):1255-60.	967	60.44	1000	14
33	ADHR Consortium. Autosomal dominant hypophosphataemic rickets is associated with mutations in FGF23. <i>Nat Genet.</i> 2000;26(3):345-8.	938	49.37	1000	6

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34	Takemura H, Hughes AR, Thastrup O, Putney JW Jr. Activation of calcium entry by the tumor promoter thapsigargin in parotid acinar cells. Evidence that an intracellular calcium pool and not an inositol phosphate regulates calcium fluxes at the plasma membrane. <i>J Biol Chem.</i> 1989;264(21):12266-71.	923	30.77	664	-
35	Marur S, D'Souza G, Westra WH, Forastiere AA. HPV-associated head and neck cancer: a virus-related cancer epidemic. <i>Lancet Oncol.</i> 2010;11(8):781-9.	915	101.67	1000	30
36	Gillison ML, D'Souza G, Westra W, Sugar E, Xiao W, Begum S, Viscidi R. Distinct risk factor profiles for human papillomavirus type 16-positive and human papillomavirus type 16-negative head and neck cancers. <i>J Natl Cancer Inst.</i> 2008;100(6):407-20.	911	82.82	968	466
37	Bergoffen J, Scherer SS, Wang S, Scott MO, Bone LJ, Paul DL, Chen K, Lensch MW, Chance PF, Fischbeck KH. Connexin mutations in X-linked Charcot-Marie-Tooth disease. <i>Science.</i> 1993;262(5142):2039-42.	902	34.69	863	9
38	Chisholm DM, Mason DK. Labial salivary gland biopsy in Sjögren's disease. <i>J Clin Pathol.</i> 1968;21(5):656-60.	889	17.43	740	-
39	Woo SB, Hellstein JW, Kalmar JR. Narrative [corrected] review: bisphosphonates and osteonecrosis of the jaws. <i>Ann Intern Med.</i> 2006;144(10):753-61.	883	67.92	944	15
40	Burkitt D. A sarcoma involving the jaws in African children. <i>Br J Surg.</i> 1958;46(197):218-23.	874	14.33	919	21
41	Herrero R, Castellsagué X, Pawlita M, Lissowska J, Kee F, Balaram P, Rajkumar T, Sridhar H, Rose B, Pintos J, Fernández L, Idris A, Sánchez MJ, Nieto A, Talamini R, Tavani A, Bosch FX, Reidel U, Snijders PJ, Meijer CJ, Viscidi R, Muñoz N, Franceschi S; IARC Multicenter Oral Cancer Study Group. Human papillomavirus and oral cancer: the International Agency for Research on Cancer multicenter study. <i>J Natl Cancer Inst.</i> 2003;95(23):1772-83.	819	51.19	854	23
42	Fox RI. Sjögren's syndrome. <i>Lancet.</i> 2005;366(9482):321-31.	816	58.29	869	6
43	Nutting CM, Morden JP, Harrington KJ, Urbano TG, Bhide SA, Clark C, Miles EA, Miah AB, Newbold K, Tanay M, Adab F, Jefferies SJ, Scrase C, Yap BK, A'Hern RP, Sydenham MA, Emson M, Hall E; PARSPORT trial management group. Parotid-sparing intensity modulated versus conventional radiotherapy in head and neck cancer (PARSPORT): a phase 3 multicentre randomised controlled trial. <i>Lancet Oncol.</i> 2011;12(2):127-36.	810	101.25	912	21
44	Calais G, Alfonsi M, Bardet E, Sire C, Germain T, Bergerot P, Rhein B, Tortochaux J, Oudinot P, Bertrand P. Randomized trial of radiation therapy versus concomitant chemotherapy and radiation therapy for advanced-stage oropharynx carcinoma. <i>J Natl Cancer Inst.</i> 1999;91(24):2081-6.	801	40.05	878	-
45	Kim JW, Dang CV. Cancer's molecular sweet tooth and the Warburg effect. <i>Cancer Res.</i> 2006;66(18):8927-30.	795	61.15	801	75
46	Bernier J, Cooper JS, Pajak TF, van Glabbeke M, Bourhis J, Forastiere A, Ozsahin EM, Jacobs JR, Jassem J, Ang KK, Lefèbvre JL. Defining risk levels in locally advanced head and neck cancers: a comparative analysis of concurrent postoperative radiation plus chemotherapy trials of the EORTC (#22931) and RTOG (# 9501). <i>Head Neck.</i> 2005;27(10):843-50.	789	56.36	927	16
47	Bittle JL, Houghten RA, Alexander H, Shinnick TM, Sutcliffe JG, Lerner RA, Rowlands DJ, Brown F. Protection against foot-and-mouth disease by immunization with a chemically synthesized peptide predicted from the viral nucleotide sequence. <i>Nature.</i> 1982;298(5869):30-3.	786	21.24	685	9
48	Klein RS, Harris CA, Small CB, Moll B, Lesser M, Friedland GH. Oral candidiasis in high-risk patients as the initial manifestation of the acquired immunodeficiency syndrome. <i>N Engl J Med.</i> 1984;311(6):354-8.	768	21.94	709	9
49	Foucar E, Rosai J, Dorfman R. Sinus histiocytosis with massive lymphadenopathy (Rosai-Dorfman disease): review of the entity. <i>Semin Diagn Pathol.</i> 1990;7(1):19-73.	767	26.45	773	3
50	Bamias A, Kastritis E, Bamia C, Mouloupoulos LA, Melakopoulos I, Bozas G, Koutsoukou V, Gika D, Anagnostopoulos A, Papadimitriou C, Terpos E, Dimopoulos MA. Osteonecrosis of the jaw in cancer after treatment with bisphosphonates: incidence and risk factors. <i>J Clin Oncol.</i> 2005;23(34):8580-7.	763	54.50	814	6
51	Grubman MJ, Baxt B. Foot-and-mouth disease. <i>Clin Microbiol Rev.</i> 2004;17(2):465-93.	763	50.87	692	13

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52	Acharya R, Fry E, Stuart D, Fox G, Rowlands D, Brown F. The three-dimensional structure of foot-and-mouth disease virus at 2.9 Å resolution. <i>Nature</i> . 1989;337(6209):709-16.	761	25.37	684	11
53	Hong WK, Endicott J, Itri LM, Doos W, Batsakis JG, Bell R, Fofonoff S, Byers R, Atkinson EN, Vaughan C, et al. 13-cis-retinoic acid in the treatment of oral leukoplakia. <i>N Engl J Med</i> . 1986;315(24):1501-5.	713	21.61	629	6
54	Groom J, Kalled SL, Cutler AH, Olson C, Woodcock SA, Schneider P, Tschopp J, Cachero TG, Batten M, Wheway J, Mauri D, Cavill D, Gordon TP, Mackay CR, Mackay F. Association of BAFF/BLYS overexpression and altered B cell differentiation with Sjögren's syndrome. <i>J Clin Invest</i> . 2002;109(1):59-68.	712	41.88	692	9
55	Proetzel G, Pawlowski SA, Wiles MV, Yin M, Boivin GP, Howles PN, Ding J, Ferguson MW, Doetschman T. Transforming growth factor-beta 3 is required for secondary palate fusion. <i>Nat Genet</i> . 1995;11(4):409-14.	705	29.38	691	6
56	Silverman S Jr, Gorsky M, Lozada F. Oral leukoplakia and malignant transformation. A follow-up study of 257 patients. <i>Cancer</i> . 1984;53(3):563-8.	700	20.00	757	3
57	Dixon MJ, Marazita ML, Beaty TH, Murray JC. Cleft lip and palate: understanding genetic and environmental influences. <i>Nat Rev Genet</i> . 2011;12(3):167-78.	696	87.00	759	11
58	Semina EV, Reiter R, Leysens NJ, Alward WL, Small KW, Datson NA, Siegel-Bartelt J, Bierke-Nelson D, Bitoun P, Zabel BU, Carey JC, Murray JC. Cloning and characterization of a novel bicoid-related homeobox transcription factor gene, RIEG, involved in Rieger syndrome. <i>Nat Genet</i> . 1996;14(4):392-9.	681	29.61	695	6
59	Isaacson PG, Spencer J. Malignant lymphoma of mucosa-associated lymphoid tissue. <i>Histopathology</i> . 1987;11(5):445-62.	676	21.13	689	-
60	Rheinwald JG, Beckett MA. Tumorigenic keratinocyte lines requiring anchorage and fibroblast support cultured from human squamous cell carcinomas. <i>Cancer Res</i> . 1981;41(5):1657-63.	665	17.50	535	-
61	Colella G, Campisi G, Fusco V. American Association of Oral and Maxillofacial Surgeons position paper: Bisphosphonate-Related Osteonecrosis of the Jaws-2009 update: the need to refine the BRONJ definition. <i>J Oral Maxillofac Surg</i> . 2009;67(12):2698-9.	663	66.30	66	-
62	Ruggiero SL, Dodson TB, Fantasia J, Goodday R, Aghaloo T, Mehrotra B, O'Ryan F; American Association of Oral and Maxillofacial Surgeons. American Association of Oral and Maxillofacial Surgeons position paper on medication-related osteonecrosis of the jaw--2014 update. <i>J Oral Maxillofac Surg</i> . 2014;72(10):1938-56.	657	131.40	833	28
63	Corrao G, Bagnardi V, Zambon A, La Vecchia C. A meta-analysis of alcohol consumption and the risk of 15 diseases. <i>Prev Med</i> . 2004;38(5):613-9.	653	43.53	675	199
64	Greenspan JS, Greenspan D, Lennette ET, Abrams DI, Conant MA, Petersen V, Freese UK. Replication of Epstein-Barr virus within the epithelial cells of oral "hairy" leukoplakia, an AIDS-associated lesion. <i>N Engl J Med</i> . 1985;313(25):1564-71.	644	18.94	685	3
65	Neville BW, Day TA. Oral cancer and precancerous lesions. <i>CA Cancer J Clin</i> . 2002;52(4):195-215.	641	37.71	675	7
66	Eisbruch A, Ten Haken RK, Kim HM, Marsh LH, Ship JA. Dose, volume, and function relationships in parotid salivary glands following conformal and intensity-modulated irradiation of head and neck cancer. <i>Int J Radiat Oncol Biol Phys</i> . 1999;45(3):577-87.	642	32.10	709	-
67	Trotti A, Bellm LA, Epstein JB, Frame D, Fuchs HJ, Gwede CK, Komaroff E, Nalysnyk L, Zilberberg MD. Mucositis incidence, severity and associated outcomes in patients with head and neck cancer receiving radiotherapy with or without chemotherapy: a systematic literature review. <i>Radiother Oncol</i> . 2003;66(3):253-62.	641	40.06	670	-
68	Lindberg R. Distribution of cervical lymph node metastases from squamous cell carcinoma of the upper respiratory and digestive tracts. <i>Cancer</i> . 1972;29(6):1446-9.	632	13.45	768	7
69	Foote FW, Frazell EL. Tumors of the major salivary glands. <i>Cancer</i> . 1953;6(6):1065-133.	628	9.52	895	-
70	Stothard KJ, Tennant PW, Bell R, Rankin J. Maternal overweight and obesity and the risk of congenital anomalies: a systematic review and meta-analysis. <i>JAMA</i> . 2009;301(6):636-50.	626	62.60	726	22
71	Skre H. Genetic and clinical aspects of Charcot-Marie-Tooth's disease. <i>Clin Genet</i> . 1974;6(2):98-118.	618	13.73	604	3
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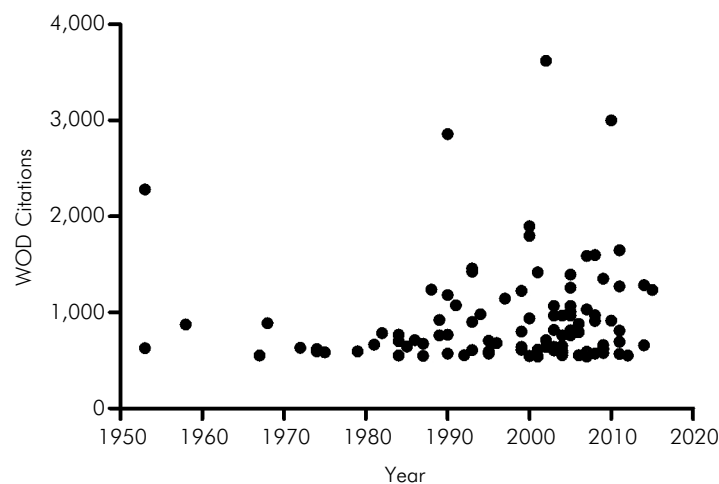
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91	Sonis ST. The pathobiology of mucositis. <i>Nat Rev Cancer.</i> 2004;4(4):277-84.	555	37.00	590	3
92	Dahlin DC, Coventry MB. Osteogenic sarcoma. A study of six hundred cases. <i>J Bone Joint Surg Am.</i> 1967;49(1):101-10.	551	10.60	471	-
93	Gillison ML, Broutian T, Pickard RK, Tong ZY, Xiao W, Kahle L, Graubard BI, Chaturvedi AK. Prevalence of oral HPV infection in the United States, 2009-2010. <i>JAMA.</i> 2012;307(7):693-703.	550	78.57	620	143
94	Isaacson P, Wright DH. Extranodal malignant lymphoma arising from mucosa-associated lymphoid tissue. <i>Cancer.</i> 1984;53(11):2515-24.	550	15.71	609	-
95	Brizel DM, Wasserman TH, Henke M, Strnad V, Rudat V, Monnier A, Eschwege F, Zhang J, Russell L, Oster W, Sauer R. Phase III randomized trial of amifostine as a radioprotector in head and neck cancer. <i>J Clin Oncol.</i> 2000;18(19):3339-45.	549	28.89	622	6
96	Advisory Task Force on Bisphosphonate-Related Osteonecrosis of the Jaws, American Association of Oral and Maxillofacial Surgeons. American Association of Oral and Maxillofacial Surgeons position paper on bisphosphonate-related osteonecrosis of the jaws. <i>J Oral Maxillofac Surg.</i> 2007;65(3):369-76.	547	45.58	658	9
97	Gorlin RJ. Nevoid basal-cell carcinoma syndrome. <i>Medicine (Baltimore).</i> 1987;66(2):98-113.	547	17.09	626	3
98	Satokata I, Ma L, Ohshima H, Bei M, Woo I, Nishizawa K, Maeda T, Takano Y, Uchiyama M, Heaney S, Peters H, Tang Z, Maxson R, Maas R. Mx2 deficiency in mice causes pleiotropic defects in bone growth and ectodermal organ formation. <i>Nat Genet.</i> 2000;24(4):391-5.	546	28.74	560	-
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**Figure 1.** Number of citations per year.



different journals, with 89% published in non-specific journals for oral medicine and pathology. The *New England Journal of Medicine* was the journal with the highest number of papers in the top-100 followed by the American Cancer Society and *Nature Genetics*, accounting for 24 papers out of 100 (Table 2).

The authors belonged to institutions in 18 different countries. Most were from institutions in the United States (55%) and Europe (35%). Papers were published in both developed (e.g., Japan, Australia, Canada, and Israel) and developing countries (e.g., China, Costa Rica, Taiwan, and Uganda) (Table 3). The most frequent field of study was head and neck cancer (n = 38), followed by congenital craniofacial anomaly (n = 8) and osteonecrosis (n = 8) (Table 4). The most common methodological designs were laboratory and descriptive studies, which accounted for 59% of the papers. Few studies have been clinical, retrospective, or comparative studies, or case-reports (Table 5).

In the correlation analysis, a strong correlation was found between the number of citations in WOS and the total number of citations in Dimensions ( $r = 0.976$ ,  $p < 0.0001$ ). A clear linear correlation between the number of citations of the papers in both databases can be seen in the scatter plot graph in Figure 2. Furthermore, a poor correlation was found between AAS and the number of citations in WOS for those papers which had an AAS ( $r = 0.147$ ,  $p = 0.185$ ).

## Discussion

Analyzing the most frequently cited papers in a specific area enables researchers to identify the evolution of research in that area over time and to gain a better understanding of the areas of most interest and the existing gaps.<sup>1,2</sup> We aimed to identify and analyze the 100 most-cited papers in the field of oral medicine and pathology. Oral medicine and pathology are specialties at the intersection of medicine and dentistry, focused on oral symptoms, diagnosis, and the oral care of medically compromised patients.<sup>21</sup> These fields were identified as specialties by Dr. Samuel Charles Miller when he founded the American Academy of Oral Medicine in 1945 (<https://www.aom.com/history>).

However, because oral medicine and pathology were considered medical fields for many years, there are few consolidated journals in our area and many researchers choose to submit to a medical journal. This is one possible explanation for why most of the publications were in non-specific journals. Of the 47 journals in which the top-100 cited papers were published, only 6 were publications specifically on oral medicine and pathology.

A citation classic refers to a paper with 100 or more citations; however, this number varies according to specialty.<sup>8,9,10,11,12,13,14,15,16,17,18,19</sup> In this study, the 100 most-cited papers in oral medicine and pathology received a greater number of citations, ranging from 541 to 3623. Therefore, all the papers on our list of the 100 most-cited are classics, as in some studies in dentistry.<sup>11,12,13,14,15,18,19</sup> However, other bibliometric studies in dentistry have listed papers with less than 100 citations.<sup>8,9,10,16,17,20</sup> This discrepancy is possible because in addition to being a very specific area of dentistry, some journals were non-specific in terms of the area studied, as in our study.

In oral medicine and pathology, head and neck cancer is the most worrying disease, and numerous studies have been conducted on this topic over time.<sup>22</sup> Therefore, studies targeted at understanding, preventing, and/or treating head and neck cancer have made this condition the most-cited thematic field in the 100 most-cited papers in oral medicine and pathology. Congenital craniofacial anomaly and osteonecrosis were the others fields most-cited in the top 100 list, reflecting the holistic manner in which oral medicine and pathology deals with health.

Although the numbers of reviews are rapidly increasing in dentistry,<sup>23</sup> only 9% of the 100 most-cited oral medicine and pathology papers were reviews (systematic reviews 4%, literature reviews 3%, and meta-analyses 2%). Thus, as authors prefer to cite reviews over research with a lower level of evidence,<sup>24</sup> additional systematic reviews and meta-analyses are needed for various focused questions in oral medicine and pathology. Fifty nine percent of the papers were laboratory and descriptive studies. This finding is not surprising since these types of studies are the precursors and subsequent studies cite them.

**Table 2.** The 47 journals in which the top-100 cited papers were published.

Journal	Nº of papers	ISSN	Published since
The New England Journal of Medicine	10	0028-4793	1812
American Cancer Society	7	1097-0142	1913
Nature Genetics	7	1546-1718	1992
Journal of Oral Maxillofacial Surgery	6	1531-5053	1943
Journal of the National Cancer Institute	6	1460-2105	1940
The Lancet	6	1474-547X	1823
Cancer Research	5	1538-7445	1916
Journal of Clinical Oncology	5	1527-7755	1983
Cell	3	1097-4172	1974
Nature	3	1476-4687	1869
JAMA	2	1538-3598	1883
Journal of Bone and Mineral Research	2	1535-1386	1889
Journal of Clinical of Oncology	2	1527-7755	1983
Nature Reviews Cancer	2	1474-1768	1869
Science	2	1095- 9203	1880
Annals of Internal Medicine	1	1539-3704	1927
Annals of the Rheumatic Diseases	1	1468-2060	1939
Anticancer Research	1	1791-7530	1981
Arthritis e Rheumatology	1	2326-5205	1958
Bull World Health Organ	1	1564-0604	1947
Cancer Epidemiology Biomarkers and Prevention	1	1538-7755	1991
Clinical Cancer Research	1	1557-3265	1995
Clinical Genetics	1	1399-0004	1970
Clinical Microbiology	1	1098-660X	1975
Community Dentistry Oral Epidemiology	1	1600-0528	1973
International Journal of Radiation Oncology	1	0360-3016	1975
Journal of Biological Chemistry	1	1083-351X	1905
Journal of Clinical Pathology	1	1472-4146	1947
Journal of Community Health	1	1573-3610	1975
Journal of Experimental Medicine	1	1540-9538	1986
Journal of Oral Pathology of Medicine	1	1600-0714	1943
Journal of the Sciences and Specialties of the Head and Neck	1	1097-0347	1995
Medicine (Baltimore)	1	1536-5964	1922
Microbiology	1	1465-2080	1947
Nano Letters	1	1530-6992	2001
Nature Reviews Genetics	1	1471-0064	2000
Oral Oncology	1	1368-8375	1965
Oral Surgery Oral Medicine Oral Pathology	1	2212-4411	1948
Preventive medicine	1	1096-0260	1972
Radiology	1	0033-8419	1923

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Radiotherapy & Oncology	1	0167-8140	1983
Seminars in Diagnostic Pathology	1	0740-2570	1984
Seminars in Arthritis and Rheumatism	1	0049-0172	1971
Society for the Study of Addiction	1	1360-0443	1884
The British Journal of Surgery	1	0007-1323	1913
The Journal of Clinical Investigation	1	1558-8238	1924
The Lancet Oncology	1	1470-2045	2000

**Table 3.** The 18 countries of origin of the top-100 cited papers in pathology and oral medicine.

Country	No. of papers	Citations	
		WOS	Citations/papers
United States of American	55	49777	905.03
United Kingdom	11	8160	741.81
France	7	8405	1200.71
Italy	4	6363	1590.75
Switzerland	4	3530	882.50
Germany	3	3082	1027.33
Japan	3	2363	787.67
Netherlands	2	1845	992.50
Norway	2	1229	614.50
Australia	1	712	712.00
Canada	1	603	603.00
China	1	573	573.00
Costa Rica	1	819	819.00
Greece	1	763	763.00
Ireland	1	572	572.00
Israel	1	585	585.00
Taiwan	1	1419	1419.00
Uganda	1	874	874.00

The vast majority of the most-cited publications (90%) were from the United States or Europe. This result probably reflects the better funding policies and the large number of researchers that are in these countries. The United States and European countries are also the leading countries in terms of medical research publications. In addition, the citations originate more frequently from institutions located in the same country,<sup>25</sup> and researchers from different parts of the world often move to these countries (<https://www.iom.int/wmr/>).

A strong correlation was observed between WOS and Dimensions citation counts. This finding indicates that the new database (Dimensions) can be used as an alternative to WOS. This result was previously observed in a study by Garcovich et al.<sup>16</sup> However, AAS values were not directly comparable to WOS citation counts. Two other studies also found no correlation between AAS and WOS or Scopus citation count.<sup>16,26</sup> In addition, Thelwall<sup>27</sup> reported that Dimensions is comparable in coverage to Scopus, suggesting that WOS, Dimensions and

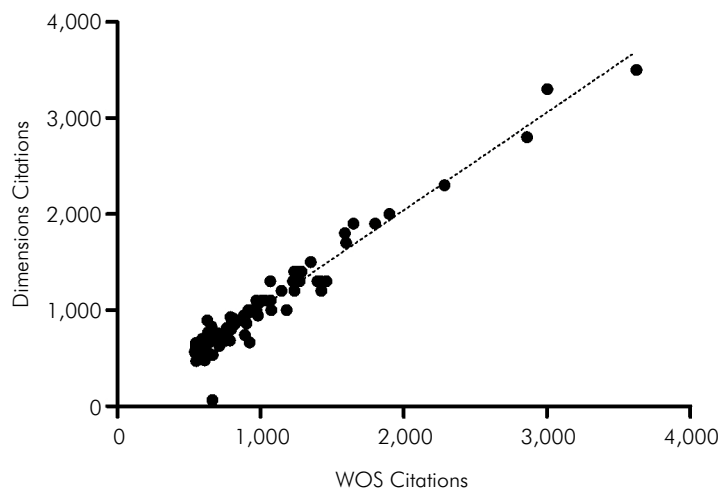
**Table 4.** Study subjects in the 100-top cited papers in pathology and oral medicine.

Study subject	No. of papers	Citations			AAS
		WOS	WOS/years	Dimensions	
Head and Neck Cancer	38	37646	52.43	40763	2262
Craniofacial congenital anomaly	8	6282	47.59	6644	77
Osteonecrosis	8	6839	80.45	6915	92
Behçet's syndrome	7	7575	35.23	7151	41
Etiology of oral diseases	6	4485	56.06	4899	412
Sjogren's syndrome	6	8059	47.41	7514	35
Pre-malignant lesions	5	4069	30.82	4073	87
Charcot-Marie-Tooth syndrome	5	4105	31.09	4138	40
Oral candidiasis	4	2485	32.27	2510	47
Oral mucositis	2	1196	38.58	1260	3
Salivary gland tumors	2	1551	16.15	1559	-
MALT* lymphoma	2	1226	18.30	1298	-
Burkitt's lymphoma	1	874	14.33	919	21
Rosai-Dorfman disease	1	767	26.45	773	3
Chemotherapy in head and neck cancer	1	1798	94.63	1900	6
Hypophosphataemic rickets	1	938	49.36	1000	6
Osteogenic sarcoma	1	551	10.59	471	-
Gorlin-Goltz syndrome	1	547	17.09	626	3
Rieger syndrome	1	681	29.61	695	6

\*Mucosa-associated lymphoid tissue lymphoma.

**Table 5.** Study designs used in the 100-top cited papers in pathology and oral medicine.

Study design	No. of papers	Citations			AAS
		WOS	WOS/paper	Dimensions	
Laboratory	33	27152	822.78	27694	580
Descriptive	26	27395	1053.65	27628	424
Randomized	8	6158	769.75	6216	57
Case-control	5	5166	1033.20	5454	660
Epidemiological	5	4389	877.80	5429	959
Longitudinal	4	2679	669.75	2577	9
Systematic review	4	3408	852.00	3740	64
Cross-sectional	3	1878	626.00	2267	10
Literature review	3	2673	891.00	2675	19
Clinical	2	2022	1011.00	1928	76
Retrospective	2	4288	2144.00	4700	62
Meta-analysis	2	2451	1225.50	2575	205
Case report	2	1226	613.00	1298	-
Comparative	1	789	789.00	927	16



**Figure 2.** Scatter plot examining the relationship between WOS citations and Dimensions citations.

Scopus can all be used independently to assess research quality.

## Conclusion

In conclusion, this biometric analysis identified the major areas of interest in the field of oral medicine and pathology. The most relevant areas that were explored in the 100 most-cited papers were head and neck cancer, congenital craniofacial anomaly, and osteonecrosis. The majority of the papers were laboratory and descriptive studies and were published

in non-specific journals. Together, these findings can help guide the training of oral medicine and pathology students and reveal the gaps in the field.

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