TOP 100MOST CITED ARTICLESON THEUSEOF OZONEINDENTISTRY:BIBLIOMETRICANALYSIS

ABSTRACT

Introdution:cdensity(number of citations per year), first author's country, year of publication, study design and subject.

VOSviewersoftwarewasusedtocreategraphicalbibliometricmaps.**Results:**Thetotalnumberofcitationspaperswhichfrom13 to 180, and only eight were cited more than 100 times. Papers were published from 1997 to 2022, mainly indentistryjournals.Thestudiesoriginatedfrom30differentcountriesandthemostpaperswerefromGermany

(16%) and Turkey (15%). In total, 250 keywords were used and the most used were ozone 50 (20%), dentistry 8(3,2%) and periodontitis 7 (2,8%). **Conclusions:** 1) Germany was the main country that contributed to fieldresearch on the use of ozone in dentistry 2) The University of Basel was the most productive university in theresearched field; 3) Clinical Oral Investigations was the journal that led the ranking with the most articlespublished, 4) The keyword ozone was the most used in the articles; 5) Oral and maxillofacial surgery was theresearch area mostaddressedbythe100mostcitedarticles.

Keywords: Bibliometrics;Citationanalysis;Ozone;Dentistry.

INTRODUCTION

Ozone is an immunostimulant, antimicrobial, and biocompatible agent [1], and there is evidence ofitseffectivenessasa therapeuticagentinboth medicine anddentistry[2].

In dentistry specifically, it is used through various indirect application methods, including gaseousozone generators, ozonated water, and ozonated oil [3]. These diverse applications are being studied across severalspecialties,suchas endodontics [4, 5, 6], restorativedentistry[2,7, 8], oral medicine[9,10, 11], surgery[12, 13,
14],periodontics[3,15,16],implantology[17,18,19],amongothers.

Althoughlaboratorystudiessuggestafavorablepotentialforozoneuseindentistry,clinicalevidencesuppo rting its routine application as a treatment modality remains limited. Therefore, well-designed studies areessentialtoassesstheefficacyandsafetyof thistherapeuticapproach [20].

Generally, studies with the highest methodological rigor are published in journals with the greatestimpact. Consequently, bibliometric analyses have emerged to identify significant articles that influence medicalpractice and inspire new research ideas [21]. These bibliometric methods evaluate the quality, credibility, andimpactofstudies[22,23]throughcitationanalyses,whichassessresearchperformance[24]anddeterminewhetherit has achieved its objectives in a specific area of health research [25]. As a result, they assess numerous publicationsfrom institutionsacrossdifferentcountries[26].

In2021,thePubMeddatabaserecordedoverthreehundredbibliometricreviewarticlesinthehealthfield,fo cusingonevaluatingthetop100citedarticleswithintheirareasofinterest,manyofwhichwererelatedtoDentistry[27].Ho wever,asearchusingtheMeSHdescriptors'Bibliometrics'AND'ozonetherapy'AND'dentistry'yielded no results in this database. Consequently, a bibliometric study on the use of ozone therapy in dentistrycould significantly contribute to the scientific literature by guiding future research and publications. It wouldenableresearchersto track theprogressofstudiesin thisarea and deepentheirunderstanding.

Thus, the objective of this bibliometric analysis was to identify and classify the 100 most citedarticlesrelatedtothe clinicaluse of ozone indentistry.

MATERIALANDMETHODS

“The literature search was conducted following the Strengthening the Reporting of ObservationalStudies in Epidemiology (STROBE) guidelines, using the Clarivate Analytics Web of Science database.
Thismethodologyissimilartothatdescribedinapreviousstudy,whichanalyzedtherankingofthe100mostcitedarticles related to orthognathic surgery, and another study, which focused on the 100 most cited articlesconcerningthirdmolarsurgery.Asareview,thisstudyisexemptfromresearchethicsboardapproval” [27-28].

Searchstrategy

A search was conducted on October 10, 2022, using Clarivate Analytics' Web of Science database. Thesearchtermsincluded“ozone”or“ozonetherapy”or“ozonized”combinedwith“dentistry”or“dental”inthetitleand/orabstract.TheresultswereextractedintoatableusingMicrosoftExcelandorganizedindescendingorderofcitation count.Manuscriptswere selected by twoindependent,previously calibratedresearchers.

To be included in this study, publications needed to mention ozone in the title and/or abstract. Publicationsunrelated to the topic were excluded. There were no restrictions on the year of publication, journal impact factor,study design,or manuscriptlanguage.

The most cited articles were manually analyzed for the following information from the Clarivate AnalyticsWeb of Science database: number of citations, year of publication, journals, keywords, authors, contributinginstitutions, countries, and research fields in dentistry. The country of origin and contributing institution of eacharticleweredeterminedbasedon the addressprovidedforthefirstcorrespondingauthor.

The number of articles and citations per article were graphed using the Statistical Package for the SocialSciences (SPSS version 22.0). The relationship between authors was determined based on how frequently theycitedeachother,usingnetworkvisualizationcreatedwithVOSviewersoftware(LeidenUniversity,Netherlands).

RESULTS

The initial search identified 743 articles in the database. After reviewing titles and abstracts, the 100 mostcitedmanuscriptsinvolvingozoneindentistrywerelistedinTable1,orderedbycitationcount.Thestudyselectionprocess,includingthesearch strategy used inthedatabase,issummarized inaflowdiagram (Figure1).

Authorspublicationsandcitations

Thenumberofauthorsrangedfromonetotwelve,withameanof4.80±2.23.Theauthorsandco-authorswith the highest number of publications among the top 100 were Edward Lynch (8), Reinhard Hickel (5), andHakkiOguzKazancioglu (5).Figure2 providesagraphicalrepresentation ofthenetworkbetweentheauthors.

Thearticleswiththehighestnumberofcitationsamongthetop100werebyFliefelR(2015)withatotalof 180 citations, Azarpazhooh A (2008) with 158 citations, and Baysan A (2000) with 146 citations. The numberofcitationsrangedfrom13to180,withameanof38.56±33.06.Only8articlesreached100citations(Table1).

The earliest manuscript inthis bibliometric analysis was publishedin1997byFilippi A inOzone: Science& Engineering (OSE) and was cited 15 times. The most recent article was published in 2022 by Rapone B inInternationalJournalofEnvironmental Research andPublicHealth (IJER)and wascited33 times.

Figure 3 illustrates the correlation between the number of citations and the year of publication of thestudies. The citation distribution shows significant peaks in the years 2008 and 2015, with the top 100 studiesreceiving 436and413citations,respectively.

Institutionsandcountries

A total of 76 different international institutions are associated with these studies. The University of Baselled the list with 5 manuscripts published among the top 100 most cited, followed by BezmialemVakif Universitywith4articles.

Thestudiesoriginatedfrom30differentcountries. TheleadingcountrieswereGermanywith16manuscripts,Turkeywith15articles,Italywith12articles,andSwitzerlandwi th11manuscripts.England,Japan,andtheUSAeachcontributedeightmanuscriptstothetop100articles(Figures4and5).

Journals

The 100 most cited articles involving ozone in dentistry were published in 59 different journals. *ClinicalOral Investigations* (COI) led the list with 7 articles, followed by *American Journal of Dentistry* (AJD) with 5articles.*EuropeanJournalofOralSciences*(EJPS),*JournalofCraniofacialSurgery*(JCS),*JournalofEndodontics*(JE), and*Lasersin MedicalScience*(LMS)each publishedfourarticles(Figure6).

Keywords

A total of 250 keywords were used across the top 100 articles. The five most frequently used keywordswere: ozone (50 times, 20%), dentistry (8 times, 3.2%), periodontitis (7 times, 2.8%), ozone therapy (6 times,2.4%), and disinfection (5 times, 2%). The most frequently used keyword appeared in 50 studies, with thefrequency of keywords ranging from one to fifty occurrences. Figure 7 provides a graphical representation of thekeywordsinmapform.

ResearchField

Figure 8 displays the research fields covered by the 100 most cited articles on ozone in dentistry. Theleading fields were Oral and Maxillofacial Surgery (OMFS) and Operative Dentistry, each with 19 studies,followed byMicrobiologywith 18studies.

Another significant finding from this bibliometric analysis is that 9 studies within the top 100 evaluatedozoneasan alternative treatmentformedication-related osteonecrosisofthe jaw(MRONJ).

Time-patternofpublications

Based on the distribution of the 100 articles over the years, 2008, followed by 2009 and 2012, were theyearswiththehighestconcentration ofpublications,with12,10,and 9studiesrespectively (Figure9).

DISCUSSION

This paper aims to conduct a bibliometric analysis of ozone therapy in dentistry. Given the considerablegrowth in scientific publications over time, bibliometric methods can assist researchers andclinicians in identifyingkey factors to consider when choosing where to publish their work or where to search for information on a field.Thus,alistofthetop100most-citedarticlesonozonetherapyindentistrywascompiled,accompaniedbygraphicdatavisualizationstoprovideresearchers and academicswith a better understanding of thesubject.

One important parameter in bibliometric analyses is the total number of citations, with articles receivingover 100 citations often classified as classics [25]. While studies with high citation rates are generally consideredinfluential in their field, a low citation count does not necessarily indicate poor quality [29], as citation patternscan vary greatly depending on the type of publication, research, and discipline, and their significance can evolveover time [26].

Thetwomostcitedarticlesonozoneindentistryweresystematicreviews.Themostcitedstudydiscussedozone as an adjunctive treatment for bisphosphonate-related osteonecrosis of the jaws [9], while the second mostcited article systematically reviewed the clinical application and potential of ozone remineralization in dentistry[20]. The third most cited article featured an in vitro study designed to evaluate the antimicrobial effect of ozonefrom a new ozone-generating device on primary root caries lesions, specifically targeting *Streptococcus mutans*and *Streptococcussobrinus*[2].

IntermsofdisciplinesOralandMaxillofacialSurgery(OMFS)andOperativeDentistryleadtheranking.The high number of citations in these areas can be attributed to the success of ozone therapy in decontaminatingboth surgical and clinical environments. Ozone therapy has established itself as an extremely effective alternativetreatmentforchallengingconditionssuchasmedication-inducedosteonecrosisofthejaws(MRONJ)[9,30,31,

32,
33,34].Additionally,othersurgicalproceduresbenefitfromozonetherapy,includingthirdmolarextractions[13,14],oralpathology[11],temporomandibular disorders[35],and dentalimplants[17,18,19,36].

Decontaminationofcariesisalsoawell-establishedprocedure[7,37,38,39,40,41,42,43],including rootcariesdecontaminationanditsuseasanendodonticirrigation solution[2,4,5,6,44,45,46,47,48,49].

Bibliometrics provides a tool that can be scaled from the micro level (institutions) to the macro level(countries)[26].Inthisanalysis,thediverserangeofstudiesisevident,withcontributionsfromover70institutions,notably theUniversityofBasel,and 30differentcountries,with Germany being prominent.

Ozonegenerationisconsideredacost-effectiveandefficientmethod.Althoughmostleadingcountriesarehigh-income economies, Turkey, a middle-income country, stands out as a significant contributor to research onthis topic. The subject of ozone therapy is taken seriously by researchers, as evidenced by the high impact factorsofseveraljournalslistedinthetop100,suchasClinicalOralInvestigations[17,50,51,52,53,54,55]andJournalof Endodontics [47, 50, 56, 57]. Increased international collaborations and the use of the Internet could furtherexpandthe volumeof publicationsand fosterknowledge exchangeamongresearchers.

As noted in the literature, using appropriate keywords is crucial for extensive article dissemination [28,58]. The keyword ozone was used in only half of the most-cited articles, often alongside related terms such asdentistry or periodontitis. Despite its relevance, ozone therapy is not listed among MeSH keywords. The authorssuggestadoptingMeSHkeywordsforstandardization andbroaderuse [59].

In conclusion, the application of ozone in dentistry and medicine has increased in recent years due to itsrecognized benefits [36]. However, the bibliometric data from this study indicate that the years 2008, 2009, and2012 were the most productive, with peaks in citations observed in 2008 and 2015. Despite the expected rise inpublicationsoverthelastfiveyears,theoldestarticleintheanalysiswaspublishedin1997[60]andthemostrecentin 2022 [7]. It is important to consider that the ranking of the 100 most cited articles represents the currentlandscape, andongoingscientific advancementsnecessitateperiodic updatesto reviews.

A major limitation of this study is the reliance on the Web of Science for bibliometric analysis. Otherbibliometric databases, such as Medline, Embase, and Cochrane Library, were not included. However, Web ofScience is widely used due to its established metrics for comparing journal impact within disciplines throughJournal Citation Reports (JCR; Clarivate Analytics). Factors such as journal and author self-citations, incompleteciting,andmanuscriptavailabilitycanaffectcitationrates.Thus,whilemanyjournalsreportonozoneindentistry,thisreflectsgrowing interestin thetopicrather thannecessarilyindicatinghigh-quality research.

CONCLUSIONS

Thisbibliometricanalysiscanleadustoconcludethat:1)Germanywasthemaincountrythatcontributedto field research on the use of ozone in dentistry 2) The University of Basel was the most productive university inthe researched field; 3) Clinical Oral Investigations was the journal that led the ranking with the most articlespublished, 4) The keyword ozone was the most used in the articles; 5) Oral and maxillofacial surgery was theresearch area mostaddressedbythe100mostcitedarticles.

Thebibliometriclisthelpslocatestudiesonspecifictopicsandhighlightstrendsintheresearchovertime. Theseresultscanguideauthorsonwheretoconsidersubmittingtheirresearchonozonetherapyindentistry.

ABBREVIATIONS

AD: Annals ofDermatology; ADJ: AustralianDental Journal; AJD: AmericanJournal of Dentistry; AMR: Archivesof Medical Research; AMS: Advances in Medical Sciences; AO: Angle Orthodontist; ASB: Applied Sciences-Basel; B: Biomaterials; BF: Biofactors; BOH: Bmc Oral Health; BOR: Brazilian Oral Research; BRI: BiomedResearchInternational;CA:CollegiumAntropologicum;CDSR: CochraneDatabaseOfSystematic Reviews; COI: Clinical Oral Investigations; COIR: Clinical Oral Implants Research; CR: Caries Research; DM:DentalMaterials;DMJ:DentalMaterialsJournal;DT:DentalTraumatology;EJPS:EuropeanJournalofOralSciences;HTA:HealthTechnologyAssessment;IEJ:InternationalEndodonticJournal;IJER:InternationalJournalofEnvironmentalResearch and Public Health;IJOMI:InternationalJournal ofOral& Maxillofacial Implants;IJOMS:InternationalJournalofOralandMaxillofacialSurgery;IJP:InternationalJournalof Prosthodontics;IN:InterventionalNeuroradiology;JAD:JournalofAdhesiveDentistry;JAOS:JournalofAppliedOral Science; JBO: Journal of Bone Oncology; JCPD: Journal of Clinical Pediatric Dentistry; JCS: Journal ofCraniofacialSurgery;JD:JournalofDentistry;JDR:JournalofDentalResearch;JDS:JournalofDentalSciences;JE:JournalofEndodontics;JERD: JournalofEstheticAndRestorativeDentistry;JFMA:JournaloftheFormosanMedical Association; JP: Journal of Periodontology; JPIERD: Journal of Prosthodontics-Implant Esthetic andReconstructiveDentistry;JPIS:JournalofPeriodontalandImplantScience;JPR:JournalofPeriodontalResearch;JPRE: Journal of Pain Research; LMS: Lasers in Medical Science; LSM: Lasers in Surgery And Medicine; MGR:Medical Gas Research; MSE: Materials Science & Engineering C-Materials for Biological Applications; NM: NewMicrobiologica; O: Odontology; OMI: Oral Microbiology and Immunology; OO: Oral Oncology; OSE: Ozone-Science&Engineering;QUADO:OralSurgeryOralMedicineOralPathologyOralRadiologyandEndodontology; PLS: Photomedicine and Laser Surgery; PPT: Photodiagnosis and Photodynamic Therapy; QI:QuintessenceInternational;SDJ:SwedishDentalJournal;SR:ScientificReports;STAM:ScienceandTechnologyof AdvancedMaterials.

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1.

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3.

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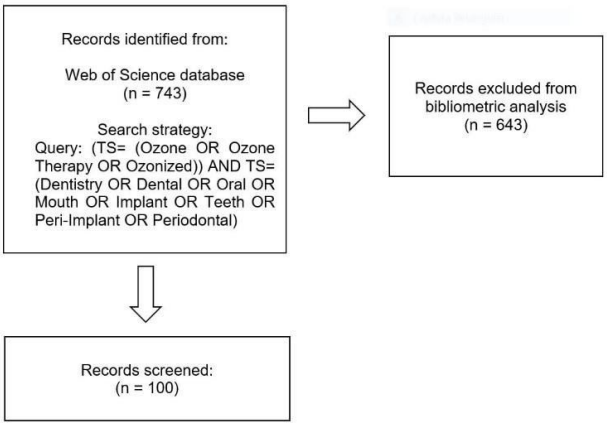

FIGURE1. Flowdiagramofthestudyselectionprocessandsearchstrategy.

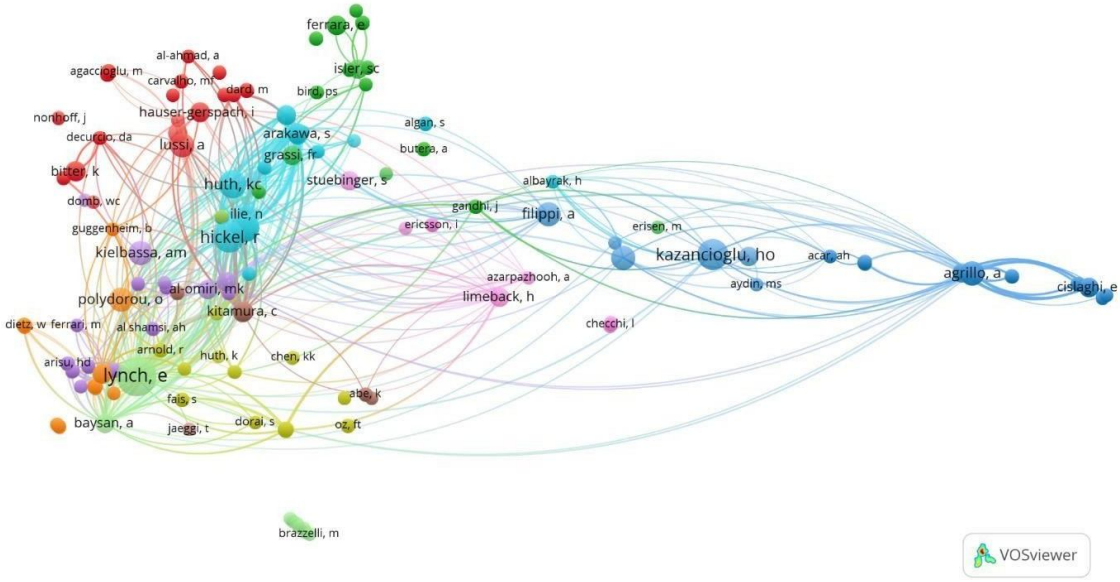

FIGURE2. Thenetwork ofauthorsandcitationsofthebibliographicresearch “ozoneindentistry”.

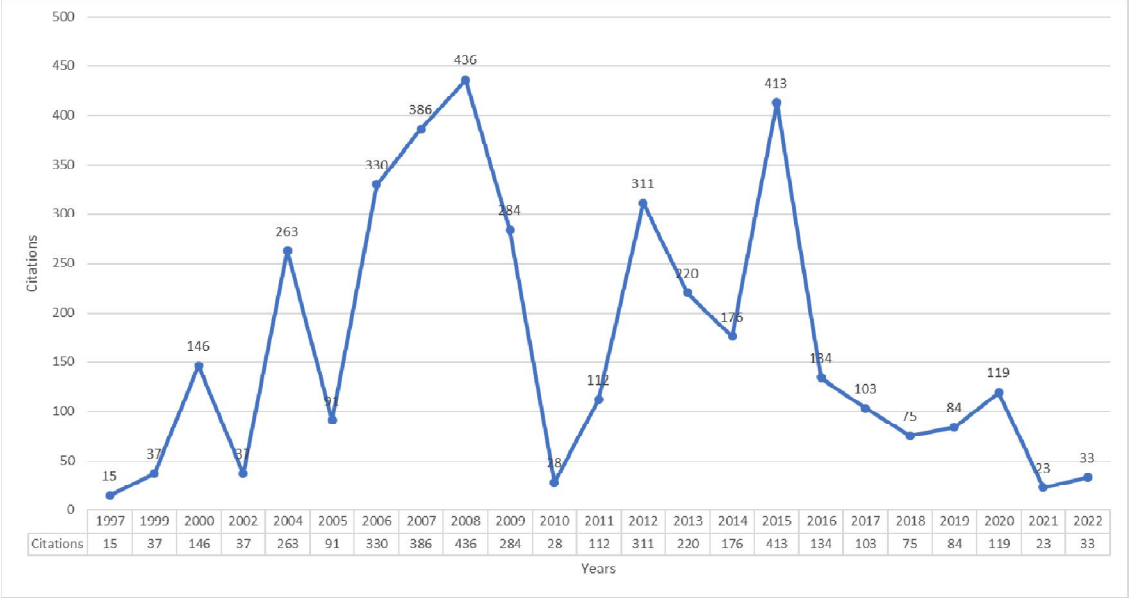

FIGURE3. Correlationbetween thenumberofcitationsandtheyearofpublicationofthestudies.

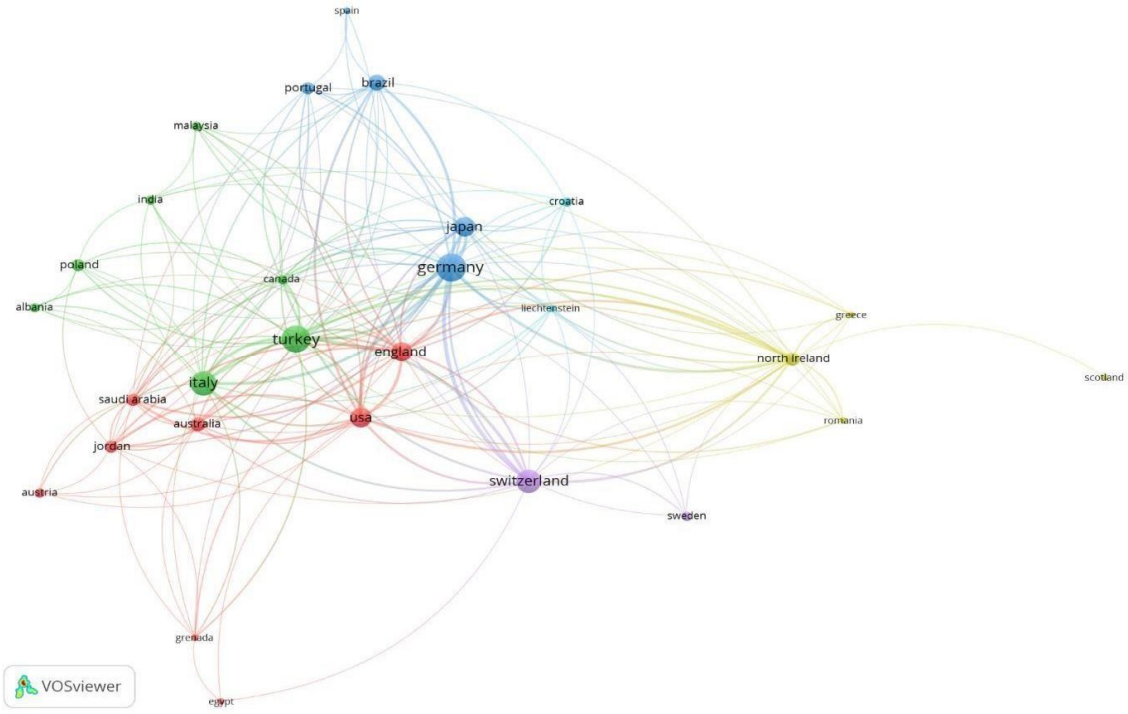

FIGURE4. Networkanalysisofcountriesfrom“ozoneindentistry”bibliographicsearch.Circlesizesarerelatedto countriesandtheirnumberof publications.

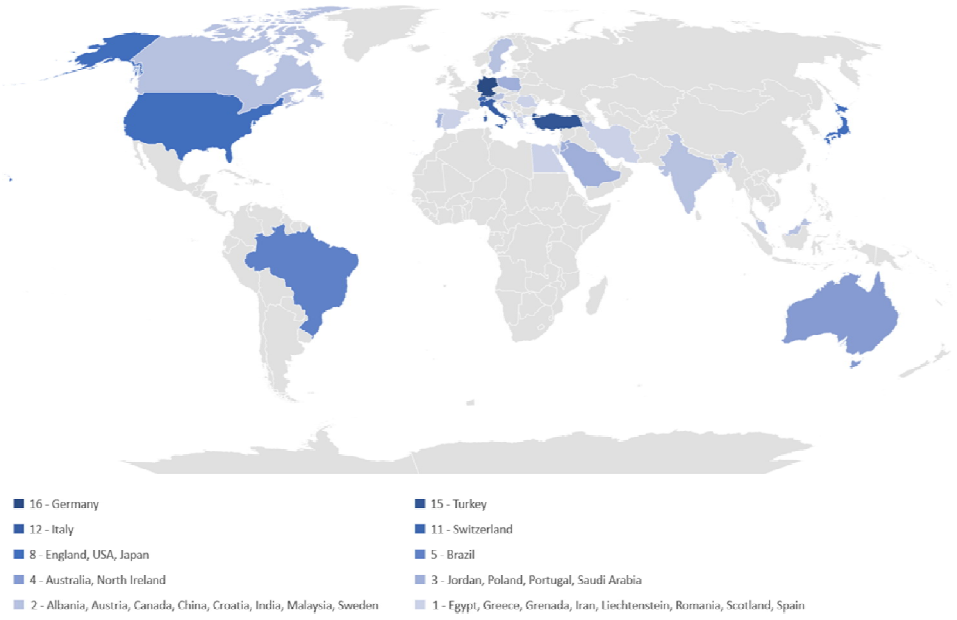

FIGURE5. Countriesoforigin oftop100articles.

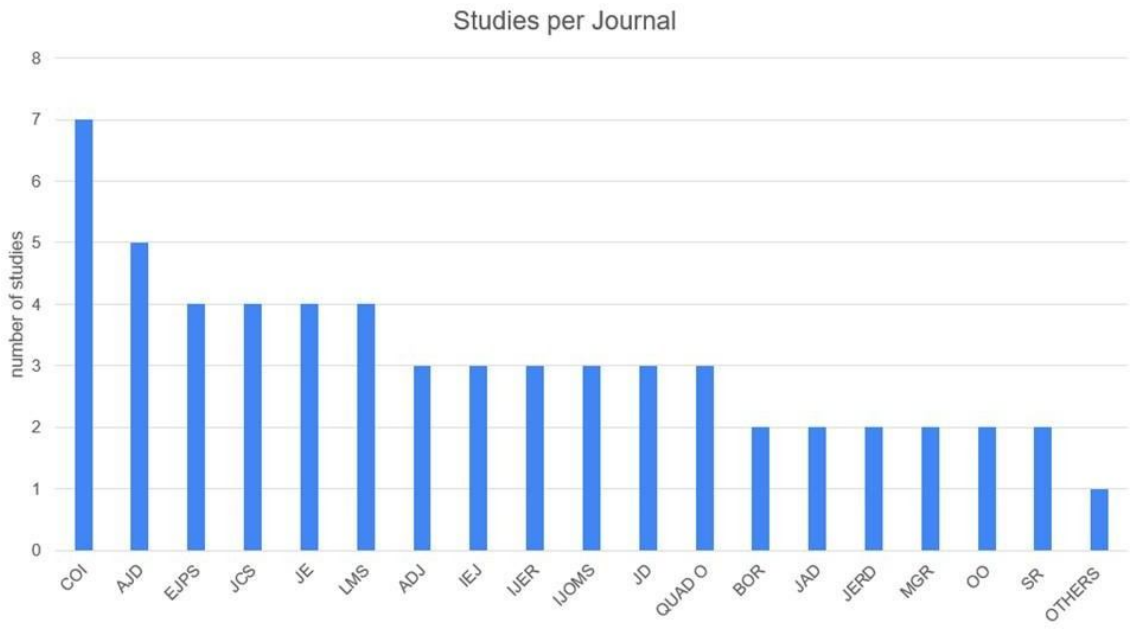

FIGURE6. Mostfrequentlycitedjournal.

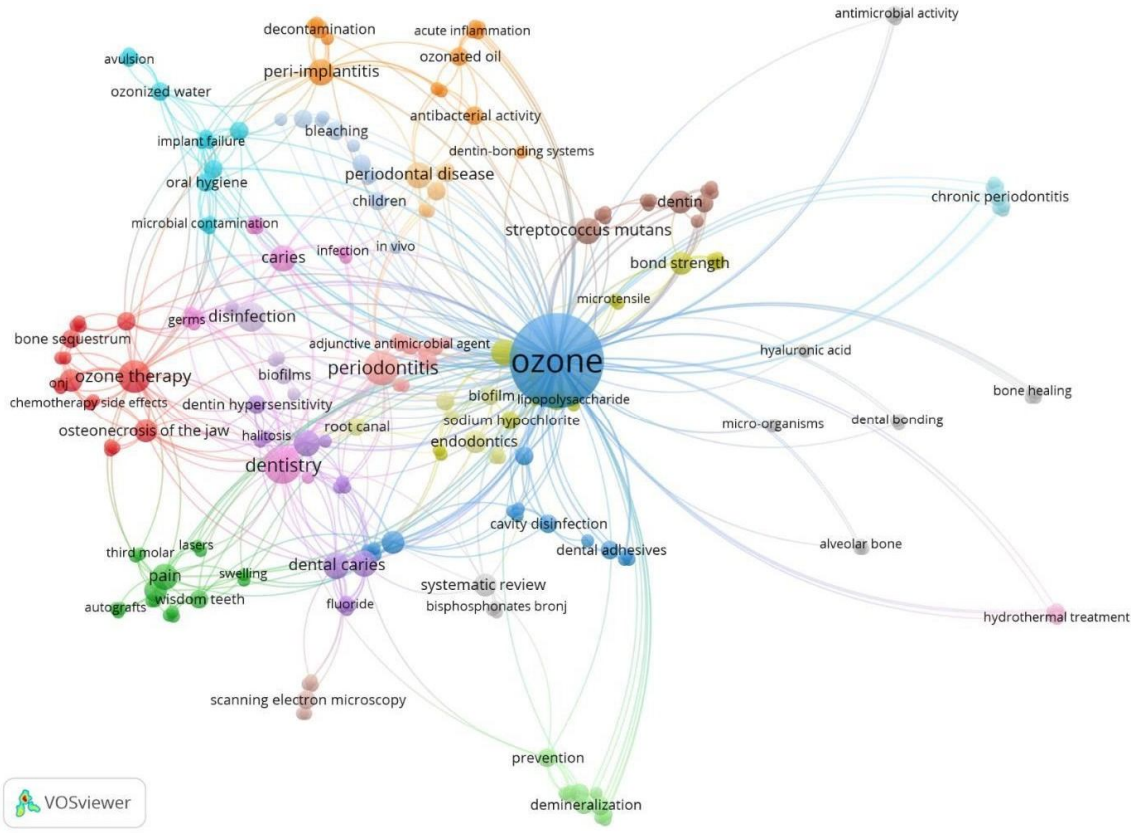

FIGURE7. Networkanalysisofkeywordsfrom“ozoneindentistry”bibliographicsearch.Circlesizesarerelatedto the numberof citationsforeachkeywordused.

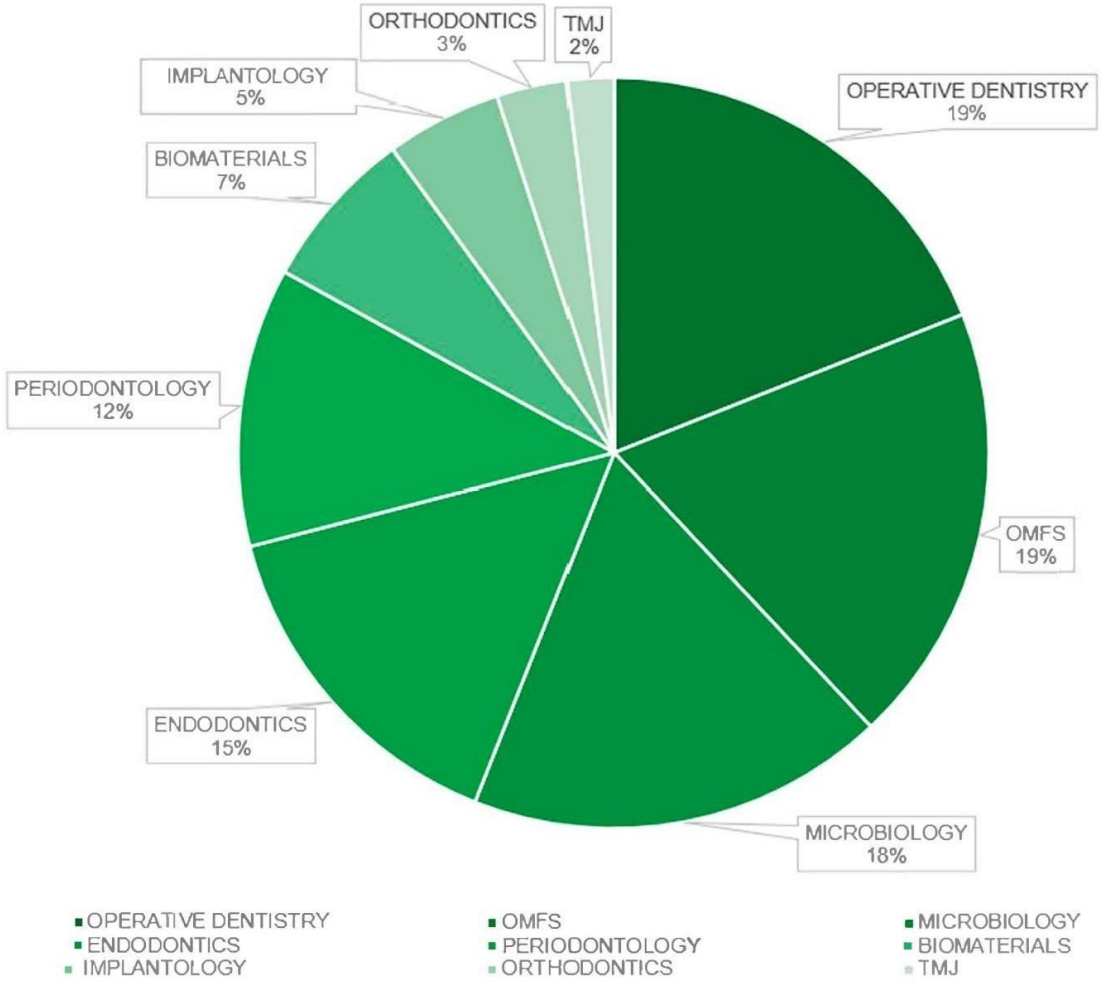

FIGURE8. Top-100ozoneindentistry -researchfieldsofincludedstudies.

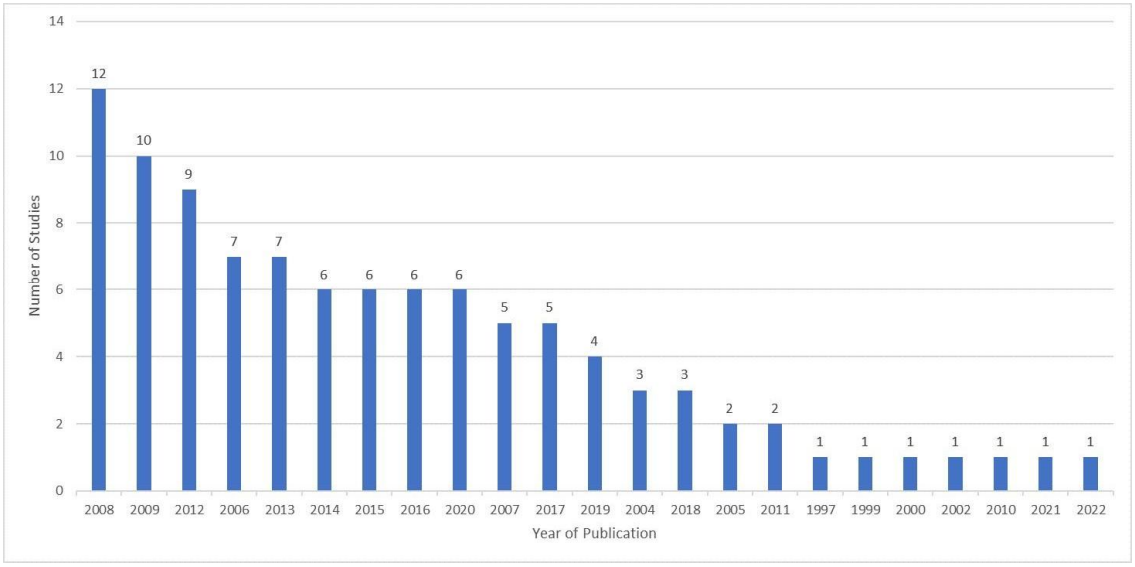

FIGURE9. Time-patterndistributionofthe100most-citedstudieson ozoneindentistryovertheyears.

UNDERPEERREVIEW

Table 1. Thetop 100 citedstudies about ozonein dentistry

Rank	Author	Title	Publication year	Journal	Institution	Citations
1	Fliefel Retal	Treatment strategies and outcomes of bisphosphonate-related osteonecrosis of the jaw(BRONJ) with characterizationof patients: a systematic review	2015	IJOMS	UniversitatMunich	180
2	Azarpazhooh A,LimebackH	Theapplicationofozoneindentistry:Asystematicreviewofliterature	2008	JD	UniversityToronto	158
3	BaysanA et al	Antimicrobial effect of a novel ozone-generating device on micro-organisms associatedwithprimary rootcarious lesions invitro	2000	CR	RoyalLondonSchool of MedicineandDentistry	146
4	NagayoshiMetal	Efficacyofozoneonsurvival andpermeabilityoforalmicroorganisms	2004	OMI	Kyushu DentalCollege	136
5	MullerP etal	Efficacyofgasiformozoneandphotodynamictherapyonamultispeciesoral biofilm invitro	2007	EJPS	University ofZurich	113
6	Kuhl Set al	Bisphosphonate-relatedosteonecrosisofthejaws-Areview	2012	OO	UniversityofBasel	104
7	Wierichs R,Meyer-LueckelH	SystematicReviewonNoninvasiveTreatment ofRootCariesLesions	2015	JDR	RWTH AachenUniversity	104
8	HuthKCetal	Effectofozoneonoralcellscomparedwithestablishedantimicrobials	2006	EJPS	Ludwig-Maximilians University	101
9	EstrelaC etal	Antimicrobialefficacyofozonatedwater,gaseousozone,sodiumhypochloriteandchlorhexidineininfected humanrootcanals	2007	IEJ	UniversidadeFederaldeGoiás	99
10	Baysan, A; Lynch,E	Effectofozoneontheoralmicrobiotaandclinicalseverityofprimaryrootcaries	2004	AJD	University Birmingham	97
11	Foschi F etal	PhotodynamicinactivationofEnterococcus faecalisindentalrootcanalsinvitro	2007	LSM	The ForsythInstitute	97
12	Ripamonti CIetal	Efficacy and safety of medical ozone (O-3) delivered in oil suspension applications forthe treatment of osteonecrosis of the jaw in patients with bone metastases treated withbisphosphonates:Preliminary resultsof aphase I-IIstudy	2011	OO	National CancerInstituteof Milan	78

13	HuthKCetal	Effectivenessofozoneagainstendodontopathogenicmicroorganismsinarootcanalbiofilmmodel	2009	IEJ	Ludwig-MaximiliansUniversity	65
14	PolydorouOetal	Antibacterial effect of an ozone device and its comparison with two dentin-bondingsystems	2006	EJPS	Albert-Ludwigs UniversityFreiburg	59
15	StubingerS etal	Theuseofozonein dentistryandmaxillofacialsurgery:Areview	2006	QI	University ofBasel	59
16	AgrilloAet al	Ozonetherapyinthetreatment ofavascularbisphosphonate-relatedjawosteonecrosis	2007	JCS	University ofRome LaSapienza	56
17	HuthKCetal	Effect of ozone on non-cavitated fissure carious lesions in permanent molars. Acontrolledprospective clinicalstudy	2005	AJD	UniversityMunich	50
18	KazanciogluHOetal	Comparison of the influence of ozone and laser therapies on pain, swelling, and trismusfollowingimpacted third-molarsurgery	2014	LMS	BezmialemVakif University	49
19	RaponeBetal	The Effect of Gaseous Ozone Therapy in Conjunction with Periodontal Treatment onGlycatedHemoglobinLevelin SubjectswithType2DiabetesMellitus:AnUnmaskedRandomizedControlled Trial	2020	IJER	Aldo Moro UniversityofBari	46
20	DuangthipDetal	Non-surgicaltreatmentofdentincariesinpreschoolchildren-systematicreview	2015	BOH	UniversityofHong Kong	42
21	CardosoMG etal	Effectiveness of ozonated water on Candida albicans, Enterococcus faecalis, andendotoxinsinrootcanals	2008	QUADO	Universityof Taubaté	42
22	HayakumoSet al	Clinical and microbiological effects of ozone nano-bubble water irrigation as an adjunctto mechanical subgingival debridement in periodontitis patients in a randomizedcontrolledtrial	2013	COI	Tokyo Medicaland DentalUniversity	41
23	Bitter Ketal	Bond strength of fiber posts after the application of erbium: yttrium-aluminum-garnetlasertreatment and gaseousozonetotherootcanal	2008	JE	Charité-Universitätsmedizin Berlin	41
24	PolydorouOetal	Theantibacterialeffect ofgasozoneafter 2monthsofinvitroevaluation	2012	COI	UniversityMedical CenterFreiburg	41
25	AgrilloAet al	Newtherapeuticprotocolinthetreatment ofavascularnecrosisofthejaws	2006	JCS	Universityof Rome LaSapienza	41

26	CasePDetal	Treatment of Root Canal Biofilms of Enterococcus faecalis with Ozone Gas andPassiveUltrasound Activation	2012	JE	The University ofQueensland	41
27	SchmidlinPRetal	Effect of ozone onenameland dentinbondstrength	2005	JAD	University ofZurich	41
28	Kazancioglu HO etal	Effectsofozonetherapyonpain,swelling,andtrismusfollowingthirdmolarsurgery	2014	IJOMS	BezmialemVakif University	39
29	Kazancioglu HO etal	EffectsofLaserandOzoneTherapiesonBoneHealinginthe Calvarial Defects	2013	JCS	BezmialemVakif University	38
30	HayakumoSet al	Effects of ozone nano-bubble water on periodontopathic bacteria and oral cells - in vitrostudies	2014	STAM	Tokyo Medical andDentalUniversity	37
31	KrozerAetal	Chemicaltreatmentofmachinedtitaniumsurfaces-Aninvitrostudy	1999	COIR	LundUniversity	37
32	Al Habashneh R etal	Ozoneasanadjuncttoconventional nonsurgicaltherapyinchronicperiodontitis:arandomizedcontrolled clinicaltrial	2015	JPR	Jordan Universityof Science andTechnology	37
33	Ebensberger U etal	PCNA-expression of cementoblasts and fibroblasts on the root surface after extraoralrinsingfor decontamination	2002	DT	UniversityofBasel	37
34	OzgulBMetal	Clinical Evaluation of Desensitizing Treatment for Incisor Teeth Affected by Molar-IncisorHypomineralization	2013	JCPD	AnkaraUniversity	36
35	Raeissadat SAet al	Intra-articular ozone or hyaluronic acid injection: Which one is superior in patients withkneeosteoarthritis? A 6-monthrandomizedclinicaltrial	2018	JPRE	Shahid BeheshtiUniversity	35
36	Cho Hetal	Postoperativeinterventionstoreduceinflammatorycomplicationsafterthirdmolarsurgery: reviewofthe currentevidence	2017	ADJ	The University ofQueensland	35
37	KustarciAetal	BactericidaleffectofKTPlaserirradiationagainstEnterococcusfaecaliscompared withgaseous ozone:anexvivo study	2009	QUADO	Cumhuriyet University	34
38	RollasonVet al	Interventionsfortreatingbisphosphonate-relatedosteonecrosisofthejaw(BRONJ)	2016	CDSR	Geneva UniversityHospitals	34
39	YilmazSetal	EvaluationoftheClinicalandAntimicrobialEffectsoftheEr:YAGLaserorTopicalGaseousOzoneasAdjuncts to Initial PeriodontalTherapy	2013	PLS	Yeditepe University	34

40	KronenbergOet al	PreventiveEffectofOzoneontheDevelopmentofWhiteSpotLesionsduringMultibracket Appliance Therapy	2009	AO	UniversityofBern	34
41	HuthKCetal	Effectivenessofozoneagainstperiodontalpathogenicmicroorganisms	2011	EJPS	Ludwig-Maximilians University	34
42	RaponeBetal	TheGaseousOzoneTherapyasaPromisingAntisepticAdjuvantofPeriodontalTreatment: ARandomizedControlled Clinical Trial	2022	IJER	Aldo MoroUniversityof Bari	33
43	DahnhardtJEetal	Treating open carious lesions in anxious children with ozone. A prospective controlledclinicalstudy	2006	AJD	UniversityofBern	33
44	Hauser-Gerspach Iet al	Influenceofgaseousozoneinperi-implantitis:bactericidalefficacyandcellularresponse.Anin vitro studyusingtitanium and zirconia	2012	COI	UniversityofBasel	32
45	Shi XLetal	PartialoxidationofTiNcoatingbyhydrothermaltreatmentandozonetreatment toimproveits osteoconductivity	2016	MSE	Jiangsu Universityof Science andTechnology	31
46	ChidambaranathanASetal	Comprehensive Review and Comparison of the Disinfection Techniques CurrentlyAvailableinthe Literature	2019	JPIERD	SRM DentalCollege	30
47	Matsumura,Ketal	Surface modification of poly(ethylene-co-vinyl alcohol): hydroxyapatite immobilizationandcontrolof periodontalligamentcellsdifferentiation	2004	B	KyotoUniversity	30
48	Bezirtzoglou E etal	Aquantitativeapproachtotheeffectivenessofozoneagainstmicrobiotaorganismscolonizingtoothbrushes	2008	JD	DemocritusUniversity ofThrace	30
49	MantonDJet al	EffectofozoneandToothMousse(TM)ontheefficacyof peroxidebleaching	2008	ADJ	The University ofMelbourne	30
50	Magni Eet al	Effectofozonegasapplicationonthemechanical propertiesofdentaladhesivesbondedtodentin	2008	DM	UniversityofSiena	29
51	Montevecchi M etal	Comparisonoftheantibacterialactivityofanozonatedoilwithchlorhexidinedigluconateand povidone-iodine. Adisk diffusion test	2013	NM	University ofBologna	29
52	Kazancioglu HO,Erisen M	Comparison of Low-Level Laser Therapy versus Ozone Therapy in the Treatment ofOral Lichen Planus	2015	AD	BezmialemVakif University	28

53	Azarpazhoob A etal	EvaluatingtheEffectofanOzoneDeliverySystemontheReversalofDentinHypersensitivity: ARandomized, Double-blindedClinical Trial	2009	JE	University ofToronto	28
54	Skurska A etal	Evaluation of the influence of ozonotherapy on the clinical parameters and MMP levelsinpatients with chronic andaggressive periodontitis	2010	AMS	Medical UniversityofBialystok	28
55	Hauser-Gerspach Iet al	Comparisonoftheimmediateeffectsofgaseousozoneandchlorhexidinegelonbacteriain cavitated cariouslesions in childreninvivo	2009	COI	UniversityofBasel	25
56	Suh Yetal	Clinicalutilityofozonetherapyindentalandoralmedicine	2019	MGR	Stony BrookUniversityRenaissance SchoolofMedicine	25
57	NoguchiFetal	Ozonated Water Improves Lipopolysaccharide-induced Responses of an Odontoblast-likeCellLine	2009	JE	Kyushu DentalCollege	24
58	McKenna DFetal	TheEffectofSubgingivalOzoneand/orHydrogenPeroxideontheDevelopmentofPeri-implant Mucositis: ADouble-BlindRandomizedControlledTrial	2013	IJOMI	University ofWarwick	24
59	Cadenaro Metal	EnamelandDentinBondStrengthFollowingGaseousOzoneApplication	2009	JAD	University ofTrieste	24
60	Butera A etal	Ozonized Water Administration in Peri-Implant Mucositis Sites: A RandomizedClinical Trial	2021	ASB	UniversityofPavia	23
61	TasdemirZet al	EffectsofOzoneTherapyontheEarlyHealingPeriodofDeepithelializedGingivalGrafts:ARandomizedPlacebo-ControlledClinicalTrial	2016	JP	ErciyesUniversity	23
62	Al-Omiri MKet al	Randomizedcontrolledclinicaltrialonbleachingsensitivityandwhiteningefficacyofhydrogenperoxide versus combinationsofhydrogenperoxideandozone	2018	SR	University ofJordan	22
63	Almaz ME,Sonmez IS	Ozonetherapyinthemanagementandpreventionof caries	2015	JFMA	Kırıkkale University	22
64	KnightGMet al	TheinabilityofStreptococcusmutansandLactobacillusacidophilustoformabiofilminvitro on dentinepretreated withozone	2008	ADJ	The University ofAdelaide	22
65	SadatullahSetal	The antimicrobial effect of 0.1 ppm ozonated water on 24-hour plaque microorganismsin situ	2012	BOR	King KhalidUniversity	21

66	AgrilloAet al	Ozonetherapyinextractivesurgeryonpatientstreatedwithbisphosphonates	2007	JCS	University of RomeLaSapienza	21

67	LynchE,Swift EJ	EVIDENCE-BASEDEFFICACYOFOZONEFORROOTCANALIRRIGATION	2008	JERD	Queen'sUniversity	20
68	Daif ET	Roleofintra-articularozonegasinjectioninthemanagementofinternalderangement ofthetemporomandibularjoint	2012	QUADO	CairoUniversity	20
69	Samuel SRet al	Effectofozonetoremineralizeinitial enamelcaries:insitustudy	2016	COI	Thai MoogambigaiDental College	19
70	BrazzelliMet al	Systematic review of the effectiveness and cost-effectiveness of HealOzone for thetreatment of occlusalpit/fissurecariesandrootcaries	2006	HTA	University ofAberdeen	19
71	Bayer Setal	Comparisonoflaserandozonetreatmentsonoral mucositisinanexperimentalmodel	2017	LMS	BezmialemVakif University	18
72	PiresPTetal	Effect ofozone gasontheshearbondstrength toenamel	2013	JAOS	UniversityofPorto	18
73	DalkilicEEet al	Effectofdifferentdisinfectantmethodsontheinitialmicrotensilebondstrengthofaself-etchadhesive to dentin	2012	LMS	YuzuncuYil University	18
74	Swift,EJ	Evidence-basedcariesreversal usingozone	2008	JERD	Queen'sUniversity	18
75	Isler SCet al	Theeffectsofozonetherapyasanadjunct tothesurgical treatment ofperi-implantitis	2018	JPIS	GaziUniversity	18
76	Tasaki Tet al	Plasma-treatedwatereliminatesStreptococcusmutansininfecteddentinmodel	2017	DMJ	Tsurumi UniversitySchool of DentalMedicine	18
77	NoitesRet al	SynergisticAntimicrobialActionofChlorhexidineandOzoneinEndodonticTreatment	2014	BRI	Catholic UniversityofPortugal	18
78	Ripamonti CIetal	Efficacy and tolerability of medical ozone gas insufflations in patients withosteonecrosis of the jaw treated with bisphosphonates-Preliminary data Medical ozonegasinsufflationintreatingONJ lesions	2012	JBO	IstitutoNazionale deiTumori	18
79	GrootveldMet al	High resolution H-1 NMR investigations of the oxidative consumption of salivarybiomolecules by ozone: Relevance to the therapeutic applications of this agent inclinical dentistry	2006	BF	London South BankUniversity	18
80	DukicW etal	TheInfluenceofHealozoneonMicroleakageandFissurePenetrationofDifferentSealingMaterials	2009	CA	University ofZagreb	17
81	AnzolinAP etal	Ozonatedoilinwoundhealing: whathasalreadybeenproven?	2020	MGR	Universidade dePasso	17

Fundo

82	XimenesMet al	AntimicrobialactivityofozoneandNaF-chlorhexidineonearlychildhoodcaries	2017	BOR	UniversidadeFederal de SantaCatarina	17
83	NoetzelJetal	Efficacyofcalciumhydroxide,Er:YAG laserorgaseousozoneagainstEnterococcusfaecalisin rootcanals	2009	AJD	Charité-Universitätsmedizin Berlin	17
84	Domb WC	OzoneTherapyinDentistryABriefReviewforPhysicians	2014	IN	Inland Institute ofAestheticDentistry	17
85	ErdemciF etal	Histomorphometricevaluationoftheeffectofsystemicandtopicalozoneonalveolarbonehealingfollowing tooth extraction inrats	2014	IJOMS	AkdenizUniversity	16
86	LoncarB etal	OzoneApplicationinDentistry	2009	AMR	UniversityZagreb	16
87	Al Shamsi AH etal	Theeffectsofozonegasapplicationonshearbondstrengthoforthodonticbracketstoenamel	2008	AJD	Queen'sUniversity	16
88	EickS et al	Effect ofozoneonperiodontopathogenicspecies-aninvitrostudy	2012	COI	UniversityofBern	16
89	Grocholewicz K etal	Effectofnano-hydroxyapatiteandozoneonapproximalinitialcaries:arandomizedclinicaltrial	2020	SR	PomeranianMedicalUniversity	15
90	Matys Jetal	Effect of ozone and diode laser (635 nm) in reducing orthodontic pain in the maxillaryarch-arandomizedclinicalcontrolledtrial	2020	LMS	MedicalUniversity	15
91	EgusaH etal	Clinical Evaluation of the Efficacy of Removing Microorganisms to Disinfect Patient-DerivedDentalImpressions	2008	IJP	Osaka UniversityGraduate School ofDentistry	15
92	Filippi,A	Ozoneinoralsurgery -Currentstatusandprospects	1997	OSE	Justus□Liebig□ UniversitätGießen	15
93	Camacho-Alonso,Fetal	Effectsofphotodynamictherapy,2%chlorhexidine,triantibioticmixture,propolisandozone on root canals experimentally infected with Enterococcus faecalis: an in vitrostudy	2017	O	University ofMurcia	15
94	FagrellTGetal	Effectofozonetreatmentondifferentcariogenicmicroorganismsinvitro	2008	SDJ	University ofGothenburg	15
95	UrazAetal	Ozoneapplicationasadjunctivetherapyinchronicperiodontitis:Clinical,microbiological andbiochemicalaspects	2019	JDS	GaziUniversity	15

96	BalFAetal	Effectsofphotodynamictherapywithindocyaninegreenon Streptococcusmutansbiofilm	2019	PPT	AbantIzzetBaysal University	14
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