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Global research trends in complex oral sensitivity disorder: A systematic bibliometric analysis of the framework

Giulio Fortuna[1,2,3] | Massimo Aria[4] | Carmela Iorio[5] | Michele D. Mignogna[6] | Gary D. Klasser[7]

[1]Glasgow Dental School and Hospital, School of Medicine, Dentistry and Nursing, College of Medical, Veterinary and Life Sciences, University of Glasgow, Glasgow, UK

[2]D.eb.RA. Mexico Foundation, Monterrey, Mexico

[3]Federico Navarro Institute – School of Orgonomy "Piero Borrelli", Naples, Italy

[4]Department of Economics and Statistics, Federico II University of Naples, Naples, Italy

[5]Department of Industrial Engineering, Federico II University of Naples, Naples, Italy

[6]Department of Neurosciences, Reproductive and Odontostomatological Sciences, Federico II University of Naples, Naples, Italy

[7]Department of Diagnostic Science, New Orleans School of Dentistry, Louisiana State University Health Sciences Center, New Orleans, LA, USA

Correspondence
Gary D. Klasser, Department of Diagnostic Sciences, Louisiana State University Health Sciences Center, 1100 Florida Ave, New Orleans, LA, 70119, USA.
Email: gklass@lsuhsc.edu

Giulio Fortuna, Glasgow Dental School and Hospital, School of Medicine, Dentistry and Nursing, College of Medical, Veterinary and Life Sciences, University of Glasgow, Glasgow G2 3JZ, UK.
Email: giulio.fortuna@gmail.com

Abstract

Objectives: A systematic bibliometric analysis was performed to investigate trends in complex oral sensitivity disorder (COSD) research worldwide and compare the contributions of different countries/institutions, scientific journals, authors, keywords, and citations.

Methods: Web of Science database from 1985 to 2018 was systematically searched to identify all relevant articles using the MeSH terms "complex oral sensitivity disorder" and all synonyms used in the literature. We included original articles, review articles, letters to the editor, and book chapters in the English language and in 27 different ISI categories of medical sciences. Several bibliometric indicators were used.

Results: We identified 10 633 articles, of which only 3349 were eligible with only 443 being included for quantitative analyses. The annual percentage growth rate for article publication was 9.16 fractionalized articles with the most productive countries (reported only in 428 out of 443 articles) being Italy (n = 66, 15.42%) followed by USA (n = 61, 14.25%) and with Italy achieving the greatest number of citations (n = 1415). Similarly, the most productive institution for article publication was the University of Turku, Finland, with 39 (8.8%) published articles. Among the top 20 departments, 15 were affiliated with dental institutions. The most productive source was "Journal of Oral Pathology and Medicine" with 38 (8.58%) articles, whereas the most productive author was "Lopez-Jornet P" with 19 articles (6.52 fractionalized articles).

Conclusions: There is an increasing trend for publications on COSD. Collaboration among different countries must improve in order to implement research on this disorder, which seems to be mainly a condition for the dental discipline.

KEYWORDS

bibliometric, BMS, burning mouth syndrome, complex oral sensitivity disorder, COSD, systematic

1 | INTRODUCTION

Complex oral sensitivity disorder (COSD) is an idiopathic and chronic medical condition, characterized by discomfort in the oral cavity, and by the absence of any local and/or systemic diseases, alterations in blood tests, and/or in radiologic imaging.[1]

Complex oral sensitivity disorder is historically known as burning mouth syndrome (BMS), or oral dysesthesia, or glossodynia, or stomatodynia. This new terminology has been recently proposed because the multiple definitions and classifications available in the literature have led to some confusion and inconsistencies.[1-3] In light of recent discoveries regarding BMS pathophysiology, its mainly reported central and peripheral central nervous system involvement, and multiple clinical manifestations,[4] the authors consider this term to be taxonomically outdated and inaccurate.[1] By employing an ontological approach, consisting of a more descriptive analysis of the true manifestations of this complex syndrome, a proposal for a new term, COSD, has been considered.[1] Therefore, the term BMS has been abandoned throughout the article and replaced with the novel term COSD.

The majority of studies on COSD have focused the scientific research mainly on its etiopathogenesis and management.[5-10] In contrast, the global trend of scientific research on COSD has never been explored to date.

Bibliometrics is a type of analysis based on the identification of the corpus of literature, ie publications in their broadest sense, within a given subject area.[11] It includes a set of mathematical and statistical methods that utilize specific indicators to obtain information regarding the output of research activity from written publications.[12] These indicators are quantitative by nature and measure the academic productivity, but have also been used to evaluate the quality (or performance) of scientific research.[12]

Bibliometrics has the potential to introduce a systematic, transparent, and reproducible review process based on the statistical measurement of science, scientists, or scientific activity. Unlike other techniques, bibliometrics provides more objective and reliable analyses.[13] Its usefulness and applicability reside in the ability of managing a large volume of new information, conceptual developments, and data by providing a structured analysis to handle a large body of information, infer trends over time, identify shifts in the boundaries of the disciplines, detect the most prolific scholars and institutions, and present the "big picture" of current research.[13]

Assessment of academic productivity has increasingly become important in recent years, for the evaluation of university and scientific research, because it influences, and is influenced, in turn, by obtaining grants and promotions.[14-16] Bibliometric analysis has already been employed to investigate scientific research trends in several medical fields, such as radiology,[17] cardiology,[18,19] endocrinology,[20] oncology,[21-23] or infectious diseases [24] for the purposes previously discussed.

To the best of our knowledge, this is the first study aimed at investigating data concerning the research on COSD originating on a global basis. The aim of this study was to provide a snapshot of scientific activity and highlight possible gaps in clinical and basic science research in this field, thereby fostering future interdisciplinary collaborations.

2 | MATERIALS AND METHODS

2.1 | Selection strategy

Our investigation followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines,[25] illustrating the outcomes of the literature searches and article selection process (Figure 1). We performed a computerized bibliometric analysis from January 1985 to December 2018 for articles retrieved from the Web of Science (WoS) database now maintained by Clarivate Analytics.

Searches focused on one main topic: complex oral sensitivity disorder (COSD), also commonly known as burning mouth syndrome (BMS). To identify all publications related to COSD, we included all synonymous MeSH terms used over the past decades to describe the same entity, by including the Boolean separator "OR": "Burning mouth syndrome" *OR* "BMS" *OR* "Burning mouth disorder" *OR* "Burning lip syndrome" *OR* "Burning tongue" *OR* "Glossalgia" *OR* "Glossodynia" *OR* "Glossopyrosis" *OR* "Oral dysesthesia" *OR* "Oral and lingual paresthesia" *OR* "Scalded mouth syndrome" *OR* "Sore mouth tongue" *OR* "Stomatodynia" *OR* "Stomatopyrosis" *OR* "Complex oral sensitivity disorder." Information of retrieved articles was exported into Microsoft Excel 2013, and duplicates and non-pertinent journals and ISI categories were not included (Figure 1).

In addition, all included articles were examined manually to identify articles that were not relevant to the quantitative analyses, because these were either not related to the main topic or the nature of the disease was not considered idiopathic (Figure 1).

2.2 | Selection criteria

After eliminating non-pertinent journals and non-relevant articles, two investigators (GF and MA) independently verified data entry and collection, and then reformulated the dataset for bibliometric analyses. Any disagreement was discussed and resolved by consensus between the two investigators (GF and MA), and, if not reached, a third investigator (CI) was consulted to resolve the issue.

The systematic review included the following: (a) original articles, review articles, letters to the Editor, and proceedings articles only; (b) articles in the English language only; (c) articles in 27 different ISI categories of medical science (Figure 1); (d) articles reporting any aspect of COSD; and (e) articles whose title included at least one of the above-mentioned MeSH terms.

2.3 | Data extraction

Studies that met the inclusion criteria were independently reviewed by two investigators (GF and MDM) who extracted and analyzed the following relevant bibliometric indicators: main information about data (number of articles, source, key words as assigned by the system and by the authors, average citations per article, number of authors, authors appearances, authors per article, authors of single-authored

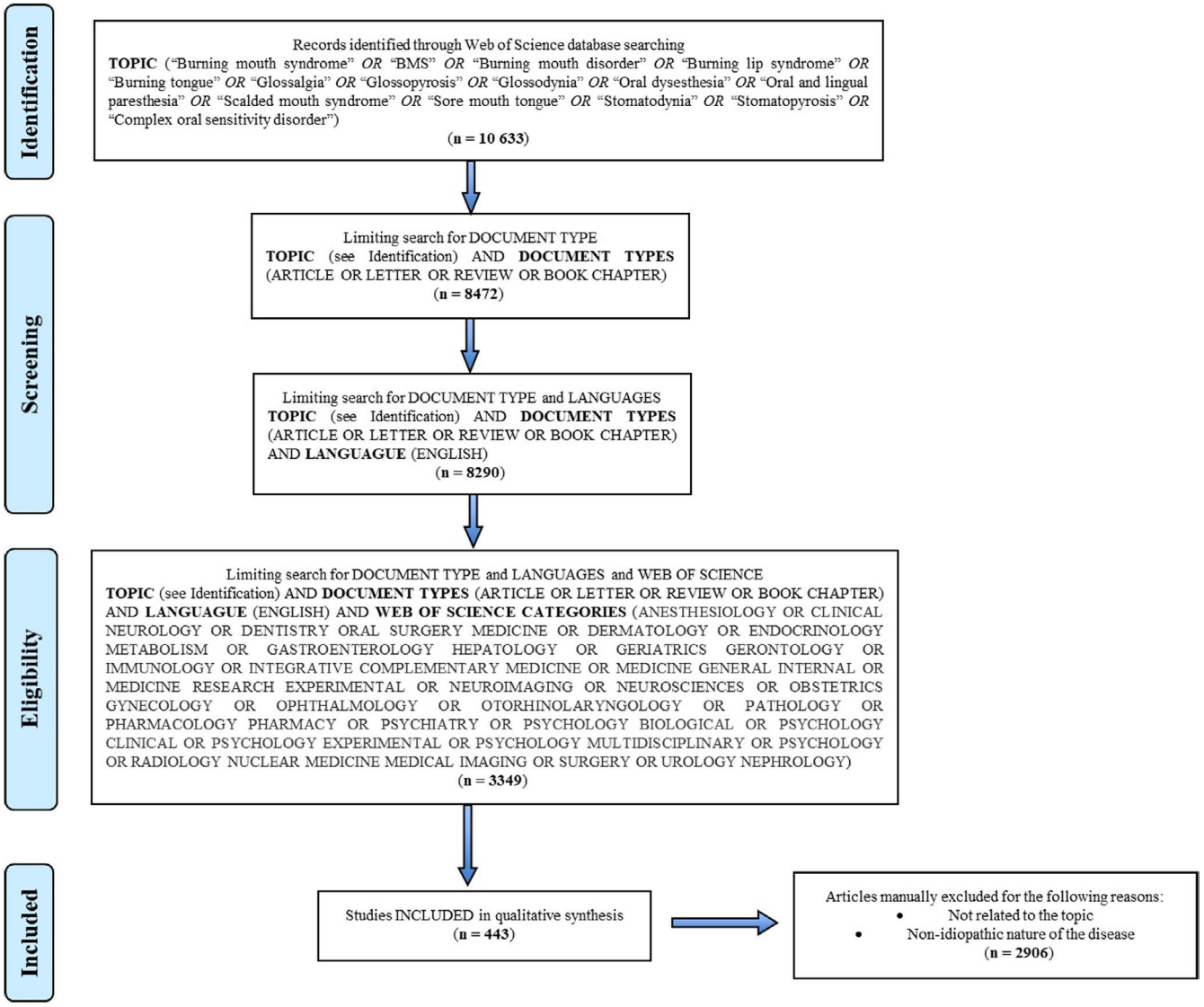

FIGURE 1 PRISMA Flow diagram of process of identification and screening of the included articles [Colour figure can be viewed at wileyonlinelibrary.com]

articles, authors of multi-authored articles, article per author, co-authors per article, collaboration index), annual scientific production and citations, top twenty productive authors, author's indices (*h*-index, *g*-index, *m*-index) and dominance factor (defined as a ratio indicating the fraction of multi-authored articles in which a scholar appears as first author), top twenty cited articles and cited references, top twenty productive countries, institutions, departments (if clearly stated), top twenty relevant sources with 2018 impact factor, and top twenty relevant keywords.

The Hirsch index (*h*-index) is an author's number of published articles (*h*) each of which has been cited in other papers at least *h* times.[26] It quantifies both the number of publications and number of citations per publication. The m-index is defined as *h*/n, where *h* is the H-index and n is the number of years since the first published paper of the researcher, also called the m-quotient.

The *g*-index has been introduced by Egghe in 2006 as an improvement of the *h*-index in order to measure the global citation performance of a set of articles. If this set is ranked in decreasing order of the number of citations that they received, the *g*-index is the (unique) largest number such that the top *g* articles received (together) at least g^2 citations.[27]

The standard competition ranking (SCR) is used for ranking purposes, and only the first top twenty ranked data for each analyzed bibliometric indicator were taken into consideration. If the measurements of bibliometric analysis have the same ranking number, then a gap is left in the following ranking numbers. The publication was assigned the country, the institution, and the department of the corresponding author.

2.4 | Statistical analysis

Data were collected and exported into open source science mapping software called bibliometrix R-package [13] for generating descriptive analyses, statistical graphs, and science maps.

3 | RESULTS

3.1 | General information

As shown in Figure 1, the initial search query identified 10 633 articles, yielding to 3349 eligible articles of which only 443 were included for quantitative analyses. Those articles showed an average citation per article of 19.78 in the period from 1985 to 2018 and were written by 1345 authors with a mean of 0.33 ± 0.41 articles per author from 158 different sources, such as journals (Table 1).

The annual percentage growth rate for article publication was 9.16, showing an exponential growth rate, mainly in the last 10 years with 2 peaks: one in 2011 and another in 2017 with 35 papers published. Interestingly, the mean total citations per year have shown a stable range between 1 and 3 citations with two peaks: in 2002 and in 2003 with 3.16 and 3.45 citations per year, respectively. On the other hand, the mean total citation per article showed the highest peak in 1987 with 91.3 mean citations and the lowest in 2018 with 0.40 mean citations.

TABLE 1 Main information about bibliometric analysis

	Number
Data	
Timespan	1985-2018
Sources (Journals, Books, etc)	158
Documents	443
Average years from publication	11.7
Average citations per documents	19.78
Average citations per year per doc	1265
References	5932
Document type	
Original articles	335
Proceeding articles	4
Letter to the Editor	60
Review articles	44
Document content	
Keywords Plus	741
Author's Keywords	649
Author	
Authors	1345
Author appearances	2004
Authors of single-authored documents	25
Authors of multi-authored documents	1320
Author collaboration	
Single-authored documents	27
Documents per author	0.33 ± 0.41
Authors per document	3.04
Co-authors per documents	4.52 ± 2.59
Collaboration Index	3.17

Abbreviation: SD, standard deviation.

3.2 | Countries, institutions, and department productivity

The analysis of country scientific production showed that the number of documents where at least one author comes from a specific country varied from 1 for Austria, Iceland, and Senegal to 161 for Italy (Figure 2).

The most productive countries (clearly stated only in 428 out of 443 articles) regarding published articles related to COSD were Italy (n = 66, 15.42%), followed by United States of America (USA) (n = 61, 14.25%) and Japan (n = 36, 8.41%), whereas the highest number of citations was attributed to Italy (n = 1415 with mean citations per article (MCA) of 21.44) followed by USA (n = 1032 with a MCA of 16.92) and United Kingdom (n = 848, with a MCA of 36.87) (Table 2).

University of Turku in Finland ranked first in terms of institutions' productivity with 39 (8.8%) articles published, followed by University of Milan in Italy and University of Zagreb in Croatia with 36 (8.12%) and 27 (6.1%) articles published, respectively. Among the top twenty departments, 15 were affiliated with dental institutions, 4 with medical institutions, and 1 with liberal arts institution, with the most prominent being the department of restorative dentistry of Seoul National University, Korea.

3.3 | Highly contributive journals, articles, and keywords

The most productive source for article publication was the "Journal of Oral Pathology and Medicine" with 38 (8.58%) articles published in the 1985-2018 period, followed by "Oral Diseases" (n = 29, 6.55%) and "Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontics" (the OOOO) (n = 20, 4.51%) (Table 3). However, due to the renaming of this journal, 15 articles must be added to the previous total for a sum of 35 (7.9%) articles, thereby ranking this journal second in the top twenty most prominent source. Those three journals are categorized within the discipline of oral medicine and are followed by the "Journal of Orofacial Pain" which published 14 articles in addition to, again due to the renaming of this journal to the "Journal of Oral & Facial Pain and Headache," another 8 for a total of 22 (5.0%) articles (Table 3).

Interestingly, the most cited journals in the references of all 443 included articles were the OOOO with 1292 citations, followed by Pain and Journal of Oral Pathology and Medicine with 1237 and 836 citations, respectively (Table 3).

The majority of all the journals (n = 10) belong to the field of dentistry, whereas the field of medicine is less represented with only 7 journals (4 in field of clinical neurology: Pain, Headache, Pain Medicine, Journal of Headache and Pain; 1 in the field of psychology: Journal of Psychosomatic Research; 1 in the field of surgery: Photomedicine and Laser Surgery, and 1 in the field of dermatology:

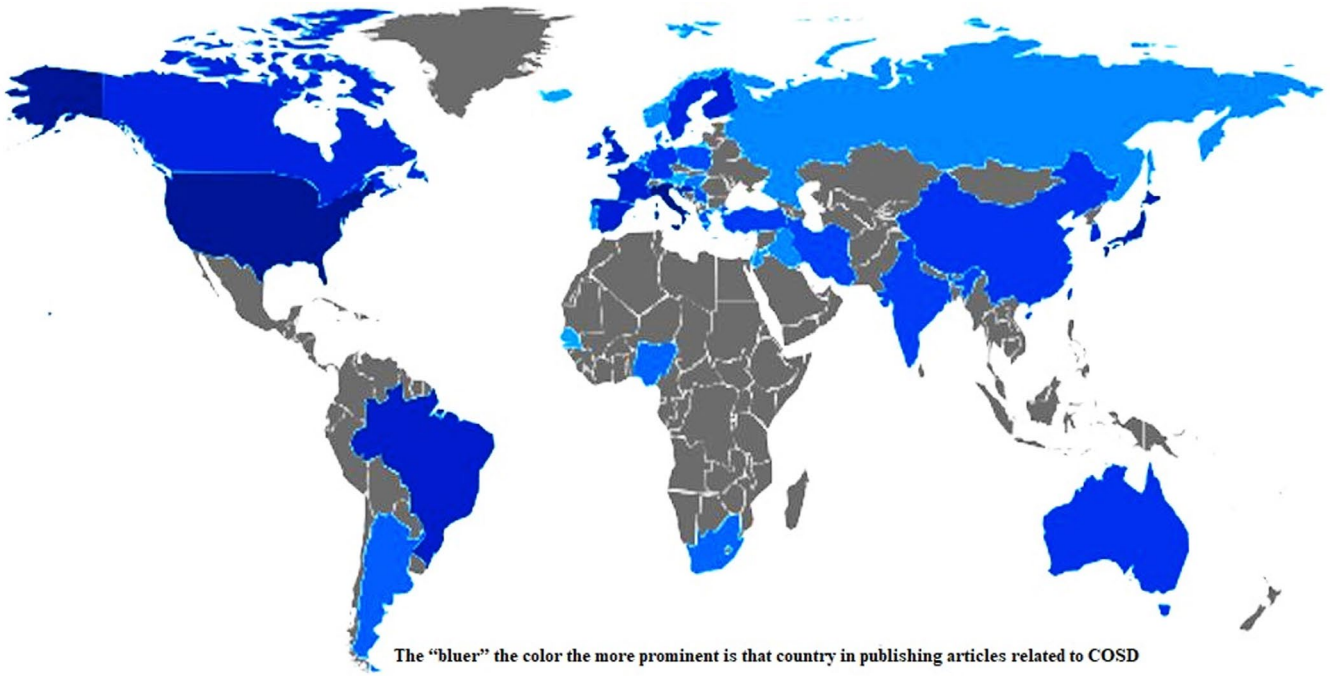

FIGURE 2 Country origin of published article production based upon the use of the descriptor COSD and synonymous MeSH terms. List of countries and number of articles published: Italy: 161; USA: 151; Japan: 93; Brazil: 68; UK: 63; Spain: 57; Croatia: 51; France: 48; Finland: 45; Canada and South Korea: 38; Sweden: 32; Taiwan: 30; Ireland: 21; Australia: 20; China: 17; Germany: 17; Israel: 16; Turkey: 13; India: 12; Denmark: 10; Iran: 10; Greece: 9; Poland and Serbia: 8; Netherlands: 7; Argentina and Belgium: 5; Nigeria and South Africa: 4; Hungary: 3; Iraq, Jordan, Norway, Portugal, and Russia: 2; Austria, Iceland, and Senegal: 1 [Colour figure can be viewed at wileyonlinelibrary.com]

Journal of the European Academy of Dermatology and Venereology) (Table 3).

Among the top twenty most cited articles and references, seventeen are original articles and three are review articles. The first ranked article is "Scala et al, 2003"[28] with 231 global citations and 149 local citations, followed by "Grushka et al, 1987"[29] with 208 global citations and 129 local citations and "Bergdahl M & Bergdahl J, 1999"[30] with 198 global citations and 135 local citations. These three articles are also the most cited reference: "Scala et al, 2003"[28] with 149 citations, "Bergdahl M & Bergdahl J, 1999"[30] with 134 and "Grushka et al, 1987"[29] with 129.

The analysis of keywords assigned by authors demonstrated that—after removing burning mouth syndrome, glossodynia, and stomatodynia as used as MeSH terms in this research—"pain," "depression," and "anxiety" are the three top relevant terms, occurring 28, 23, and 20 times, respectively. Conversely, as far as the keywords created by Clarivate Analytics are concerned, "pain" still ranks first occurring 130 times, whereas "depression" and "anxiety" ranked fourth and fifth occurring 49 and 47 times, respectively, after "management" and "prevalence," occurring 75 and 55 times in all 443 articles.

3.4 | Authors' productivity

The most productive authors are "Lopez-Jornet P" with 19 published articles (6.52 fractionalized articles), followed by "Lamey PJ" and "Grushka M" with 14 published articles (5.32 and 4.82 fractionalized articles, respectively). Interestingly, the majority of all authors included in our review published between 1 (999 authors) and 2 articles (188 authors), whereas only 1 to 2 authors published between 10 and 19 articles.

The authors with the highest indices are "Lamey PJ" with both an *h*- and a *g*-index of 14, a total citation of 718 and total citation per article (TCA) of 51.29. This author was followed by "Grushka M," with an *h*-index of 10 and a *g*-index of 14, a total citation of 853, and TCA of 60.93, then by "Lopez-Jornet P" with an *h*-index of 8 and a *g*-index of 15, a total citation of 232, and TCA of 12.21 (Table 4).

On the other hand, different authors are found when analyzed by dominance factor (DF). "Klasser GD" ranked 1st with a DF of 0.83 with 5 articles as first authored and 6 with multi-authored, followed by "Lamey PJ" with a DF of 0.69 with 9 articles as first authored and 13 as multi-authored, and "Lopez-Jornet" with a DF of 0.67 with 12 articles as first authored and 18 as multi-authored (Table 4).

4 | DISCUSSION

In this study, bibliometric indicators were used to describe the global scientific activity on COSD, in order to assist researchers with an enhanced understanding of the history and future direction of COSD research. To the best of our knowledge, this is the first study aimed at

TABLE 2 Top 20 productive countries and citations per country[a]

SCR by number of articles	Country	Articles (%)	SCP	MCP (%)	SCR by TC	Country	TC	MCA
1st	Italy	66 (15.42)	57	9 (13.6)	1st	Italy	1415	21.44
2nd	United States of America	61 (14.25)	52	9 (14.8)	2nd	United States of America	1032	16.92
3rd	Japan	36 (8.41)	30	6 (16.7)	3rd	United Kingdom	848	36.87
4th	Brazil	30 (7.01)	27	3 (0.1)	4th	Canada	788	49.25
5th	Spain	30 (7.01)	30	0 (0.0)	5th	Sweden	662	50.92
6th	United Kingdom	23 (5.37)	18	5 (21.7)	6th	Finland	621	56.45
7th	Croatia	17 (3.97)	14	3 (17.6)	7th	Spain	408	13.60
8th	Korea	17 (3.97)	17	0 (0.0)	8th	Brazil	400	13.33
9th	Canada	16 (3.74)	9	7 (43.8)	9th	France	354	29.50
10th	Sweden	13 (3.04)	13	0 (0.0)	10th	Japan	258	7.17
11th	France	12 (2.80)	10	2 (16.7)	11th	Ireland	252	21.00
12th	Ireland	12 (2.80)	9	3 (25.0)	12th	Australia	171	17.10
12th	Finland	11 (2.57)	8	3 (27.3)	13th	Netherlands	162	54.00
14th	Australia	10 (2.34)	6	4 (40.0)	14th	Denmark	156	22.29
15th	Germany	8 (1.87)	4	4 (50.0)	15th	Germany	145	18.12
15th	India	8 (1.87)	8	0 (0.0)	16th	Israel	145	36.25
17th	Denmark	7 (1.64)	4	3 (42.9)	16th	Korea	124	7.29
17th	China	6 (1.40)	5	1 (16.7)	18th	Croatia	111	6.53
17th	Taiwan	6 (1.40)	6	0 (0.0)	19th	Taiwan	97	16.17
20th	Greece	5 (1.17)	4	1 (20.0)	20th	Argentina	74	37.00

Abbreviations: MCA, mean citations per article; MCP, multiple countries publications (inter-country collaboration); SCP, single country publications (intra-country collaboration); SCR, Standard Competition Ranking; TC, total citations.

[a]Country was selected based on the corresponding author (countries were clearly stated only in 428/443 articles).

evaluating quantitatively the evolving trend of COSD research, in terms of productivity from various countries, institutions and departments, contribution of authors, and assorted journals, over the past 30 years.

Research activity on COSD showed a remarkable growth in the past 10 years, with Italy and USA being the leading countries for publishing and receiving citations, and a stable range in mean annual citations per article. The two positive peaks observed in 1999 and 2003 clearly reflect the impact that those articles had in COSD research. The slow increase in publishing in other countries could be due to the lack of funding, or different geographic distribution of patients' population, or different areas of interest in research, as demonstrated by the fact that <1% of the authors included in our review have published 6 or more papers on COSD.

Unfortunately, very few authors have embraced and undertaken collaborative efforts with authors from other countries in regard to COSD research initiatives. This is quite surprising because the advances in technology and the rapid processing and dissemination of scientific information should have reduced the barriers to geographic distance and broadened interdisciplinary collaboration, thereby facilitating more sophisticated research. In turn, an increase in global scientific productivity would have a stronger impact on academic recruitment, promotion, and funding thereby benefitting all involved stakeholders.

Interestingly, the majority of departments involved with COSD research belong to dental institutions, supporting the notion that COSD falls under the category of being an odontostomatological disorder, primarily within the domains of the fields of oral medicine and/or orofacial pain. Indeed, the importance of research on COSD by dental disciplines is evidenced by the fact that 10 out 17 journals belong to the "dentistry/oral surgery/oral medicine" category, with the first four dealing specifically with oral medicine and/or orofacial pain. However, the presence of different departments from medical institutions, such as dermatology, physiology, psychiatry, or clinical neurophysiology, reinforces the idea that COSD research requires a multidisciplinary approach.

Our results are similar to those from previous investigations that showed a significant growth in the dental literature in absolute terms, as well as upward trends for most of the citation-based bibliometric indices [31] with the USA and Japan being the most productive countries not only in general dentistry,[32] but also specifically in the field of chronic orofacial pain.[33]

Our results suggest that COSD should be more represented in the field of general dentistry as COSD patients are usually firstly seen in general dentistry practice offices.[34] Therefore, more publications on COSD in journals focusing on general dentistry and other dental disciplines would result in oral healthcare providers

TABLE 3 Top 20 relevant and cited sources

SCR by number of articles	Relevant sources	Number of articles	(%)	TCA	IF	SCR by TC	Cited sources	Citations
1st	Journal of Oral Pathology & Medicine	38	8.58	1097	2.237	1st	Oral Surgery Oral Medicine Oral Pathology Oral Radiology	1292
2nd	Oral Diseases	29	6.55	340	2.31	2nd	Pain	1237
3rd	Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontics[a]	20	4.51	1080	1.718	3rd	Journal of Oral Pathology & Medicine	836
4th	Pain	16	3.61	1200	5.559	4th	Journal of Oral & Facial Pain and Headache	434
5th	Journal of Orofacial Pain[b]	14	3.16	459	1.538	5th	British Dental Journal	389
6th	Medicina Oral Patologia Oral y Cirugia Bucal	12	2.71	188	1.671	6th	Oral Diseases	327
7th	British Dental Journal	11	2.48	230	1.274	7th	Journal of the American Dental Association	291
8th	Headache	8	1.81	62	3.091	8th	Medicina Oral Patologia Oral y Cirugia Bucal	247
8th	Journal of Oral & Facial Pain and Headache[b]	8	1.81	13	1.538	9th	Critical Review Oral Biology	178
8th	Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontology[a]	8	1.81	126	1.718	10th	Journal of Dental Research	162
8th	Pain Medicine	8	1.81	43	2.782	11th	British Medical Journal	154
9th	International Journal of oral and maxillofacial surgery	7	1.58	50	2.164	12th	Cephalalgia	129
9th	Oral Surgery Oral Medicine Oral Pathology Oral Radiology[a]	7	1.58	30	1.718	13th	Journal of Psychosomatic Research	119
10th	Archives of Oral Biology	6	1.35	92	2.050	14th	Archives of Oral Biology	114
10th	Clinical Oral Investigations	6	1.35	17	2.386	15th	Minerva Stomatologica	113
10th	Journal of Headache and Pain	6	1.35	48	3.403	16th	Journal of Oral Rehabilitation	108
10th	Journal of Psychosomatic Research	6	1.35	86	2.947	17th	Contact Dermatitis	101
10th	Journal of the American Dental Association	6	1.35	188	2.486	18th	Cochrane Database of Systematic Review	97
10th	Journal of the European Academy of Dermatology and Venereology	6	1.35	51	4.287	19th	Clinical Journal of Pain	96
10th	Photomedicine and Laser Surgery	6	1.35	58	1.620	20th	American Family Physician	94

Abbreviations: IF, impact factor 2018; SCR, standard competition ranking by number of articles; TCA, total citations of articles.

[a]These journals are now merged under "Oral Surgery Oral Medicine Oral Pathology Oral Radiology"

[b]These journals are now merged under "Journal of Oral & Facial Pain and Headache"

TABLE 4 Authors' indices based on this study's article collection

Author	SCR by *h*-index	*h*-index	g-index	*m*-index	TC	LC[a]	NP	TCA	Author	SCR by DF	DF	First authored	Multiauthored
Lamey PJ	1st	14	14	0.40	718	392	14	51.29	Klasser GD	1st	0.83	5	6
Grushka M	2nd	10	14	0.29	853	634	14	60.93	Lamey PJ	2nd	0.69	9	13
Lopez-Jornet P	3rd	8	15	0.62	232	170	19	12.21	Lopez-Jornet P	3rd	0.67	12	18
Forssell H	3rd	8	9	0.33	516	130	9	57.33	Sardella A	4th	0.60	6	10
Lamb AB	5th	7	7	0.21	442	49	7	63.14	Pigatto PD	5th	0.57	4	7
Kho HS	6th	6	9	0.50	91	17	11	8.27	Adamo D	6th	0.50	3	6
Sardella A	6th	6	10	0.27	203	178	10	20.30	Fortuna G	6th	0.50	3	6
Camacho-Alonso F	6th	6	9	0.46	196	3	9	21.78	Jaaskelainen SK	6th	0.50	2	4
Lodi G	6th	6	9	0.27	201	4	9	22.33	Umezaki Y	6th	0.50	3	6
Carrassi A	6th	6	7	0.27	197	0	7	28.14	Grushka M	10th	0.46	6	13
Savage NW	6th	6	6	0.24	106	23	6	17.67	Mignogna MD	11th	0.43	3	7
Boras VV	6th	5	8	0.33	69	19	10	6.90	Brailo V	12th	0.33	2	6
Mignogna MD	13th	5	7	0.31	108	49	7	15.43	Takenoshita M	12th	0.33	2	6
Bergdahl J	13th	5	5	0.18	407	142	5	81.40	Forssell H	14th	0.22	2	9
Drage LA	13th	5	5	0.23	84	31	5	16.80	Boras VV	15th	0.20	2	10
Femiano F	13th	5	5	0.24	192	199	5	38.40	Savage NW	15th	0.20	1	5
Rogers RS	13th	5	5	0.15	91	0	5	18.20	Kho HS	17th	0.18	2	11
Toyofuku A	13th	4	7	0.22	51	8	9	5.67	Lamb AB	18th	0.14	1	7
Adamo D	13th	4	6	0.40	84	18	6	14.00	Spadari F	18th	0.14	1	7
Brailo V	13th	4	6	0.27	43	21	6	7.17	Camacho-Alonso F	20th	0.11	1	9

Abbreviations: DF, dominance factor; LC, local citations; NP, number of publications; SCR, standard competition ranking; TC, total citations; TCA, total citations per article.

[a]LC measure how many times an author as first author included in our collection of 443 articles has been cited by other authors also in the same collection.

being more cognizant of this disorder, thereby avoiding potential delay in diagnosis as well as providing misdirected or inappropriate treatment.[35,36]

In the top twenty articles, we may notice a gap in the clinical and basic science research, since there is a lack of an appropriate animal model to test the many hypotheses on the etiology of COSD. Also, due to this shortcoming, we are unable to discern pathophysiology or mechanisms behind the initiation, progression, and perpetuation of this condition. Unfortunately, there are only a limited number of articles dedicated to elucidating the contribution of central and/or peripheral neuropathic processes in this disorder. Additionally, we are yet to discover any specific biomarkers for this condition. A significant increase in the number of publications has occurred over the past 10 years, probably because contributions from the newest technologies in the field of radiologic imaging, molecular biology, and pharmacology have become available only recently.

From a clinical perspective, the majority of articles are focused on psychological aspects and management, but there are no studies aimed at validating, by means of field testing the diagnostic criteria for COSD. Also, COSD is a broad term, and therefore, there are probably many subgroups within COSD, as the current concept of COSD is rather heterogeneous as opposed to a more descriptively and refined homogeneous condition.

The analyses of keywords provided by the authors indicated that—after eliminating burning mouth syndrome, glossodynia, stomtoadoynia, as they were used as MeSH terms—"pain," "depression," and "anxiety" reached the highest frequency, whereas in the Keywords plus® (assigned by Clarivate Analytics) "anxiety and depression" ranked fourth and fifth.

This clearly indicates these affective dimensions are thought by researchers to play a predominant role in the COSD pathogenesis,[6,37-39] constituting a complementary view to the current knowledge that COSD is also driven by peripheral and central neuropathic mechanisms.[40-45]

5 | LIMITATIONS OF STUDY

This study presents with several limitations mainly related to the instrument of bibliometric analysis per se. Indeed, there are always false-positive and false-negative results in any bibliometric research, because it is impossible to generate a perfect and all-encompassing research query.

The citation analysis represents an objective and quantitative measure of the research, but does not provide information about its quality or the influence on clinical practice, although we may hypothesize that the more citations an article receive, the greater impact that article may have on the scientific community, such as, for instance, those reporting on the use of topical clonazepam [46] and cognitive-behavioral therapy.[47]

We included articles only from Web of Science, and therefore, it is impossible to claim that our research was an exhaustive review of the entire literature related to COSD. However, it appears that no perfect medical database exists, as each of the most common ones, such as Scopus or PubMed, has its own strengths and weaknesses.[48]

There are at least four other limitations related to this instrument: (a) It only includes articles where the term COSD or any of the included synonyms appear in the titles/abstract/keywords, but not within the full text; (b) it does not exclude self-citations, (c) the SCR system used in this analysis, and (d) WoS does not allow electronic access to articles published prior to 1985. This implies that we may have omitted some articles because one of those terms appeared only in the full text, have had an over-estimation of total citations, and/or have been published before 1985. Additionally, many other articles might have been published in not-yet-indexed journals, and therefore, to date, they remain inaccessible.

The present study was also limited to the English language, to 27 categories of journals and type of manuscript. We excluded all the remaining journals as they were not considered pertinent to the topic and other type of manuscripts because they were not considered capable of reporting sufficient study data necessary for the purpose of our bibliometric analysis. However, some dental research papers included in other categories, type of articles, and in other languages may have been overlooked.

Considering all these limitations, the number of publications analyzed in this study might not exactly reflect the entire global research activity on COSD, but the data presented likely provide significant insight into the evolving trends over the last three decades.

6 | CONCLUSIONS

The number of publications on COSD has shown a clear increasing trend in the past decade. A greater collaboration among different countries, authors, and institutions should be established in order to implement and broaden the research on this enigmatic disorder.

Last but no less important, research on COSD seems to be mainly a matter for dental disciplines, specifically for oral medicine and orofacial pain, which seems to be the two leading disciplines responsible for education, research, and management on COSD, evidenced by the high number of publications in their respective journals.

ORCID

Giulio Fortuna https://orcid.org/0000-0001-7655-3523

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