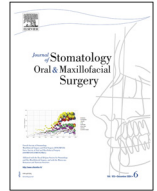




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Review

Top 100 most cited papers on diagnostic aids for oral cancer: A bibliometric analysis



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ABSTRACT

Background: Oral cancer (OC) is a multifactorial disease that affects the oral cavity. The mortality rate is approximately 50 % and a high percentage of patients are diagnosed in advanced stages. Early diagnosis has been well demonstrated to improve overall survival, mainly when detected at a localized stage. Non-invasive techniques can help identify malignant features in real time, thus improving the path to diagnosis. This study aimed to perform a bibliometric analysis of the top 100 articles cited on diagnostic aids for oral cancer.

Methods: Articles from 2000 to 2023 in Scopus were scanned using five OC topic titles crossed with 27 diagnostic aid keywords. Duplicate manuscripts were eliminated using Microsoft Excel software and publications were ranked according to their citation count. This study selected and analyzed the top 100 most cited English-language papers.

Results: 86,676 citations were accumulated by the top 100 articles most cited. 2011 was the year with the highest number of publications with OC papers. The article with the most citations obtained a total of 30,832. The United States was the country with the most publications, with a total of 45, and UCLA was the institution with the most publications (7) among the top 100 most cited papers.

Conclusions: This study identified the top 100 most cited articles on diagnostic aids for oral cancer. These results can help dentists, specialists, healthcare providers, and researchers become familiar with the most influential publications in this field.

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1. Introduction

An illness of the oral cavity, oral cancer (OC) is caused by a variety of factors. The buccal mucosa, palate, vestibule, floor of the mouth, two-thirds anterior space of the tongue, gingivae, and floor of the mouth are the most frequent locations [1]. Globally, it is ranked sixth in terms of prevalence, accounting for an estimated 350,000 newly diagnosed cases and 177,000 fatalities annually [2]. According to histological classification, squamous cell carcinoma comprises 90–95 % of all malignant tumors that affect this anatomic area, with rare or metastatic malignancies comprising the remaining 5 % to 10 % [3]. It is associated with the use of alcohol and tobacco and predominantly impacts the elderly male population. A considerable proportion of

patients are diagnosed in advanced stages, when severe and mutilating therapy is administered, significantly reducing the patient's quality of life. The death rate is estimated to be over 50 % [1,4]. Early diagnosis, particularly when found in a localized stage, has been shown to significantly enhance overall survival [1]. Biopsy and histological evaluation are the gold standard for the diagnosis of OC. Non-invasive approaches have the potential to detect malignant characteristics in real time, facilitating the diagnostic process, in contrast to invasive and time-consuming treatments. Several established techniques are being used to achieve diagnosis, including tissue autofluorescence and vital staining. Additionally, unique and inventive methods, including narrowband imaging and high-frequency ultrasounds (3, 5) are being used. For clinical use, new techniques, such as biomarker identification, are being developed; some of these have already been authorized by the FDA.

Furthermore, it is critical to highlight the recent expansion of artificial intelligence (AI), which can aid in the early detection of OC

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through clinical decision making or AI-based diagnostic systems. Such systems may be utilized for screening purposes, lesion discrimination, and the development of prediction models [2]. Notwithstanding advances in technology, the mortality rate continues to be substantial, hence necessitating an increasing assault on this issue. Due to accessibility of the oral cavity, health care providers and dentists are able to perform opportunistic screenings; visual examination, routine interactions with patients, and a variety of diagnostic aids ranging from simple to complex techniques are all useful tools to establish a diagnosis [5,6]. Bibliometrics is an essential scientific instrument that is utilized to quantitatively analyze publications, journal articles, and citation counts. An examination of these objects quantitatively yields data on their development, level of expertise, leading authors, conceptual and intellectual frameworks, and patterns [7]. The objective of this research effort was to determine the 100 most referenced publications on diagnostic tools for oral cancer and perform a bibliometric analysis that identifies the most significant work in this field. Documenting the top 100 articles most cited in diverse pathologies is a key benchmark in the field of medical research. This compilation encapsulates the seminal works that have significantly shaped and advanced our understanding of various diseases and medical conditions. It serves as a critical reference point for researchers, clinicians, and scholars, offering comprehensive insight into key studies, breakthroughs, and trends within specific pathologies. The compilation not only acknowledges the historical

progression of medical knowledge, but also serves as a guiding compass for future investigations, allowing informed decisions and the identification of potential avenues for further exploration and innovation [8]. Furthermore, the objective of this research was to determine the authors, publications, nations, and organizations that exert the greatest effect on this subject matter. For dentists, specialists, and other health professionals affiliated with patients diagnosed with oral cancer, this can serve as a valuable resource to identify current developments in this field.

2. Materials and methods

2.1. Data collection and search strategy

As a retrospective examination of material that was readily accessible to the public, institutional review board approval was not required for this work. We searched the Elsevier Scopus database (<https://www.scopus.com/home.uri>) on October 31, 2023, for publications related to diagnostic assistance for oral cancer. The impact factor (IF) values for the chosen journals were obtained from Clarivate Analytics via Web of Science's Journal Citation Reports (JCR) (<https://jcr.clarivate.com/jcr>). The quartile classifications (Q1 to Q4) for each journal were sourced from the Scimago Journal Rank (SJR) website (<https://www.scimagojr.com/index.php>). Table 1 contains the entire list of selected keywords utilized in the search.

Table 1
List of keywords used in the bibliometric analysis.

Topic	Search algorithm
Oral Cancer: Oral cancer Oral neoplasms Oral squamous cell carcinoma Mouth cancer Non-invasive oral cancer	(TITLE-ABS-KEY ("Oral cancer" OR "Oral neoplasms" OR "Oral squamous cell carcinoma" OR "Mouth cancer" OR "Non-invasive oral cancer")
Diagnostic aids: Non-invasive diagnosis Diagnostic methods Early detection Biomarkers Screening Saliva biomarkers Oral fluid analysis Non-invasive techniques Optical Imaging Molecular Markers Spectroscopy Imaging modalities Machine learning Artificial intelligence Diagnostic accuracy Sensitivity and Specificity Autofluorescence Chemiluminescence Cytology Narrowband Imaging Vital staining Imaging Methods Lab-on-a-chip Liquid biopsy Advanced Diagnostic Aids Nanodiagnostics Diagnostic technologies	TITLE-ABS-KEY ("Non-invasive diagnosis" OR "Diagnostic methods" OR biomarkers OR "Early detection" OR screening OR "Saliva biomarkers" OR "Oral fluid analysis" OR "Non-invasive techniques" OR "Optical imaging" OR "Molecular markers" OR spectroscopy OR "Imaging modalities" OR "Machine learning" OR "Artificial intelligence" OR "Diagnostic accuracy" OR "Sensitivity and specificity" OR "Autofluorescence" OR "Chemiluminescence" OR "Cytology" OR "Narrow band imaging" OR "Vital staining" OR "Lab-on-a-chip" OR "Imaging methods" OR "Liquid biopsy" OR "Advanced diagnostic aids" OR "Nanodiagnostics" OR "Diagnostic technologies"))
Complete advanced query	
(TITLE-ABS-KEY ("Oral cancer" OR "Oral neoplasms" OR "Oral squamous cell carcinoma" OR "Mouth cancer" OR "Non-invasive oral cancer") AND TITLE-ABS-KEY ("Non-invasive diagnosis" OR "Diagnostic methods" OR biomarkers OR "Early detection" OR screening OR "Saliva biomarkers" OR "Oral fluid analysis" OR "Non-invasive techniques" OR "Optical imaging" OR "Molecular markers" OR spectroscopy OR "Imaging modalities" OR "Machine learning" OR "Artificial intelligence" OR "Diagnostic accuracy" OR "Sensitivity and specificity" OR "Autofluorescence" OR "Chemiluminescence" OR "Cytology" OR "Narrow band imaging" OR "Vital staining" OR "Lab-on-a-chip" OR "Imaging methods" OR "Liquid biopsy" OR "Advanced diagnostic aids" OR "Nano diagnostics" OR "Diagnostic technologies"))	

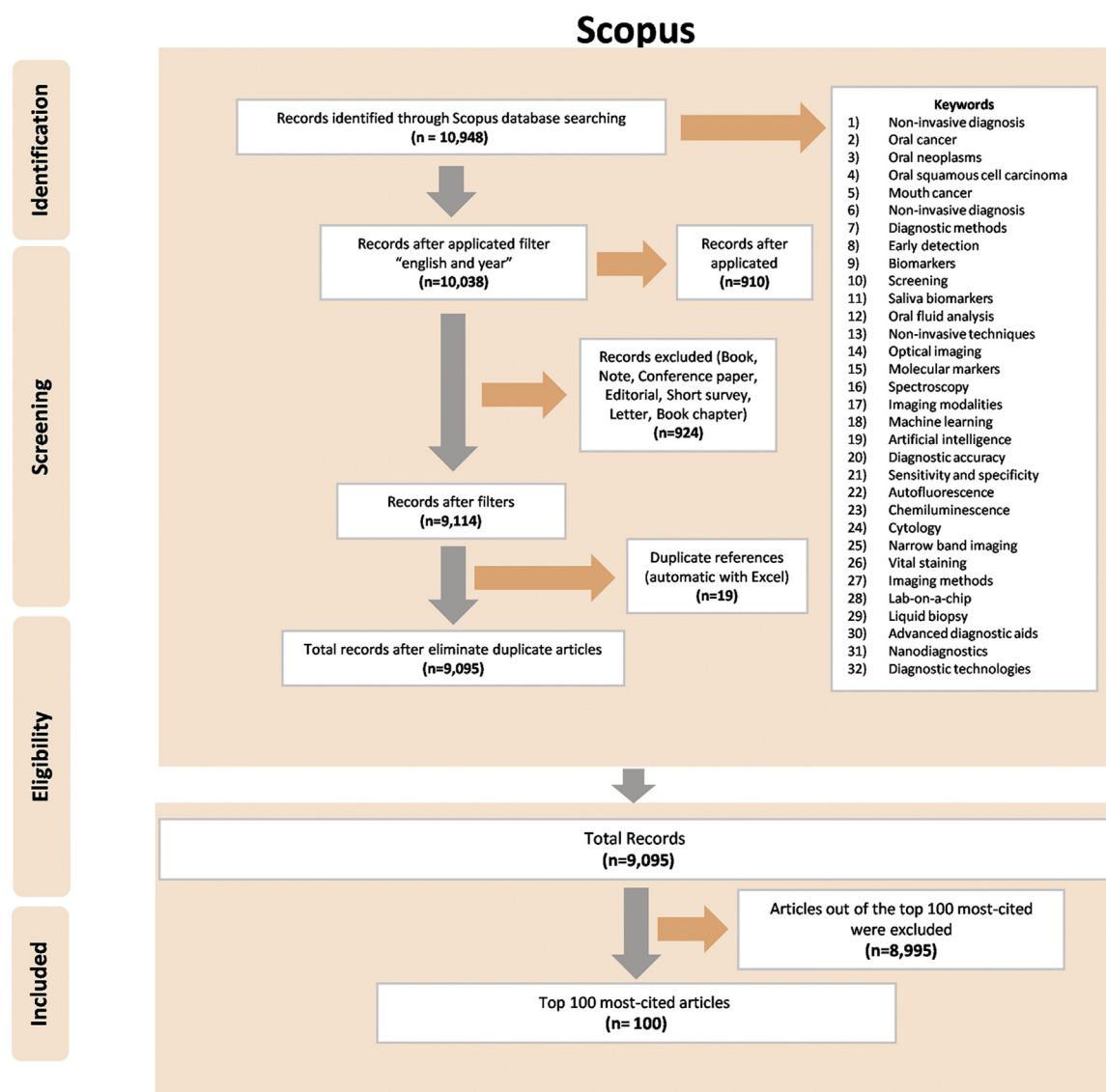


Fig. 1. Graph illustrating the article selection procedure.

2.2. Eligibility criteria and article selection

The data search encompassed both original publications and reviewed articles published in English between 2000 and 2023. Papers, books, notes, editorials, brief surveys, letters, and book chapters were omitted. The search query was refined using Boolean operators to link each subject matter with the abstract, keywords, and title. We saved the resultant database as a single document after executing the search algorithms for the designated themes. Subsequently, we used Microsoft Excel v16.33 (Microsoft Corporation, Redmon, WA, USA) to eliminate duplicate articles. The investigation adhered to the PRISMA-ScR checklist. The article selection process is depicted in Fig. 1 as a flow chart.

By sorting the final database by citation count in descending order, the 100 most cited publications were retrieved. The additional file with the list of the top 100 most referenced articles is exclusively accessible as an on-line-only file.

2.3. Bibliometric analysis techniques

Bibliometric analysis (BA) is a rigorous scientific approach utilized to acquire quantitative data; evaluate scholarly output by employing published scientific literature (including but not limited to books, research articles and conference proceedings) to quantify research

efforts within a particular field [9]. Performance analysis (contributions of research constituents) and science mapping (relationships among research constituents) were the two categories of our bibliometric studies. A comprehensive exposition of both methodologies was recently published [9]. The performance analyses yielded the following parameters: The total published articles (TP) were classified according to the number of active years of publication (NAY) and the specified topic (authors, journals, countries, and institutions). Additionally, the number of sole-authored articles (SA), contributing authors (NCA), and co-authored publications (CA) was calculated.

The science mapping analyzes assessed three facets: the intellectual structure and knowledge underlying the diagnostic aids most commonly used for oral cancer diagnosis; the interrelationships between key concepts investigated in the field of oral cancer and its diagnosis; and the degree of collaboration evident in oral cancer literature publications. We utilized coauthorship networks, cocitation networks, and keyword cooccurrence networks to illustrate these elements.

2.4. Statistical analysis

Descriptive statistics (sum, average, percentages) were employed to determine the number of citations, average citation per year, and year of publication for the top 100 publications referenced.

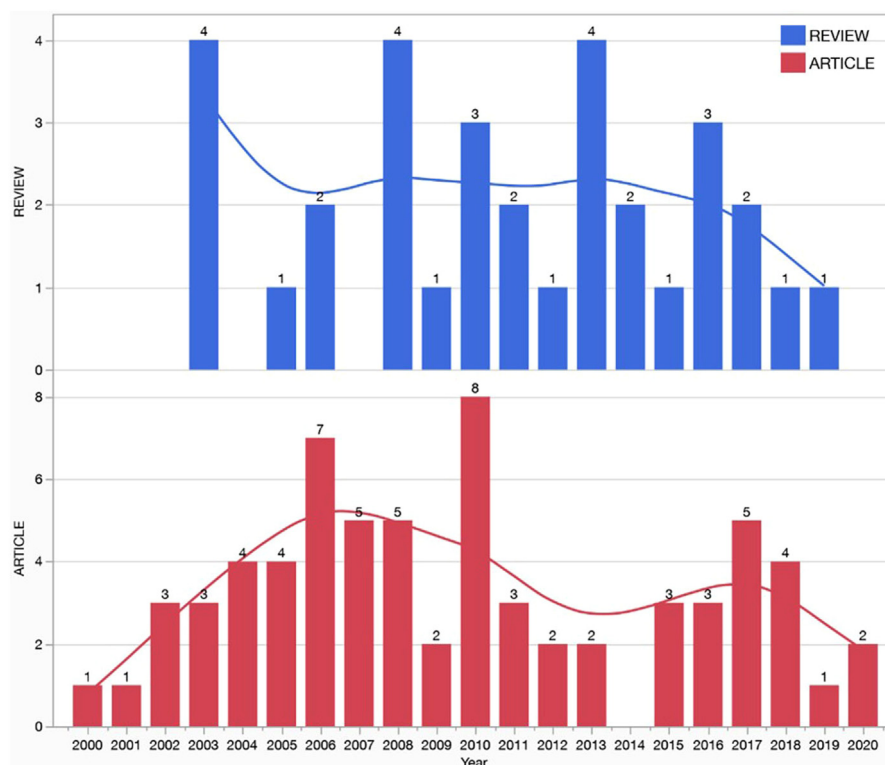


Fig. 2. The temporal distribution of the top 100 articles cited on oral cancer and early diagnosis is represented by bar graphs. The columns in question are labeled as follows: blue for reviews and red for original pieces. The blue and red lines represent the spline fit of the data to curves in a spline polynomial model (using the least-squares criteria).

2.5. Software

The performance of the exported Scopus database was analyzed using Microsoft Excel® v.16.67 (Microsoft Corporation, Redmon, WA, USA). Some bar graphs were prepared using JMP® Pro software (version 17.1.0, SAS Institute Inc., Cary, NC, USA). Visualization of the network for *science mapping* was performed using the VOS viewer 2009–2023 Version 1.6.19 (available from <https://www.vosviewer.com>).

3. Results

A total of 10,948 articles were recovered from the Scopus database using the keywords listed in Table 1. We applied the year filter from 2000 to 2023, retrieving 10,306 articles. We selected articles written in English and discarded 268 articles written in other languages, obtaining a total of 10,038 articles. Subsequently, 924 articles comprised of book chapters, books, editorials, conference papers, letters, short surveys, and notes were excluded. Subsequently, 9114 articles remained. Furthermore, we eliminated 19 duplicate articles, obtaining a final database of 9095 articles. The top 100 most cited articles were obtained from this database Fig. 1.

3.1. Most productive year—publication-related

Between 2000 and 2021, the 100 publications with the highest number of citations on diagnostic aids for oral cancer were published; of these, 68 were original and 32 were reviews. Articles published between 2022 and 2023 did not rank in the top 100 most referenced. The year 2010 was the most fruitful, with eleven papers published; 2008 and 2006 followed with nine articles each, while 2003 and 2017 each had seven articles published. The annual number of original articles and reviews is depicted in Fig. 2.

3.2. Most productive year—citation-related

The total citations of these top 100 articles ranged from 213 to 30,832, with a median of 886.66. with a total count of 86,676. The average citation per year ranged from 10.80 to 2371.69, with a median of 75.04. Fig. 3 shows the total number of citations per year; the highest number of citations was obtained in 2011 with 32,377 citations, followed by 2015 with 12,607 citations. This figure indicates no clear trend between the number of citations per year, as the association is weak or practically non-existent ($R = 0.005$, p -value < 0.001).

3.3. Countries of publication

Seventeen countries on four continents contributed to the top 100 most cited articles on diagnostic aids for oral cancer. According to the citation count, the five leading countries were the United States (66,124), the United Kingdom (3778), France (3150), Spain (2052), and India (2030). The most productive by number of publications were the United States of America (45), United Kingdom (10), India

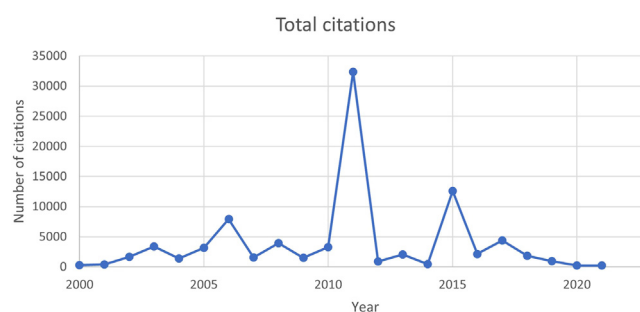


Fig. 3. Annual citations on the early diagnosis of oral cancer from 2000 to 2023.

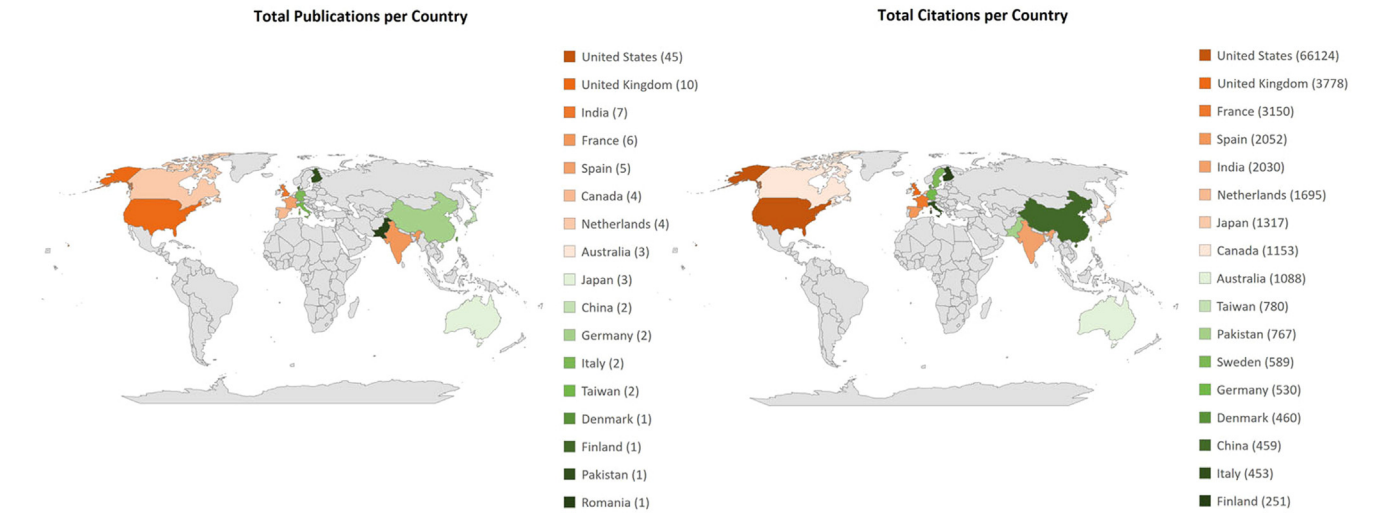


Fig. 4. The worldwide map illustrates the aggregate count of publications and citations for each nation in relation to the 100 most cited articles.

Table 2
Institutions of the corresponding authors.

Rank	Institutions	TP	TC
1	University of California, Los Angeles	7	2827
2	American Cancer Society	5	32,982
3	International Agency for Research on Cancer	5	2929
4	Georgia Institute of Technology	4	5930
5	King's College London Dental Institute	3	1035
6	Catalan Institute of Oncology, L'Hospitalet de Llobregat	2	723
7	Erasmus MC University Medical Center Rotterdam	2	859
8	Johns Hopkins University	2	564
9	National Cancer Institute	2	1059
10	University of Cambridge	2	498
11	University of Queensland	2	762
12	VU University Medical Center	2	12,406
13	YMT Dental College and Hospital	2	773

TP: Total publications, TC: Total citations.

(7), France (6), and Spain (5). Fig. 4 presents a global map representing the total number of publications and citations per country.

3.4. Contributing institutions

The University of California–Los Angeles (UCLA), USA, had the most articles in the top 100, contributing with 7 publications with 2827 citations, followed by the American Cancer Society, USA, with

five articles and 32,982 citations. The rest of the institutions with at least two articles in the Top 100 are represented in Table 2.

3.5. Distribution of journals

The articles were published in 66 different journals. *Oral Oncology*, a journal with an IF in 2022 of 4.8, had the highest number of publications, a total of nine articles, and 2720 citations, followed by the *CA Cancer Journal for Clinicians* with an IF in 2022 of 286.13 with six articles and a total number of citations of 44,904. The rest of the journals with at least two articles in the Top 100 are represented in Table 3.

3.6. Contributing authors

A mean of 8.13 contributors was observed for each publication, with values ranging from 1 to 81. A total of ninety-five unique first authors authored the articles that received the most citations. There were nine sole-authored publications and 91 co-authored articles among the top 100 most referenced. By number of publications, Xiaohua Huang ($n = 3$), Ahmedin Jemal ($n = 2$), and Gokul Sridharan ($n = 2$) were the writers with the highest output. Ahmedin Jemal received the most citations, totaling 31,887, as shown by the citation count. This was followed by Rebecca Siegel with 11,802 citations and Xiaohua Huang with 5612 citations. The writers with the highest

Table 3
Top-cited journals with their bibliometrics and productivity metrics.

Rank	Title of the journal	TC	TP	IF	CiteScore	SNIP	SJR	CPP	Quartile
1	Oral Oncology	2720	9	4.8	8.6	1.497	1.271	302.22	Q1
2	CA Cancer Journal for Clinicians	44,904	6	286.13	642.9	153.478	86.091	7484	Q1
3	Clinical Cancer Research	2360	5	13.801	21.8	2.156	4.603	472	Q1
4	International Journal of Cancer	2095	4	5.145	15.2	1.931	2.259	523.75	Q1
5	Journal of the National Cancer Institute	1782	3	10.3	18.3	3.144	5.409	594	Q1
6	Journal of Clinical Oncology	796	3	45.3	39.6	6.449	10.163	265.33	Q1
7	Journal of the American Dental Association	727	3	3.454	5	1.401	0.52	242.33	Q2
8	Nano Letters	2299	2	12.262	18	1.873	3.54	1149.5	Q1
9	Cancer	1137	2	3.61	12.2	2.097	2.736	568.5	Q1
10	Journal of Oral Pathology and Medicine	995	2	3.539	7.3	1.213	0.682	497.5	Q2
11	The Lancet	929	2	168.9	133.2	25.787	14.607	464.5	Q1
12	The Lancet Oncology	703	2	33.752	62	10.918	12.27	351.5	Q1
13	New England Journal of Medicine	554	2	176.08	134.4	17.194	26.015	277	Q1
14	Cancer Research	473	2	13.312	16.9	1.624	2.984	236.5	Q1
15	Cancer Epidemiology Biomarkers and Prevention	438	2	5.057	6.5	1.23	1.923	219	Q1

TC: Total citations, TP: Total publications, IF: Impact factor, SNIP: Source-normalized impact per paper, SJR: SCImago Journal Rank, CPP: Citation per publication.

Table 4
The most productive authors in the top 100 cited articles on oral cancer and early detection.

Rank	Author full names	TP	Title of the journal	Cited by	Institutions	Country
1	Huang, Xiaohua	3	Journal of the American Chemical Society Nano Letters Lasers in Surgery and Medicine	4856 502 254	Georgia Institute of Technology	United States
2	Jemal, Ahmedin	2	CA Cancer Journal for Clinicians Journal of the National Cancer Institute	30,832 1055	American Cancer Society	United States
3	Sridharan, Gokul	2	Journal of Oral Pathology and Medicine Journal of Cancer Research and Therapeutics	518 255	YMT Dental College and Hospital	India
4	Warnakulasuriya, Saman	2	Journal of Oral Pathology and Medicine Oral Oncology	477 245	King's College Dental Institute, London	United Kingdom

Table 5
The top 15 authors cited on oral cancer and early detection.

Rank	Author full names	TP	Title of the journal	TC	Institutions	Country
1	Jemal, Ahmedin	2	CA Cancer Journal for Clinicians/Journal of the National Cancer Institute	31,887	American Cancer Society	United States
2	Siegel, Rebecca L.	1	CA Cancer Journal for Clinicians	11,802	American Cancer Society	United States
3	Huang, Xiaohua	3	Journal of the American Chemical Society/Nano Letters/Lasers in Surgery and Medicine	5612	Georgia Institute of Technology	United States
4	El-Sayed, Ivan H.	1	Nano Letters	1797	University of California at San Francisco	United States
5	de Martel, Catherine	1	International Journal of Cancer	1196	International Agency for Research on Cancer	France
6	Parkin, D. Maxwell	1	Vaccine	1173	University of Oxford	United Kingdom
7	Hecht, Stephen S.	1	Nature Reviews Cancer	1151	University of Minnesota Cancer Center	United States
8	Neville, Brad W.	1	Ca-A Cancer Journal for Clinicians	929	Medical University of South Carolina	United States
9	Pascual, Gloria	1	Nature	835	Barcelona Institute of Science and Technology (BIST)	Spain
10	Cronin, Kathleen A.	1	Cancer	808	National Cancer Institute	United States
11	Sridharan, Gokul	2	Journal of Oral Pathology and Medicine/Journal of Cancer Research and Therapeutics	773	YMT Dental College and Hospital	India
12	Warnakulasuriya, Saman	2	Journal of Oral Pathology and Medicine/Oral Oncology	722	King's College Dental Institute, London	United Kingdom
13	Sugimoto, Masahiro	1	Metabolomics	719	Keio University	Japan
14	Park, Noh Jin	1	Clinical Cancer Research	678	Dental Research Institute	Serbia
15	Karim-Kos, Henrike E.	1	European Journal of Cancer	629	Erasmus MC University Medical Center	The Netherlands

TP: Total publications, TC: Total citations.

productivity, and the highest citation count, are shown in [Tables 4](#) and [5](#) respectively. The complete list of authors ranked by citations is included in Table B in the supplementary file.

3.7. Science mapping analyses

Using the VosViewer program, [Figs. 5, 6,](#) and [7](#) illustrate the network of the three facets of scientific mapping: coauthorship, cooccurrence, and cocitation.

4. Discussion

By identifying and assessing the scientific effect of a certain subject or field, bibliometric analysis identifies research trends and study hotspots [\[10\]](#). Scopus, one of the most extensive databases of peer-reviewed literature, subjected its journals to rigorous evaluation processes to ensure adherence to its stringent criteria. Scopus offers an extensive compilation of data, including a list of authors and their publications, the frequency of citations for each published work, as well as a ranking of the most prolific nations, years, and journals [\[7\]](#). Therefore, we collected and retrieved the information using the Scopus database. Regarding diagnostic aids for oral cancer, our investigation found the most pertinent papers. As a result, it provides academics and health professionals with the most authoritative bibliography of the last 20 years, serving as a resource for medical innovation and the identification of knowledge gaps that warrant further investigation.

From 2000 to 2023, publications and total citations were distributed unevenly; this may have been the result of substantial scientific advancements, policy shifts in the field of research, or annual occurrences of particular interest. 2010, with 11 papers published, was the most fruitful year. Possibly as a result of the development of new screening and diagnostic methods in the 2000s, there was greater emphasis on early diagnosis [\[11\]](#). The article “Global Cancer Statistics,” which was published in the CA Cancer Journal for Clinicians in 2011, had the most citations, totaling 30,832. ‘Cancer statistics’, which was also published in the CA Cancer Journal for Clinicians in 2015, accumulated 11,802 total citations, making it the second most cited publication.

With 66,124 citations, the United States provided more than half of the 100 most cited works ($n = 45$). With 10 papers and 3778 citations, the United Kingdom ranked second, followed by India with seven articles and 2030 citations and France with six articles and 3150 citations. It is imperative to note that while France has published fewer articles than India, it has accumulated a greater number of total citations. This suggests that the number of publications does not guarantee or concentrate the number of citations.

4.1. Ranking of institutions by citations

The five most substantial contributing institutions originated from various nations. Five of the articles from the American Cancer Society of the USA received the most citations, totaling 32,982. Interestingly, when comparing institutions, there is no clear association between the number of publications and citations. As an illustration, the

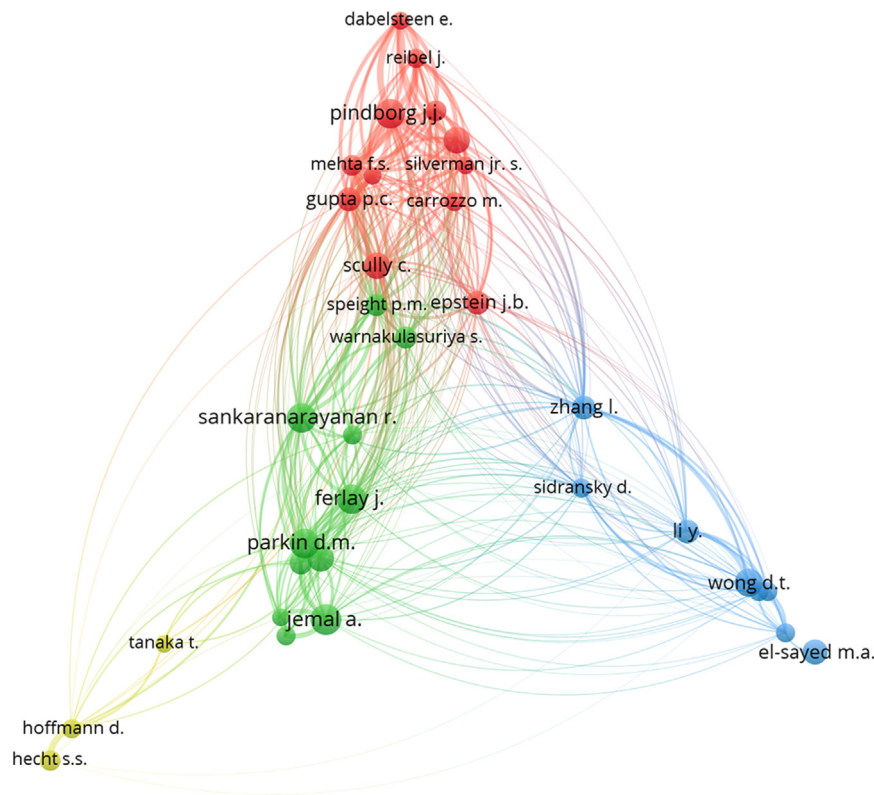


Fig. 5. Cocitation system. Colored clusters indicate a collection of co-cited articles that share the same subject matter. Each individual node symbolizes a distinct article, with the thickness of the lines indicating a more pronounced cocitation pattern, and the size of the nodes indicating the significance or relevance of the item within the network.

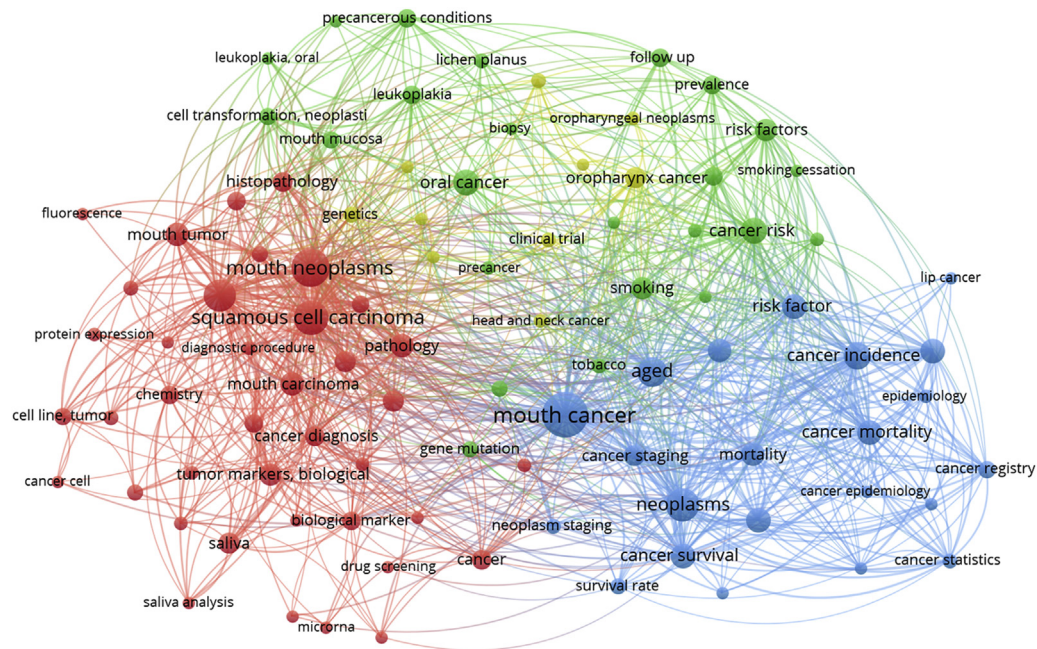


Fig. 6. The lines in a co-occurrence network symbolize the relationship between keywords, while the nodes correspond to individual keywords, and the node size signifies the key-word's significance or relevance within the network.

Georgia Institute of Technology earned 5930 citations with four articles, but the VU University Medical Center accumulated 12,406 citations with two articles. These results imply that the possession of high-impact articles is more crucial than the quantity of articles in achieving a significantly higher number of citations.

4.2. Ranking of journals by citation: most relevant sources

Based on the results of this bibliometric research, the CA Cancer Journal for Clinicians garnered the highest number of citations among the Top 100 with 44,904 throughout its six publications and an IF of

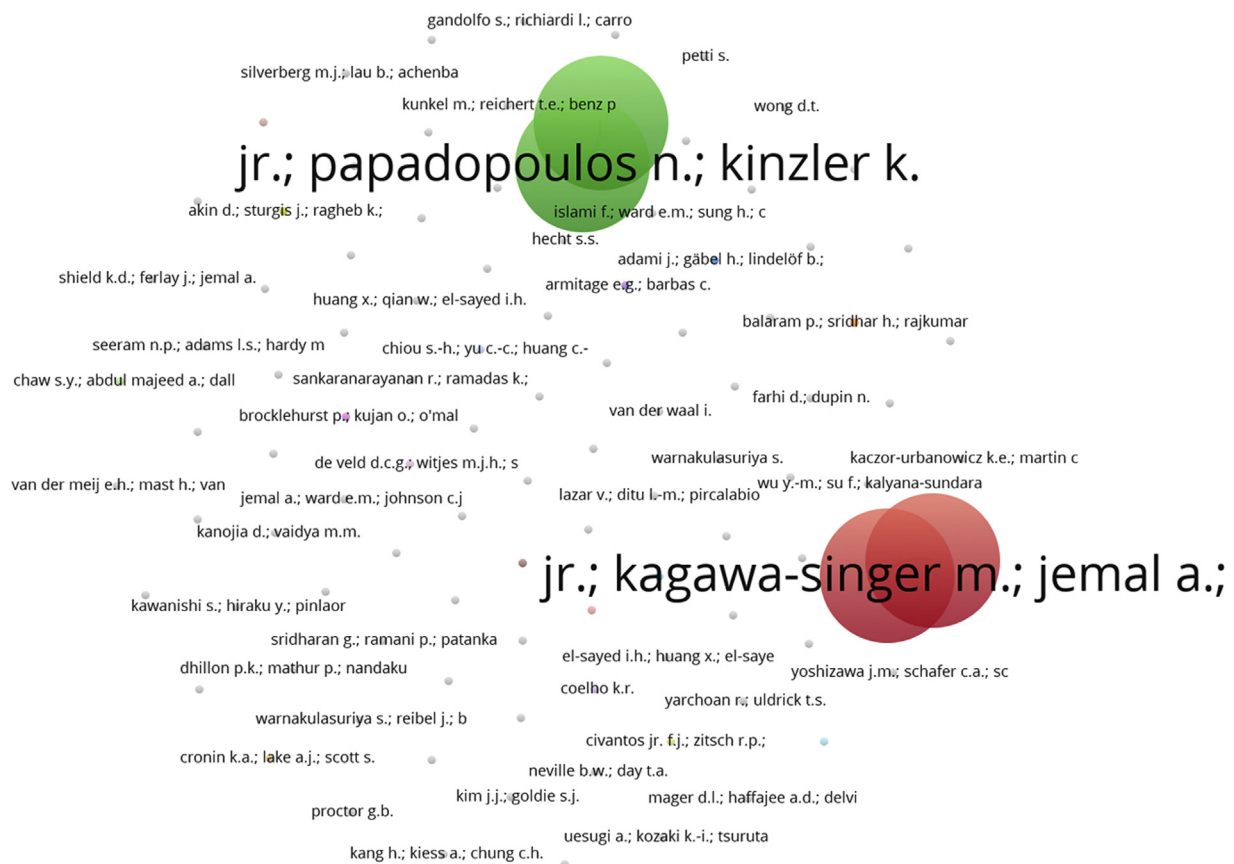


Fig. 7. In a co-authorship network, each node represents a different author, and the node size represents the relevance or importance of this network. In this case, the proximity of the nodes represents the collaboration between the authors.

286.13. On the contrary, among the Top 100, oral cancer had the highest number of articles (nine publications with 2720 citations) with an IF of 5.972. This shows that these journals are the most referenced in this particular area of study. The 15 most published journals comprised the majority of the first quartile in their respective JCR categories [Table 3](#).

4.3. Author rank by citations: most relevant contributions

Jemal Ahmedin was the author most cited with two publications in two different journals, the *CA Cancer Journal for Clinicians* and the *Journal of the National Cancer Institute*, with 30,832 and 1055 citations, respectively, making a total of 31,887 citations. The following author was Siegel, Rebecca, with one publication as the first author and accumulating 11,802 total citations. It is worth mentioning that seven of the top 15 authors among the top 100 have affiliations with the USA. This is consistent with the trend mentioned above, with the United States being the country that contributed with almost half of publications to the top 100 and having more than 50 % of the total citations.

The two articles by Jemal Ahmedin in the Journal of the National Cancer Institute and the CA Cancer Journal for Clinicians received a total of 31,887 citations each, for which he received 30,832 and 1055 citations, respectively. These publications made Ahmedin the author with the most citations. Rebecca Siegel was the subsequent author, having authored a single work that received a cumulative total of 11,802 citations. It should be noted that within the top 100, seven of the top 15 writers are affiliated with the United States of America. This aligns with the aforementioned pattern, where the United States produced more than half of the papers ranked in the top 100 and accumulated more than fifty percent of the total citations.

4.4. Science mapping

Our study provides evidence that the network of co-citation and co-occurrence among the top 100 most cited papers is robust, as cocitation indicates a shared interaction among articles and the keywords listed; conversely, the association between authors is weak, as the network indicates only two associations. Various factors, including geographical distance, institutional affiliation, and the presence of isolating environments, may have influenced this result.

4.5. Clinical relevance

The review is of clinical significance due to the fact that oral cancer ranks sixth in terms of prevalence and imposes a substantial economic and clinical burden on a global scale. The 5-year death rate associated with oral cancer after diagnosis is between 45 and 50 %. In contrast, early diagnosis of the condition is associated with a death rate of 80 % to 90 % [12]. Early detection continues to be challenging due to inadequate screening methods and lack of public awareness, leading to unfavorable prognoses and low survival rates. As a consequence of the elevated rates of death and morbidity linked to the delayed diagnosis of the disease, the development of effective screening techniques and early diagnostic instruments is necessary [13]. Routine oral cavity examinations, including visual and tactile examinations of the oral cavity and tissue biopsies, continue to be the gold standard of diagnostics. However, sample bias and invasiveness can result in misdiagnosis, particularly with multifocal lesions, when using this technique [13]. As a result, there is a need to explore screening techniques that are fast, economical, non-invasive, sensitive, and specific enough to detect oral cancer in its early stages. The selected articles are relevant to the topic of oral cancer and provide information on advances in understanding this condition.

4.6. Identification of citation classics

When assessing the quality and influence of a scientific work, the citation classics are often referenced and highly cited publications (more than 100 citations) [14]. The process of identifying citation classics has been reproduced in a variety of health science disciplines; however, as far as we know, no prior publication has focused solely on the classics in oral cancer diagnostic tools. This research illustrates the quantity of citations for classic works in this particular domain. Only the supplementary file is available online.

5. Limitations

This study had several limitations. After reviewing the current literature on the subject, we identified relevant publications using Scopus. Although this is one of the best databases for searching the medical literature, we exclude others such as PubMed or Web of Science. In addition, we included only English-language publications. Following this approach, we may have missed relevant articles published in different languages. Moreover, the list of most cited publications is expected to change over time due to the exponential expansion of research. Finally, the number of citations is only an indirect indicator of scientific impact and can be influenced by other factors, such as the accessibility and reputation of the journal.

6. Conclusions

Through the implementation of this bibliometric study and the examination of the 100 most cited publications on oral cancer, we have successfully discerned the most influential articles, as well as the most prominent organizations, nations, and journals. It is important to gather this information on the topic of oral cancer, as it can give a wealth of knowledge on the most significant developments in this area. The 100 most referenced publications on diagnostic aids for oral cancer were published in journals with a high impact factor, according to our findings. Additionally, institutions and writers from the United States have been crucial in the development of this field of study. Physicians and researchers are expected to find this study and the compilation of the most pertinent articles useful in acquainting themselves with the most prominent works on this subject.

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Declaration of Generative AI and AI-assisted technologies in the writing process

The authors declare they have nothing to disclose, as they only use accepted *software* tools to check grammar, spelling, and references.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Lilibeth-Stephania Escoto-Vasquez: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software,

Validation, Visualization, Writing – original draft, Writing – review & editing. **Luis-Fernando Delgadillo-Valero:** Investigation, Methodology, Validation, Visualization, Writing – original draft, Writing – review & editing. **Sergey K. Ternovoy:** Investigation, Methodology, Validation, Visualization, Writing – original draft, Writing – review & editing. **Ernesto Roldan-Valadez:** Investigation, Methodology, Project administration, Software, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.jormas.2024.101793](https://doi.org/10.1016/j.jormas.2024.101793).

References

- [1] Gonzalez-Ruiz I, Ramos-Garcia P, Ruiz-Avila I, Gonzalez-Moles MA. Early diagnosis of oral cancer: a complex polyhedral problem with a difficult solution. *Cancers (Basel)* 2023;15(13):3270.
- [2] Su YF, Chen YJ, Tsai FT, Li WC, Hsu ML, Wang DH, et al. Current insights into oral cancer diagnostics. *Diagnostics (Basel)* 2021;11(7):1287.
- [3] Romano A, Di Stasio D, Petrucci M, Fiori F, Lajolo C, Santarelli A, et al. Noninvasive imaging methods to improve the diagnosis of oral carcinoma and its precursors: state of the art and proposal of a three-step diagnostic process. *Cancers (Basel)* 2021;13(12):2864.
- [4] Mavedatnia D, Cuddy K, Klieb H, Blanas N, Goodman J, Gilbert M, et al. Oral cancer screening knowledge and practices among dental professionals at the University of Toronto. *BMC Oral Health* 2023;23(1):343.
- [5] Chan ZW, Phuan YF, Ooi PY, Nor Azmi N, Pateel DGS, Yap HY, et al. An assessment of oral cancer knowledge, attitudes, and practices among undergraduate students in Malaysian dental schools. *BMC Oral Health* 2023;23(1):617.
- [6] Yang G, Wei L, Thong BKS, Fu Y, Cheong IH, Kozlakidis Z, et al. A systematic review of oral biopsies, sample types, and detection techniques applied in relation to oral cancer detection. *BioTech (Basel)* 2022;11(1):5.
- [7] Mahuli Sr. AV, Sagar Sr. V, Vpk V, Mahuli SA, Kujur Sr. A. Bibliometric analysis of poor oral health as a risk factor for oral cancer. *Cureus* 2023;15(3):e36015.
- [8] Rivera-Ibarguen S, Jimenez-Carbajal MG, Gamboa-Lopez CA, Garcia-Lezama M, Roldan-Valadez E. Top 100 most cited papers on multimodality imaging for complex congenital heart disease. A bibliometric analysis. *Curr Probl Cardiol* 2024;49(1 Pt A):102028.
- [9] Manoj Kumar L, George RJ, P SA. Bibliometric analysis for medical research. *Indian J Psychol Med* 2023;45(3):277–82.
- [10] Yang X, Yang X, Ji T, Zhou Q, Liu W. A bibliometric analysis of the papers on oral potentially malignant disorder in oral oncology. *Oral Oncol* 2022;132:105996.
- [11] Mehrotra R, Gupta DK. Exciting new advances in oral cancer diagnosis: avenues to early detection. *Head Neck Oncol* 2011;3:33.
- [12] Wang S, Yang M, Li R, Bai J. Current advances in noninvasive methods for the diagnosis of oral squamous cell carcinoma: a review. *Eur J Med Res* 2023;28(1):53.
- [13] Ford PJ, Farah CS. Early detection and diagnosis of oral cancer: strategies for improvement. *J Cancer Policy* 2013;1(1):e2–7.
- [14] Ahmad SJ, Ahmed AR, Kowalewski KF, Nickel F, Rostami K, Stocker CJ, et al. Citation classics in general medical journals: assessing the quality of evidence; a systematic review. *Gastroenterol Hepatol Bed Bench* 2020;13(2):101–14.