



# Publication Trend on Oral Mucositis Induced by Chemotherapy 1978-2023: Bibliometric Analysis

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## Abstract

Oral mucositis (OM) is the oral mucosa inflammation caused by an adverse side-effect of cancer therapy and is expressed as atrophy, enlargement, erythema and ulceration. This bibliometric study aimed to review the publication of OM induced by chemotherapy. The search of bibliometric study using *Scopus* was performed (accessed on 16 July 2023). In total, 521 documents were retrieved from the *Scopus* database from 1978-2023. About 2680 authors global were encompassed in writing papers. Investigation of the retrieved papers indicated 424 original articles and 59 review articles. The repossessed papers exhibited top 10 cited articles. The study that obtained the highest number of citations was published in the *Cancer* in 1999 and received 301 citations (1999-2023). The quotation of this paper was nearly 3-fold higher quotation than those the other ten highest cited scientific papers. The top journal in publishing papers related to the OM stimulated by chemotherapy was the *Supportive Care in Cancer*, with a total number of papers 41, quadruple than others. This investigation showed that the studies on OM have been more noticeable in the last ten years.

**Key words:** Oral mucositis; Chemotherapy; Bibliometrics.

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## Introduction

Oral mucositis (OM) is a very debilitating condition described by inflammation, oedema and ulcer of the oral mucosa. These manifestations result from chemotherapy, radiotherapy, chemo-radio combination therapy and cell transplantation. The prevalence of OM diverges among the different chemotherapeutic drugs. Chemotherapy agents that affect DNA synthesis (S-phase), for example 5-fluorouracil, methotrexate and cytarabine have a high incidence of OM.<sup>1,2</sup> OM tends to appear more rapidly regarding chemotherapy than after radiotherapy. The OM subsequently decreases and leaves no scars, for 2-3 weeks after the injection of the drug.<sup>3</sup>

An observational study was conducted in Italy. The subject was 669 patients receive surgery-ra-

diotherapy. It was described the prevalence of OM was 22.3 %. Furthermore, dysphagia and xerostomia were also informed to be the effect of the therapy.<sup>4</sup> A systematic search of 4,996 studies on OM was screened. The occurrence, economic impact, health-related quality of life (HRQoL) as raising problem of OM were performed.<sup>5</sup> Therefore, OM has recently increased more attention in the researcher's community by rising study actions to verify the evidence growth of OM induced by chemotherapy.

Even though citations are not a reliable measurement to define whether study is valuable to scientists and medical/dental practitioners, citations and citation investigation can compute a paper influence, author, topic of discussion, country,



journal or a discipline.<sup>6-9</sup> Based on citation evaluation, the bibliometric assessment objectives to offer evidence about the tendency in a study subject and reveals its progress and development;<sup>10</sup> the amount of citations received, scholar H-index and journal impact factor are the furthestmost frequent bibliometric analysis and counted as a systematic output mark for the scient metric assessment.<sup>8, 11</sup>

With the noteworthy growth in the published papers on OM, identifying trends and developments in a study subject is essential and significant to the necessities of medical/dental practitioners and researchers.<sup>12, 13</sup> In this sense, bibliometric evaluation is a helpful instrument for this objective.<sup>14, 15</sup>

This study presents state of the art of the trends and developments in OM induced by chemotherapy have not been studied before; hence this analysis aimed to appraise the bibliometric output of OM induced by chemotherapy.

## Methods

### Database

*SciVerse Scopus* is a leading database used to store significant journals and publications of OM caused by chemotherapy studies (accessed: 16 July 2023). *Scopus* was chosen due to its advantages compared to other online databases.<sup>16</sup> First, *Scopus* provides data on various features that make sorting and ranking easier, including country, author, journal and institution. Second, it also provides the number of citations for each group of documents, which is used as a scientific metric merit.<sup>17</sup>

### Indicators of bibliometrics

The investigation of several bibliometric criteria in this study were: (1) Document type and language; (2) Progression in publications; (3) The author's most frequently used keywords; (4) Analysis of quotations and most cited articles; (5) 10 most quoted countries; (6) Top 10 most active journals and (7) International collaboration. Data on the most cited publications came from *Scopus* which counts the number of documents cited for each publication. Data on the most active and cited countries was also collected directly from *Scopus*, which counted the number of papers and

citations for each country each year. Bibliometric analysis was performed using *VOSViewer* version 1.6.16<sup>18</sup> and the *Biblioshiny R* package.<sup>19</sup> The bibliometric maps were created and viewed using *VOSViewer* and *Biblioshiny* software.

### Keywords and search strategy

Numerous systematic methods were used to save as many documents as possible. For the bibliographic search, the following keywords were used: Using (TITLE (oral AND mucositis) OR TITLE (oral AND stomatitis) AND TITLE (chemotherapy) OR TITLE (radiotherapy)). The 571 document was obtained. After including only the articles using English language 521 documents were retrieved. Those articles were used for further analysis.

## Results

### Type of documents and languages

In total, 521 articles were retrieved from the *Scopus* database from 1978-2023. Around 2680 authors globally were involved creating papers. Analysis of the retrieved documents showed that

*Table 1: Analysis of the retrieved documents*

Data information	Results
Timespan (years)	1978-2023
Sources (journals, books, etc)	302
Documents (n)	521
Annual growth rate (%)	7.93
Document average age	9.71
Average citations per document	26.23
References (total number)	15,275
Document contents	
Keywords Plus (ID)	3345
Author's Keywords (DE)	747
Authors	
Total number of authors	2680
Authors of single-authored documents	32
Authors collaboration	
Single-authored documents	37
Number of co-authors per document	6.34
International co-authorships %	12.86
Document types	
Article	424
Conference paper	6
Data paper	1
Erratum	6
Letter	11
Note	11
Review	59
Short survey	3

424 were research articles and 59 were review articles. Additionally, other document types display letters 11, notes 11, short survey 3, conference paper 6. Herein, only documents in English were selected. The comprehensive data of the retrieved documents is shown in Table 1.

### Growth of publications

A total of 521 documents were successfully extracted during 1978-2023. This study focuses on OM caused by chemotherapy. The first documents appeared as early as 1978 and surprisingly, the number of annual publications has increased significantly since then, peaking in 2019 (n = 45) followed by 2022 (n = 38). The number of publications in 2023 up to the 16 July 2023 was 31 (Figure 1).

ters, each with different colours including chemotherapy (red colour) and oral stomatitis (green colour) and mouth wash (dark blue colour).

### Citation analysis and the highly cited articles

The retrieved documents demonstrated top 10 cited documents. The study that received the highest number of citations was published in the *Cancer* in 1999 and received 301 citations (1999-2023); the citation of this article was almost 3-fold higher citation than that the other top ten highest cited articles. The trend of citation seems to be increased over time. The author of this article was Sonis et al in 1999 with the title of his article "Validation of a new scoring system for the assessment of clinical trial research of oral mu-

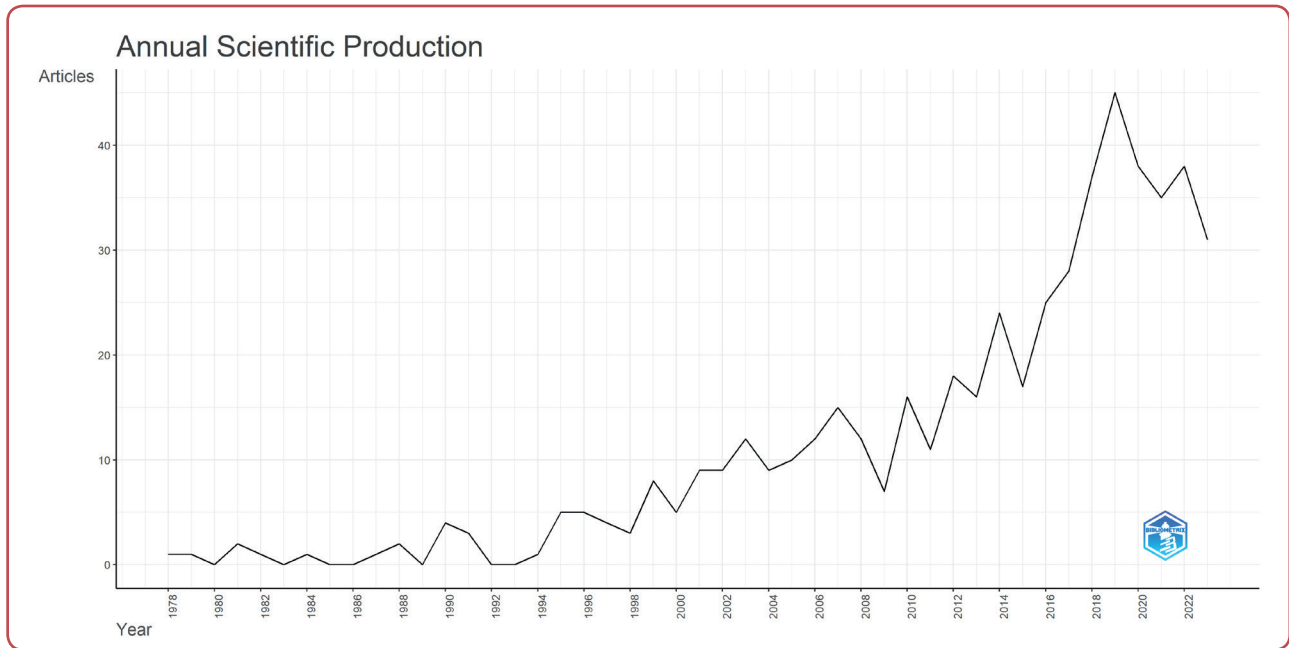


Figure 1: Growth of publications on oral mucositis induced by chemotherapy (1978-2023)

### Most frequently used author keywords

Figure 2 depicts the network visualisation map of most of the author keywords with minimum occurrences of 65. Author keywords with the highest number of occurrences were 'human (534 occurrences)' followed by 'humans (436 occurrences)', followed by articles (328), stomatitis (347), female (294). Human (319), male (295), OM (345), antineoplastic (220), cancer chemotherapy (259) in overlay visualisation indicated the most author keywords related to OM induced by chemotherapy during these years (1978-2023), which were categorised into three-largest clus-

Table 2: Top 10 cited articles regarding oral mucositis induced by chemotherapy

Reference	Journal	Year	Citations
[20]	Cancer	1999	301
[21]	Cancer	2008	267
[22]	CA Cancer J Clin	2001	253
[23]	Oncol Nurs Forum	1996	134
[24]	J Clin Oncol	1995	129
[25]	Eur J Cancer	2001	127
[26]	Semin Oncol	1998	120
[27]	Eur J Cancer	2004	106
[28]	J Prosthet Dent	1991	104
[29]	Support Care Cancer	2000	77

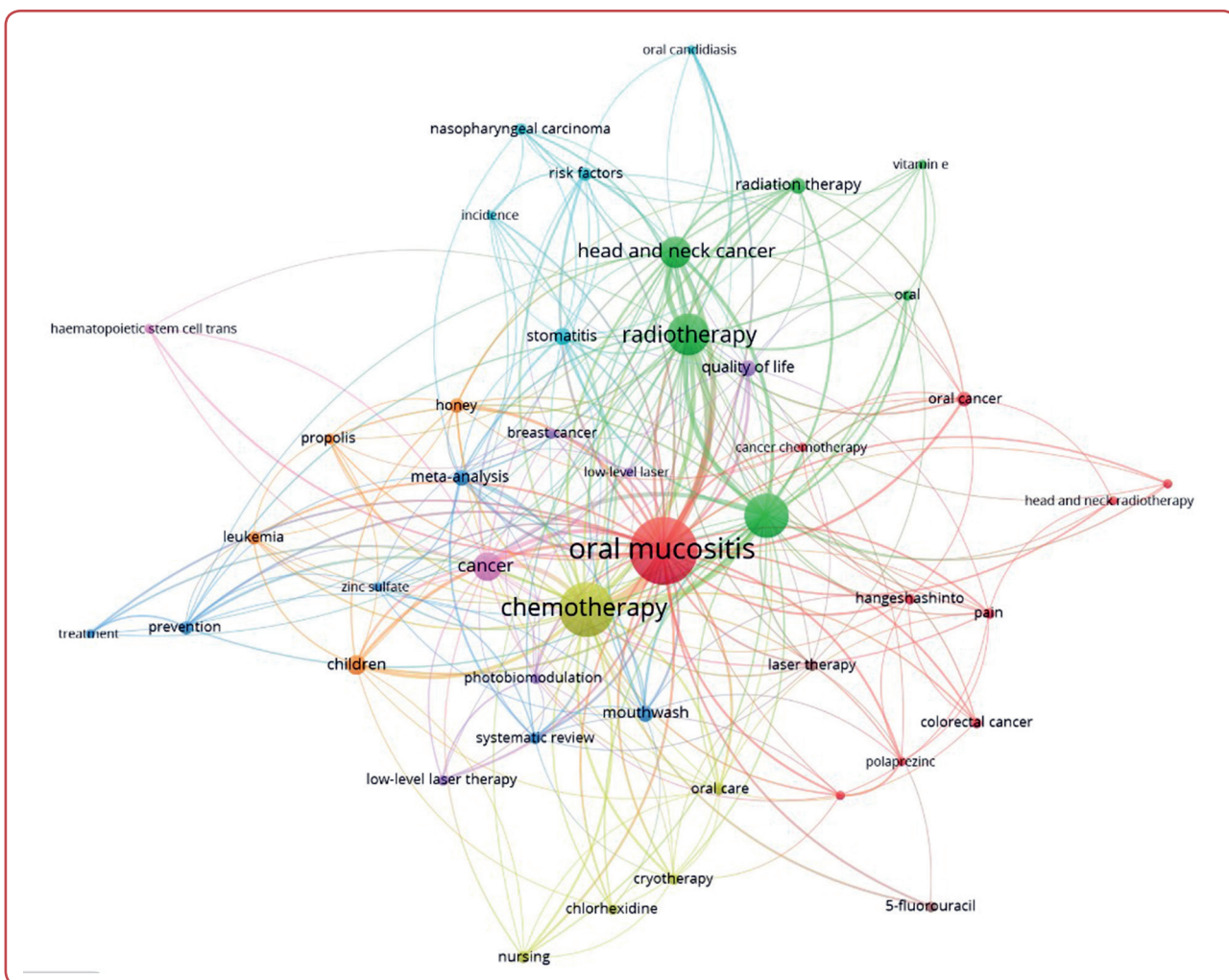


Figure 2: Visualisation of most frequent author keywords (minimum occurrences of 65 times) related to the oral mucositis induced by chemotherapy

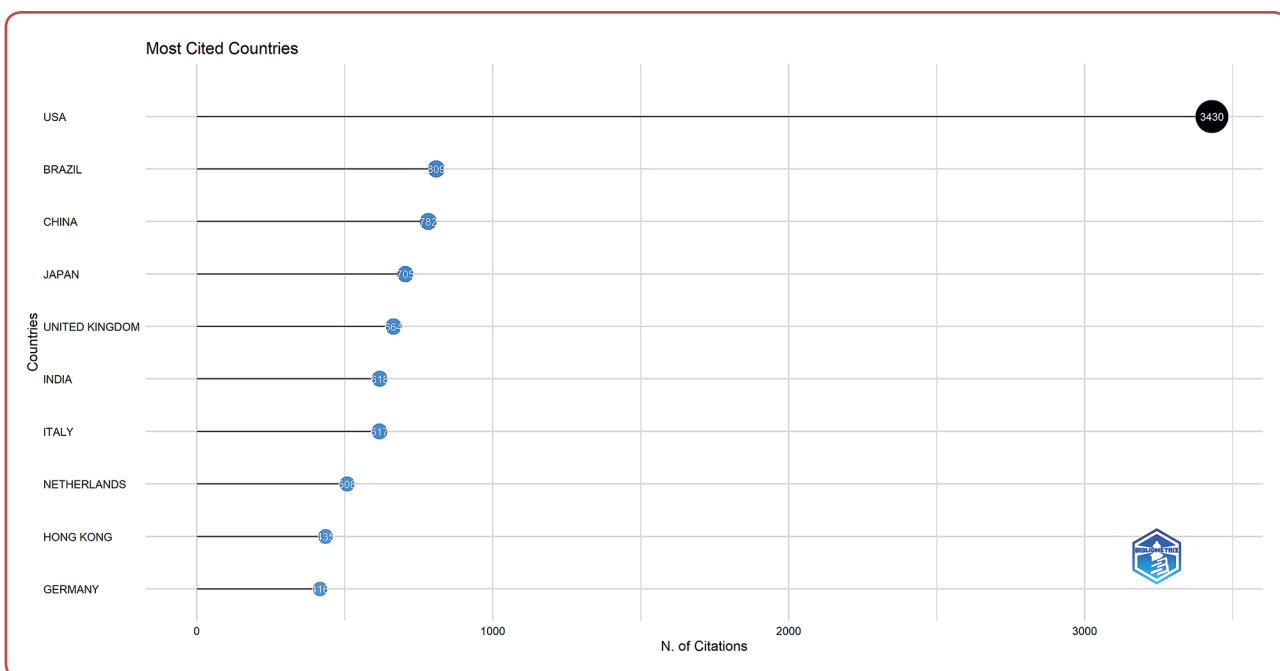


Figure 3: Top 10 countries from which the most cited manuscripts originate

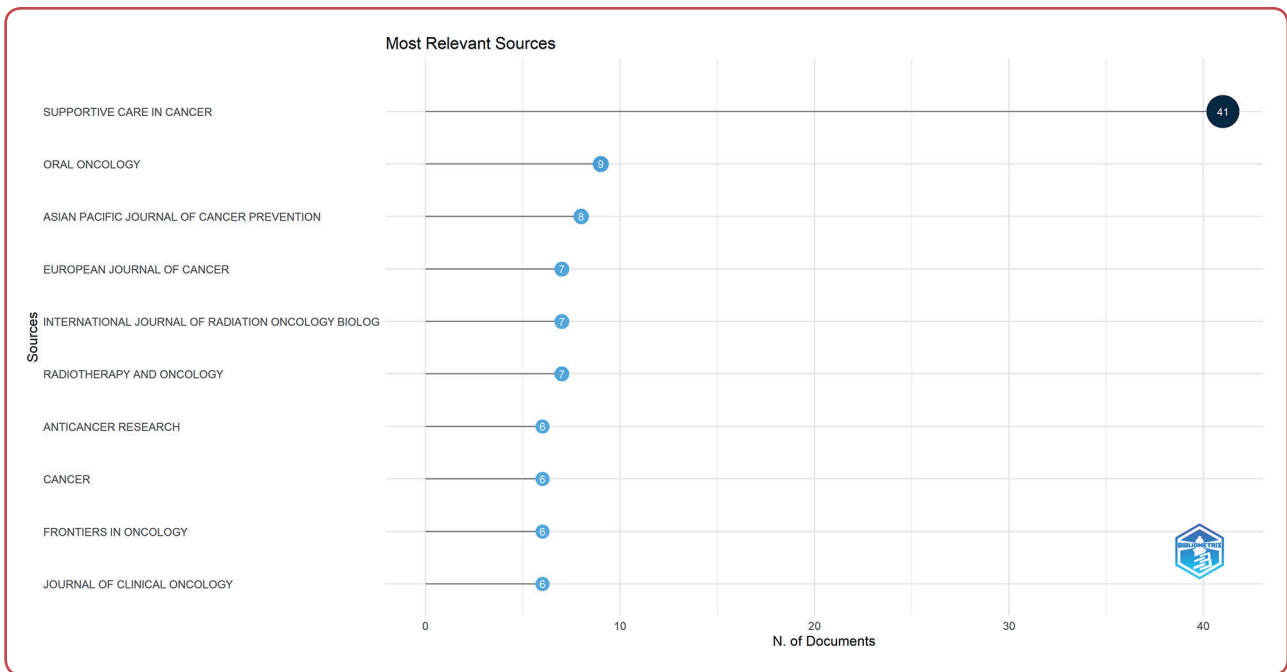


Figure 4: The top 10 most active journals related to publishing the studies on oral mucositis induced by chemotherapy

cositis induced by radiation or chemotherapy”<sup>20</sup>. The second highest citation of the document was published in 2008 in the *Cancer* with the title “Patient-reported measurements of oral mucositis in head and neck cancer patients treated with radiotherapy with or without chemotherapy”, the total number of citations of this article was 267.<sup>21</sup> The top 10 most cited articles related to the study of OM induced by chemotherapy were listed in Table 2.

### Top 10 countries from which the most cited manuscripts originate

Figure 3 shows the top 10 most cited countries related to the OM induced by chemotherapy. USA was the most cited country with a total number of citations of 3430, followed by the Brazil with a total number of citations around 809 and China with a total number of citations around 782. It is not surprising that the most cited countries were from USA. Authors from USA has published an article in high reputation journals.

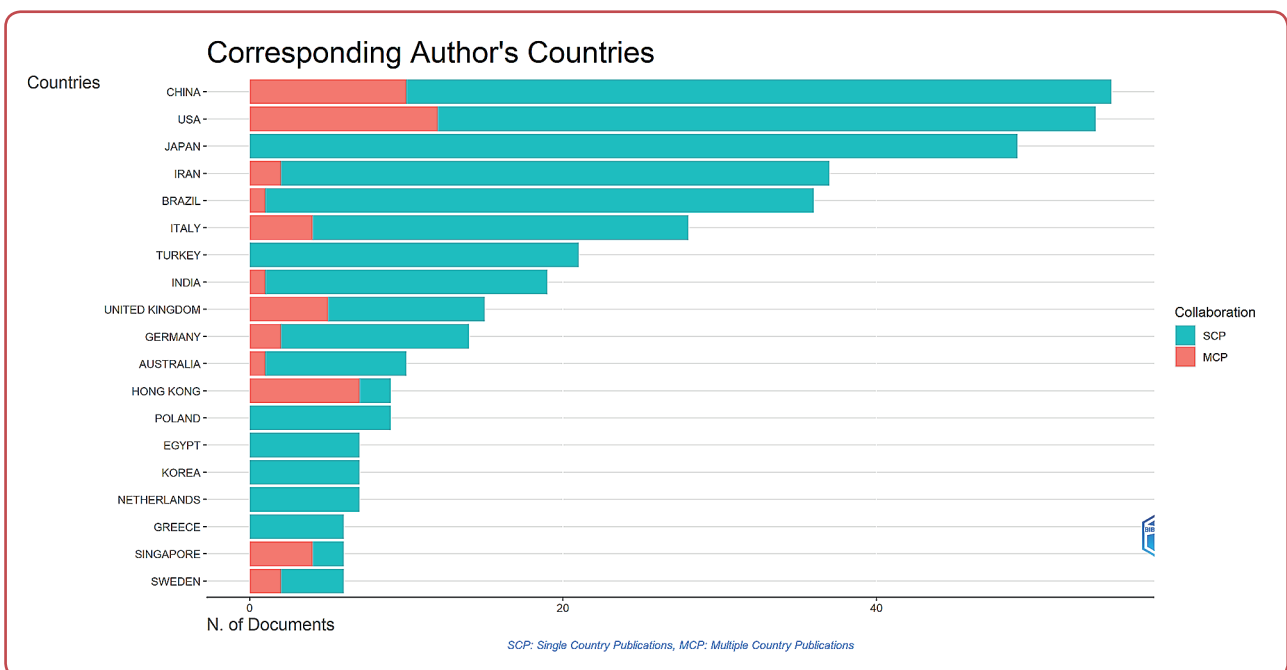


Figure 5: Visualisation of international collaboration among countries related to publishing the studies on oral mucositis induced by chemotherapy

## Top 10 most active journals related to publishing the studies of oral mucositis induced by chemotherapy

The leading journal in publishing articles related to the OM induced by chemotherapy was the *Supportive Care in Cancer*, with a total number of documents was 41. In addition, the second most active journal was *Oral Oncology* which published 8 articles on the topic of the OM induced by chemotherapy. The third leading journal was *Asian Pacific Journal Cancer Prevention*. The top 10 most active journals related to publishing the studies of OM induced by chemotherapy are listed in Figure 4.

## International collaboration

Figure 5 depicted the single country publication (SCP) and multiple country publication (MCP) related to OM induced by chemotherapy. China was the country with the highest number of collaborating countries, followed by USA and Japan in second and third places, respectively. Visualisation of international collaboration among countries is shown in the Figure 5.

## Discussion

The present study carried out a bibliometric analysis of OM induced by chemotherapy, highlighting the significant heterogeneity of the included studies. Original research articles were most published articles, followed by review articles. Moreover, the analysis found the few numbers of letters, notes, short survey and conference paper. The publications in 1978-2015 were under 25 publications per year and it increases after 2015 with the peak on 2019 (45 publications).

The most cited article was published in the *Cancer* in 1999 that was coauthored by Sonis et al<sup>20</sup> and presented in part at the Annual Conference of the Dutch Association of Oral and Maxillofacial Surgery, November 1998. The study designed, tested and validated a scoring system for OM that is easy to use, reliable and feasible for research applications. One hundred eight chemotherapy and 56 radiotherapy patients were included as the participants. Seventy-eight percent of chemotherapy patients and 64 % of radiotherapy patients had clinically significant OM. The result of the study showed the scoring system had strong correlation with symptoms.

The second most cited article was published in 2008 in the *Cancer* that was coauthored by Elting et al.<sup>21</sup> The study has reported the prevalence, the severity, resistance to palliation and impact on quality of life of OM by using several measurements. They were patient-reported questionnaire using Oral Mucositis Daily Questionnaire (OMDQ), the Functional Assessment of Cancer Therapy Quality of Life (FACT-QOL) and the Functional Assessment of Chronic Illness Therapy (FACIT) fatigue scales were used to measure mucositis (reported as mouth and throat soreness), daily functioning and use of analgesics. The result showed that all patients who were undergoing radiotherapy with or without chemotherapy for head and neck cancer manifested mouth and throat soreness (MTS) reduce QOL and need analgesics.

The top journal in publishing papers related to the OM stimulated by chemotherapy was the *Supportive Care in Cancer*. The publisher of this journal is Springer and has partnership with the Multinational Association of Supportive Care in Cancer (MASCC). The journal is ranked #1 in the Google Scholar h5-Index of Hospice and Palliative Care, with a 2021 h5-Index of 63. The journal was indexed by *Scopus* since 1999 and covers some issues including primarily medical, technical and surgical topics concerning supportive therapy and care which may addition or alternate basic cancer therapy at all phases of the disease, nursing, rehabilitative, psychosocial and spiritual issues of cancer therapy support. The second top journal in OM paper publication was *Oral Oncology* which were issued around 8 papers at the time of this article created. The publisher of this journal is Elsevier. This journal publishes high quality of original article, clinical trials and review papers, editorials and commentaries describing the etiopathogenesis, epidemiology, prevention, clinical appearance, diagnosis, treatment and management of patients with head and neck cancers. It is the formal journal of the International Association of Oral Pathologists, the International Academy of Oral Oncology and the European Association of Oral Medicine.

Although all studies involved in this analysis were inspected and selected from the *Scopus*, this study has some limitations.<sup>13, 30</sup> The year of publication may influence a trustworthy indicator of the total of citations received, as older articles get more citations than latest publications since there is further time to quote them.<sup>31, 32</sup> Open access publication has a major impact on

the citations received in the assessed papers,<sup>33-35</sup> consequently large discrepancy in Topic/Total Citations % and co-authors' H-index was observed.

## Conclusion

This is the first study emphasising bibliometric output of the research related OM induced by chemotherapy as proved by the growth in the number of scientific articles published since 1978. This investigation showed that the studies on OM have been more noticeable in the last ten years.

## Ethics

This study was a secondary analysis based on a dataset published from [www.scopus.com](http://www.scopus.com) and did not directly involve human participants or experimental animals. Hence, ethics approval was not required in this paper.

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## Conflicts of interest

The authors declare that there is no conflict of interest.

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## Data access

The data that support the findings of this study are available from the corresponding author upon reasonable individual request.

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