

# Bibliometric Analysis of Oral Mucositis Research In Pediatric Oncology

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## Research Article

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# Abstract

**Background:** Individuals receiving cancer treatment experience many treatment-related complications. Since one of these complications is oral mucositis, studies are conducted on this subject. This study aims to analyse the studies examining oral mucositis in the pediatric oncology population by bibliometric methods.

**Methods:** Bibliometric analysis was performed using the WosViewer software to scan the articles written in the relevant field. Publication trend, country distribution, journal and citation analysis, citation analysis of publications, keyword analysis of publications, text mining of abstracts were performed.

**Results:** In this study, 108 studies in the Web of Science database were examined. Because of the analyses, it was determined that there was an increase in studies on the subject after 2017. It has been determined that America, Brazil and Canada are the countries with the highest number of studies on this subject. Oral mucositis, mucositis and chemotherapy were determined as the most frequently used keywords.

**Discussion:** Studies of oral mucositis in the pediatric population tend to increase recently. Preserving this increase and accelerating the work to be done in this field will fill the gaps in the literature.

## Introduction

Pediatric cancers are the second most important cause of death in childhood after accidents. It is estimated that 10,500 children in the 0-14 age group will be diagnosed with cancer by 2021 in the United States. As the most common malignancies in the pediatric population, leukemias, brain and central nervous system tumors and lymphomas are in the top three ranks (National Cancer Institute, 2021). Chemotherapy, radiotherapy and surgical treatment are used to treat childhood cancers. Moreover, supporting treatments (infection and pain management, nutrition and prevention of complications, etc.) is of vital importance. Cases also need to be supported from a social and psychological viewpoint (Çevik Özdemir & Şenol, 2021; Olver et al., 2020).

Because of today's advances in health technology and regulations in treatment protocols, the survival rate in childhood cancers increases, but there is an increase in the duration of hospitalization and the incidence of side effects in children (Zahnreich & Schmidberger, 2021). While the therapies used in its treatment fight malignant cells, they also have devastating effects on healthy cells. One of the most common complications of cancer treatment is gastrointestinal mucositis (Frowen et al., 2020). Gastrointestinal mucositis (GIM) can be defined as inflammation or ulceration in the gastrointestinal organs due to cancer treatment causing cytotoxic damage (Ferreira et al., 2021). In particular, grade 3 or 4 mucositis may cause anorexia, dysphagia, malnutrition, weight loss, anxiety, insomnia and systemic complications in addition to the pain experienced by the child. This can negatively affect children's quality of life (Elad et al., 2020; Jung et al., 2019). The development of mucositis may lead to increased opioid use, delay in treatment and thus prolongation of hospital stay. It

can also directly lead to increased healthcare costs (Elting & Chang, 2019; Miranda-Silva et al., 2021; Valer et al., 2021; Yavuz & Bal Yılmaz, 2015).

Bibliometry has the meaning of a research area based on counting. Bibliometric analysis is a quantitative analysis of documents or publications in terms of some characteristics, such as the number of authors, the journal in which they are published, the topic, and publication information (Ellegaard & Wallin, 2015). Analysing a scientific field from a bibliometric viewpoint not only shows the state of that field but also can identify shortcomings in the field and aspects that need to be improved.

## **AIM**

This study is a bibliometric study designed to develop and analyse the scientific indicators of studies on mucositis. The current study reveals the status of systematic knowledge on the pediatric oncology literature and the contributions of studies to this literature.

## **Methods**

### **Design**

This study is a descriptive bibliometric record study using VOSviewer software. Bibliometric studies give very effective and useful results for researchers and policymakers. Thus, the quality of research related to the field being studied is increased (Bayu et al., 2020; Hamidah et al., 2020).

### **Data source and search strategy**

This study, in which A bibliometric analysis of studies on oral mucositis was performed, was initiated by scanning the databases. Today, there are many important databases such as Web of Science, Pubmed, MEDLINE and Scopus. In this study, the Web of Science database was preferred because it is widely used in bibliometric studies, covers the most effective and highest impact factor journals in the field of health sciences, and provides ease of data acquisition for analysis. Attention was paid to the compliance of the keywords with Medical Subject Headings (MeSH). The literature search terms were applied as; theme= (oncology) AND (pediatrics) AND (oral mucositis) in topics. Searches done with "topic" include title, abstract, author keywords, and keywords plus.

The WoS database was screened on 06.11.2021 (Web of Science, 2021). When scanning; the last publication date of the articles was selected as November 5, 2021 and publications after this date were not included in the data. No lower year limit was determined for the time range of the articles. The research data consisted of 146 articles. As a result of the content analysis, 38 articles that were not found to be related to our keywords were excluded from the study.

### **Data analysis**

The results were analysed using descriptive bibliometric analysis. The data was extracted from Web of Science database as a text file (\*.txt) and imported to VOSviewer software. VOSviewer is a Java-based computer program that creates and visualizes bibliometric maps. As can be seen in the analyses used in this study, publication maps, country maps, journal maps, keyword maps can be given as examples of maps created by the software (Huang et al., 2020). The analyses to be used in this study were determined and performed with the VOSviewer software. The studies were examined in relation to publication trends, citation analyses, country distributions, keyword and abstract analysis. Text mining analysis was used to determine the frequency of the words used in the abstracts of publications. Also, the visualization of related analyses is provided.

## Results

### 1. Analysis of Publication Trend

In the study, in which 108 publications were analysed, it was determined that the publications were made between 1989 and 2021. It was seen that the publications in the research field increased especially after 2005 although there have been increases and decreases over the years. Moreover, almost half of the studies were done in 2017 and beyond. The trend line of the publication years also shows clearly that the studies in this field are in increasing trend (Figure 1).

### 2. Analysis of Country Distribution

It was determined that the studies carried out by 37 different countries. Among these, the countries that have the most publications were America (30), Brazil (19), Canada (13), Italy (12) and Australia (12). When the citations of the countries' publications were analysed, the USA (651) and Brazil (332) were the countries with the highest number of citations. In contrast, the country with the most average citations per publication was the Netherlands (27.8). The country distribution of publications is shown in Table 1.

In the analysis made to show the collaboration network between countries, the minimum number of publications was set to 5. In other words, countries less than 5 publications were excluded from the analysis, and 13 countries met this requirement. While the United States of America had close collaboration with especially England and Canada, Brazil was in collaboration with the others. While England and the People's Republic of China conducted researches in this field in the 2010s, countries such as Israel and Singapore have conducted researches recently (Figure 2).

### 3. Journals Having the Most Publications and Citations

In this analysis, the journals that published the most in the research field and the number of citations to these publications were examined. It was determined that the articles related to the field were published in 58 different journals. The minimum number of publications for the analysis was determined as 3 and it was determined that there were 8 journals meeting this requirement. Journal of Pediatric Oncology Nursing was one of the most cited journals with 8 publications and 100 citations. The average citation value of the journal was determined as 12.5. Network analysis of journals was seen in Figure 3. Journal of Pediatric Oncology Nursing is in close collaboration with Journal of Pediatric Hematology Oncology and Supportive Care in Cancer.

#### **4. Citation Analysis of Publications**

In this section, the number of citations and the links between the articles published in the field of pediatric oral mucositis was analysed. The minimum citation number of a publication set was 25, and 20 publications met this criterion among 108 publications. According to analysis results; publications of Anderson (Anderson et al., 1998), McGuire (McGuire et al., 2006) and Zadik (Zadik et al., 2019) were the most cited publication with 15, 78, and 76 citations, respectively. The top 10 cited publications can be seen in Table 2, and the map of links among publications was shown in Figure 4.

#### **5. Keyword Analysis of Publications**

Keywords used in the publications were evaluated using co-occurrence network analysis tool of VOSviewer. A total of 240 different keywords was determined before the analysis stage. The minimum number of occurrences of a keyword was set as 5, and 12 keywords met this requirement. "Oral mucositis", "mucositis" and "chemotherapy" were the most used keywords with 36, 32, and 28 occurrences, respectively (Table 3).

When the analysis of keyword co-occurrence on oral mucositis, the software created 3 clusters among keywords. The first cluster (blue) consisted of "oral mucositis", "chemotherapy", and "pediatric oncology". "Cancer", "children", and "pediatric" constituted the second cluster (green). Finally, the last group with the largest population (red) comprised "mucositis", "glutamine", "child", "nutrition", "pediatrics", and "oncology" (Figure 5).

#### **6. Text Mining of Abstracts**

In this section, the abstracts of 108 articles included in this study were analysed by data mining method. In the analysis, the terms used in the abstracts and their relations were evaluated. The minimum number of occurrence of a term was set at 15, and 20 terms out of 2487 terms met this criterion. Afterward, it was

decided that analysing some of the 20 terms (such as study, year, use, etc.) would not provide meaningful results. Finally, a total of 7 terms were excluded from the analysis, and analysis was performed using 13 terms. "Patient", "oral mucositis", "child" and "chemotherapy" were found the most occurrences terms in the abstracts. In addition, these terms were in the same cluster in the network (Figure 6, Table 4).

## Discussion

In this study, it was performed bibliometric analysis of studies on mucositis in pediatric oncology patients. In this context, the Web of Science database was scanned using the relevant keywords. As a result of the search, 146 articles were accessed through the database, 108 of them were analysed. This study provides the opportunity to evaluate and interpret the status, development process and problems of the literature on the development of mucositis in this population. It has been determined that the number of articles on oral mucositis has increased gradually, especially after 2017. Similarly, as stated by Miranda-Silva et al. (Miranda-Silva et al., 2021), there has been an increase in the relevant literature, although there are not as many as desired, qualified studies investigating oral mucositis in the pediatric oncology population. In this context, the findings obtained in the studies in the literature support the results of this study, and it is thought that it is the right time to analyse the existing studies on mucositis in this population. Therefore, it is considered appropriate to conduct a bibliometric analysis of existing studies on mucositis in this population.

When the countries the articles were written are examined, it is seen that United States of America, Brazil and Canada are in the first three places. It can be thought that the reason for this is the high populations of USA and Brazil and, accordingly, the high number of cases in these countries. According to the report of the American Cancer Society; it is predicted that 1.9 million people will be diagnosed with cancer in the USA alone and 608,570 of them will experience cancer-related mortality (American Cancer Society, 2021). Similarly, when Figure 2 is examined, it is seen that USA works in cooperation with other countries and is in the middle of the network map. It can be thought that especially the abundance of statistical studies and the easy access to systematic data contribute to this situation. Additionally, the high amount of funding for cancer studies in the United States may have led to many studies.

Among the journals in which the articles are published, the Journal of Pediatric Oncology Nursing has an important place with 8 articles. The reason most articles are published in this journal is because it is a high quality journal related to the research field. The analyses also show that the articles published in Journal of Pediatric Oncology Nursing are the most cited articles. This is likely due to the journal's collaboration with the Association of Pediatric Hematology/Oncology Nurses (APHON).

Anderson et al. (Anderson et al., 1998), McGuire et al (McGuire et al., 2006), and Zadik et al. (Zadik et al., 2019) were determined as the most cited publications. These publications were used as the main reference in oral mucositis studies and played a pioneering role in the formation of the literature and guided the studies done/to be done in this field.

## Conclusion

This study provides an insight into the current situation and recent trends in the literature in oral mucositis research related to cancer treatment in the pediatric oncological population. The study provides various contributions to both researchers and the relevant literature. A strong aspect of the study is the use of bibliometric analysis and visualization of data to review all the literature conducted in the relevant population. A prominent result of this research is that it facilitates an overview of the literature on a specific topic. This study can support managers of health institutions and potential researchers to collect systematic data. It can guide academic individuals in their quest to develop policy, make decisions, plan research, and provide funding. Academicians who want to conduct research on the subject can get an idea from this study about which subjects can be studied and design their studies within this framework. This study is considered to be valuable both in terms of providing an overview of the literature and shedding light on the researchers and being the first bibliometric study written on this subject. Under the guidance of this bibliometric analysis study, more studies on the subject will be conducted and the enrichment of the literature will support increasing the quality of life of children.

## Declarations

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**Declaration of interests:** The Authors declare that there is no conflict of interest.

**Availability of data and material:** The data that support the results of this study are available from the corresponding author upon reasonable request.

**Authors' contributions:** All authors contributed to the study conception and design. Conceptualization, data collection and analysis were performed by Seda ARDAHAN SEVGİLİ. The first draft of the manuscript was written by Seda ARDAHAN SEVGİLİ and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

**Ethics approval:** Ethics committee approval is not required for this study.

**Consent to participate:** Not applicable.

**Consent for publication:** Not applicable.

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## Tables

**Table 1.** Country Distribution of Publications

Country	Publications	Citations	Average Citations per Publication	Total Link Strength
USA	30	651	21.7	55
Brazil	19	332	17.5	20
Canada	13	204	15.7	36
Italy	12	209	17.4	37
Australia	12	249	20.8	34
Netherlands	9	250	27.8	25
England	9	168	18.7	10
Turkey	8	49	6.1	8

**Table 2.** Distribution of Publications

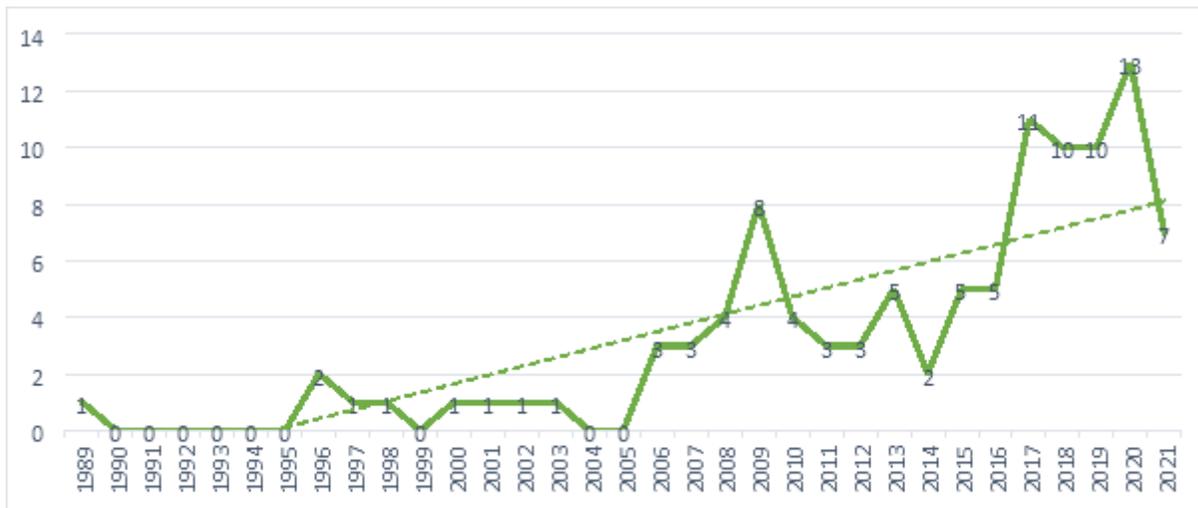
Journal	Publications	Citations	Average Citations per Publication	Total Link Strength
Supportive Care in Cancer	10	271	27.1	29
Journal of Pediatric Hematology Oncology	10	146	14.6	20
Journal of Pediatric Oncology Nursing	8	100	12.5	12
Pediatric Hematology and Oncology	6	124	20.7	7
Oral Oncology	4	148	37.0	11
Iranian Journal of Pediatric Hematology	3	17	5.7	4
Pediatric Blood & Cancer	3	83	27.7	3
European Journal of Cancer	3	51	17.0	2

**Table 3.** The Top 10 Cited Publications

Publication	Citations	Links
Anderson et al. [17]	152	3
Mcguire et al. [18]	78	0
Zadik et al. [19]	76	1
Abdulrhman et al. [20]	66	0
Van Vliet et al. [21]	65	0
Kuhn et al. [22]	61	2
Sung et al. [23]	48	3
Qutob et al. [24]	44	5
Cheng et al. [25]	40	3
Sung et al. [26]	40	2

[Table 4 not available with this version.]

## Figures



**Figure 1**

Publication trend

**Figure 2**

Network map showing the relations between various countries by year in oral mucositis

**Figure 3**

Network map showing the collaborations between journals in the pediatric oral mucositis field.

Image not available with this version

**Figure 4**

Figures 4-6 not available with this version.