ORIGINAL ARTICLE

Trend Study of Dysphagia in Head-and-Neck Cancer: 2019-2023

Rizka Fakhriani[1], Maria Ulfa[2], Agus Surono[3]

[1] Department of Otorhinolaryngology, Head and Neck Surgery, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta, Yogyakarta, 55183, Indonesia
[2] Master of Hospital Administration, Postgraduate Program, Universitas Muhammadiyah Yogyakarta, Yogyakarta, 55183, Indonesia
[3] Department of Otorhinolaryngology, Head and Neck Surgery, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, 55281, Indonesia

ABSTRACT

Introduction: Dysphagia is a common complication in head and neck cancer (HNC) patients. While previous literature has heavily focused on clinical outcomes, a comprehensive overview of global research trends, collaborations, and knowledge development remains lacking. This study aims to address this gap by examining global trends in dysphagia research among HNC patients. **Methods**: Following the PRISMA method, 151 Scopus-indexed articles published between 2019 and 2023 were identified. Bibliographic analysis and visualization were performed using VOSviewer, NVivo 12 Plus, and RStudio to map keywords, topic clusters, and country-level contributions. **Results:** The data demonstrate a steady rise in publication interest, with an annual growth rate of 9.73%. The United States was the leading contributor with 45 published articles, peaking in 2020. Keyword analysis revealed four primary thematic clusters: chemotherapy side effects, physiology of outcomes, quality of life, and pharmacological interventions. Furthermore, comparative radiotherapy studies and chemoradiotherapy protocols received the highest citation counts. **Conclusion:** By mapping the evolving landscape of dysphagia in HNC, this study provides valuable insights for clinicians, researchers, and policymakers. These findings underscore the importance of systematic reviews and the development of interdisciplinary strategies to optimize patient care and enhance quality of life, offering a foundational framework to guide future research directions.
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Keywords: Bibliometrics, dysphagia, head and neck cancer, chemoradiotherapy, quality of life.

Corresponding Author:
Rizka Fakhriani
Email: rizkafakhriani@umy.ac.id
Tel: +62 274 387656

INTRODUCTION

Dysphagia is a condition when someone cannot swallow both liquid or solid food due to anatomical or functional problems in their body (1). Dysphagia is a severe illness that may affect someone's quality of life despite their age, and it requires prompt medical intervention. The inability to keep to the dietary habits can exacerbate the illness, leading to malnutrition, dehydration, recurrent lung infections, loss of weight, and mortality (2–5).

Swallowing requires a complex system comprised of both sensory and motor components. Previous studies have shown frequent eating causes a reduction in the degree of cervical lordosis and the mobility of the cervical spine (3,6,7). For optimal functioning of the cervical area, it is essential to maintain static and dynamic head and neck alignment (3). Swallowing requires complex neurocognitive capabilities. The efficient transmission of food from the mouth and throat to the esophagus requires synchronized activity of many muscles and nerves (8). The process of swallowing consists of four distinct phases: pre-oral, oral, pharyngeal, and esophageal (9). The pre-oral phase happens while food is transferred from the plate to the mouth. The oral phase occurs in the cavity just before the food is swallowed. The pharyngeal phase begins when the tongue comes into contact with the back wall of the pharynx, pushing the bolus forward and initiating reflexive movements. The esophagus phase is initiated by peristaltic waves (9). Approximately 23% to 100% of patients with head and neck cancer (HNC) experience dysphagia as a result of cancers or therapy effects (10–12). A tumor in the head or neck may hinder the mobility of the mouth, tongue, or throat muscles, making it difficult to control food in the mouth, chew it, and transmit it to the esophagus. Sometimes, the tumor may hinder the esophagus,

making it unable to allow the flow of fluids or food. The Global Burden of Disease study revealed a total of 890,000 new cases of head and neck cancer (HNC) in 2017, globally (13). Patients diagnosed with advanced stages III and IV of head and neck cancer (HNC) might face long-term effects when receiving multimodal or invasive treatments, such as radiotherapy (RT). These treatments can be administered as a single therapy or in combination with chemotherapy or surgery. Mucositis and xerostomia are often observed as side effects in patients with dysphagia caused by chemoradiation and tissue alterations induced by RT. RT is commonly referred to as the procedure of dysphagia, which adversely affects the patient's quality of life (QOL) (14,15).

Scopus, different from the Web of Science, includes a total of 23,000 publications that have been indexed by over 5000 publishers (16). Scopus articles cover many academic fields, making it a better choice than Medline (17). Scopus can retrieve information using basic and advanced methods to provide valid search results. Both methods include the use of complex search queries. Times Higher Education and QS World Universities employ the Scopus database to establish a global rating system for institutions (18). Scopus is well-known for indexing articles from reputable journals through an in-depth analysis and monitoring process, which enhances its database's reliability.

Sun et al. (2022) conducted a study titled "Study on dysphagia from 2012 to 2021: A bibliometric analysis via CiteSpace." They utilized the Web of Science database and CiteSpace software to examine publications published between 2012 and 2021. The analysis revealed an ongoing increase in publishing rates but a notable decrease of 1843 articles in 2021 and a drop to 752 publications in 2022. The United States, Japan, and China are the leading countries in terms of publishing production. Meanwhile, the most frequently occurring terms include dysphagia, management, quality of life, and deglutition disorder (19). The clinical burden of dysphagia in patients with head and neck cancer (HNC) is the focus of recent research, especially regarding chemoradiotherapy, which increases the risk of dysphagia so that data affects the nutritional status and well-being of patients (20) Gomes et al. explained the effects of radiotherapy (RT), which triggers early dysphagia; this condition negatively impacts nutrition and reduces the quality of life for HNC patients (21) Research conducted by Yang et al. explained the benefits of telerehabilitation, which can impact protection in swallowing, maintaining oral intake, good nutritional results, and improving the quality of life of dysphagia patients (22). Several of these studies, including those by Hanna, focused on clinical outcomes without further investigation into global research development trends on dysphagia, especially in HNC patients. There is still a need for an explanation of global trends, including research patterns, thematic developments, and collaborations in this field. The evidence shows that there are still gaps that have not been resolved; therefore, this study conducted a comprehensive bibliometric analysis of the global trend of dysphagia in head and neck cancer in 2019-2023 as a strategic basis for further research and opportunities for interdisciplinary collaboration.

MATERIALS AND METHODS

This bibliometric analysis only assessed the Scopus database on March 16, 2024. Articles were selected based on specific criteria restrictions to limit the topic of this study. The articles were published between 2019 and 2023. The article focused on the health sector and was considered a scientific article, and the following keywords associated with these articles are dysphagia, head and neck cancer, and randomized clinical trial. The language used in these articles is English. The search strategies utilized various combinations of keywords, as demonstrated below:
TITLE-ABS-KEY (dysphagia AND in AND head AND neck AND cancer) AND TITLE-ABS-KEY (randomized AND clinical AND trial)) AND PUBYEAR > 2018 AND PUBYEAR < 2024 AND (LIMIT-TO (SUBJAREA , "MEDI") OR LIMIT-TO (SUBJAREA , "BIOC") OR LIMIT-TO (SUBJAREA , "DENT") OR LIMIT-TO (SUBJAREA , "PHAR")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (SRCTYPE , "j"))

The data obtained from the Scopus database was converted into a Microsoft Excel format. At first, the processed data was saved into CSV, RIS, and Bibtex formats for further analysis using VOSviewer, NVivo 12 plus, and RStudio software (23). The second phase was the utilization of VOSviewer to manage the bibliographic entries. During the third stage, we utilized NVivo 12 plus software to classify the study subjects into themes, examine the connections between different topics, and assess the significance of specific terms in bibliographic documents on "Dysphagia in Head and Neck Cancer" by creating a word cloud. After that, the Bibtex file containing the downloaded data was imported into R studio for analysis. We utilize automated coding techniques to demonstrate concepts (24). Descriptive statistics were employed to analyze the data.

RESULTS

Annual publication growth and country-based scientific production

The study analysis included 151 documents over 2019 to 2023 (Fig. 1). These documents were published in 66 different publications and had 1536 authors. The publications exhibited an annual growth rate of 9.73%. The mean number of citations per document was recorded as 25.13. The average number of publications per year is shown in Figure 1.

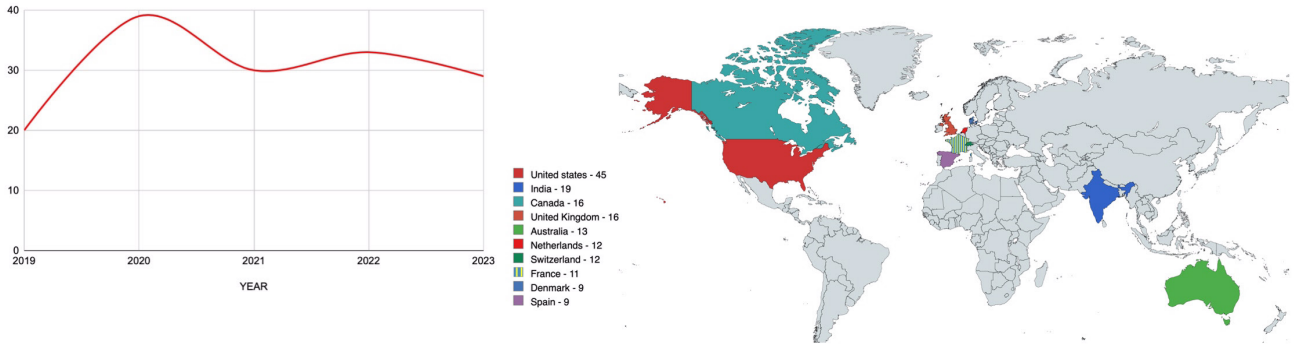

Figure 1: Annual production of research and country-based scientific production on dysphagia in head and-neck cancer

The most publications on this topic were reported in 2020, with 39 articles, and in 2022, with 33 articles. In 2020, the number of documents published reached its lowest point, totaling 20. The fluctuations in the quantity of dysphagia-related publications in head and neck cancer from 2019 to 2023 can be assigned to several factors, encompassing progressions in research methodologies and technology, the launch of interesting clinical trials, and the emergence of novel treatments for dysphagia. It is necessary to consider the effects of policy changes, variations in funding opportunities, and the consequences of public health occurrences, such as the COVID-19 epidemic. Collaborative initiatives, awareness campaigns, and advocacy actions may have prompted increased interest and research activities.

Furthermore, changes in related fields, variations in research emphases, and advancements in technical availability may have played a role in the observed variations in publication frequencies. The interaction of these complex aspects highlights the ever-changing character of dysphagia research in head and neck cancer during the defined period. Gaining a comprehensive understanding of these factors is essential for academics, clinicians, and policymakers who seek to navigate and make meaningful contributions to improvements in this field.

The figure also displays research conducted by 32 countries on "dysphagia in head and neck cancer." The countries that published the highest number of issues on dysphagia in head and neck cancer using mapchart.net include the United States, India, Canada, the United Kingdom, Australia, Netherlands, Switzerland, France, Denmark, and Spain. The different color palettes depicted above represent distinct outcomes of the publication. The United States has the highest number of publications, precisely 45 documents, in the Scopus index for dysphagia in head and neck cancer. The concept of top ranking entails the production of highly engaging documents, as the field of dysphagia research in head and neck cancer originated within the United States. The study of the relevance of this issue receives considerable attention as the United States is known to have one of the best education systems in the world (25).

The most cited articles

The top five most cited documents from 2019 to 2023 are shown in Table I (26–30) This method was used to capture the published documents relevant to dysphagia

Table I. The 5 most cited articles

Document title	Authors	Year	Source	Cited by
Radiotherapy plus cetuximab or cisplatin in human papilloma-virus-positive oropharyngeal cancer (NRG Oncology RTOG 1016): a randomised, multicentre, non-inferiority trial	Gillison, M.L., Trotti, A.M., Harris, J., (...), Dignam, J.J., Le, Q.T.	2019	The Lancet 393(10166), pp. 40-50	810
Radiotherapy versus transoral robotic surgery and neck dissection for oropharyngeal squamous cell carcinoma (ORATOR): an open-label, phase 2, randomised trial	Nichols, A.C., Theurer, J., Prisman, E., (...), Kwan, K., Palma, D.A.	2019	The Lancet Oncology 20(10), pp. 1349-1359	298
Avelumab plus standard-of-care chemoradiotherapy versus chemoradiotherapy alone in patients with locally advanced squamous cell carcinoma of the head and neck: a randomised, double-blind, placebo-controlled, multicentre, phase 3 trial	Lee, N.Y., Ferris, R.L., Psyrri, A., (...), Thurm, H., Cohen, E.	2021	The Lancet Oncology 22(4), pp. 450-462	277
Neoadjuvant Nivolumab or Nivolumab plus Ipilimumab in Untreated Oral Cavity Squamous Cell Carcinoma: A Phase 2 Open-Label Randomized Clinical Trial	Schoenfeld, J.D., Hanna, G.J., Jo, V.Y., (...), Uppaluri, R., Haddad, R.I.	2020	JAMA Oncology 6(10), pp. 1563-1570	185
Phase II Randomized Trial of Transoral Surgery and Low-Dose Intensity Modulated Radiation Therapy in Resectable p161 Locally Advanced Oropharynx Cancer: An ECOG-ACRIN Cancer Research Group Trial (E3311)	Ferris, R.L., Flamand, Y., Weinstein, G.S., (...), Мйндez, E., Burtness, B.	2022	Journal of Clinical Oncology 40(2), pp. 138-149	145

in head and neck cancer. It is important to emphasize that the number of citations alone is not the sole determinant of the ranking. The most frequently cited publications were those related to radiotherapy, chemoradiotherapy, specific drugs, and doses administered. The number of citations to an article recorded in all the databases has been standardized worldwide (Scopus).

Table I presents the researchers' analysis of the citations acquired in the articles. The three most frequently mentioned articles were "Radiotherapy plus cetuximab or cisplatin in human papillomavirus-positive oropharyngeal cancer (NRG Oncology RTOG 1016): a randomized, multicentre, non-inferiority trial" (n: 810) in 2019; an article by Gillison et al titled "Radiotherapy versus transoral robotic surgery and neck dissection for oropharyngeal squamous cell carcinoma (ORATOR): an open-label, phase 2, randomized trial" (n: 298) by Nichols et al in 2019; and an article titled "Avelumab plus standard-of-care chemoradiotherapy versus chemoradiotherapy alone in patients with locally advanced squamous cell carcinoma of the head and neck: a randomized, double-blind, placebo-controlled, multicentre, phase 3 trial" by Lee et al with a total of 277 citations in 2021.

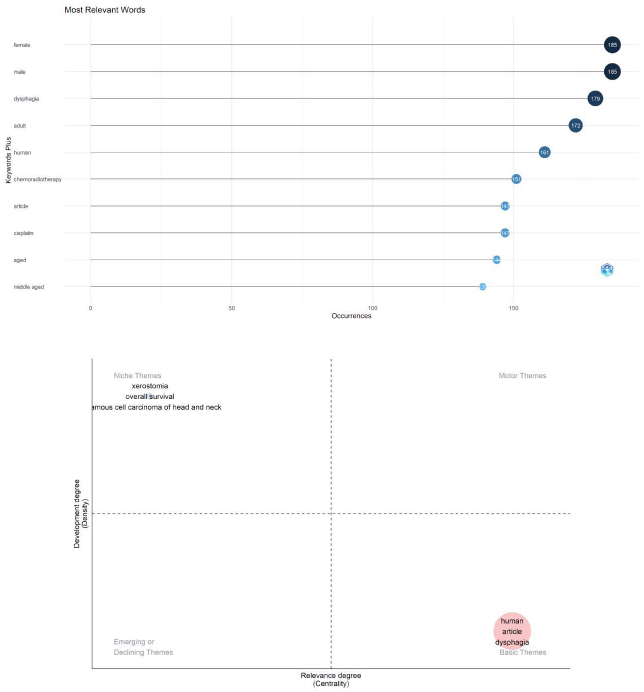

Figure 2: Keywords and thematic map of keywords in publications about dysphagia in head and neck cancer

Gillison's research indicated that, based on a follow-up period of 4-5 years, the combination of radiation and cetuximab did not meet the requirements for non-inferiority in terms of overall survival. The predicted 5-year overall survival rate was 77.9% in the group treated with cetuximab, compared to 84.6% in the group treated with cisplatin. The cetuximab group had a considerably poorer progression-free survival rate than the cisplatin group. At the same time, the incidence of local failure was significantly higher in the cetuximab group compared to the cisplatin group (26). Nichols' research revealed that the median follow-up period for the radiation group was 25 months, with an interquartile range (IQR) of 20-33 months. In contrast, the TORS with neck dissection group had a median follow-up period of 29 months, with an IQR of 23-43 months. The mean MDADI score at one year was 86.9 (SD 11.4) in the radiation group, while it was 80.1 (SD 13.0) in the TORS with neck dissection group (p=0.042) (27). According to a study conducted by Lee, the median follow-up for progression-free survival was 14.6 months (with an interquartile range of 8.5-19.6) in the avelumab group and 14.8 months (with an interquartile range of 11.6-18.8) in the placebo group. Neither the avelumab group nor the placebo group met the median progression-free survival (28).

The most frequently used words

The terms "female" and "male" were the most frequently utilized by authors, appearing 185 times, followed by "dysphagia" with 179 occurrences. Fig. 2 shows a positive correlation between the size of a keyword and the number of occurrences it has. Over time, the annual frequency of all the primary phrases grew, although some experienced more rapid growth than others. The phrases "dysphagia," "chemoradiotherapy," and "female" experienced the most substantial increase in frequency, as indicated by a word cloud (Fig. 2). Themes are clusters of keywords that can be organized into a single circle and represented as a two-dimensional graphic based on frequency and importance. That figures also displays a thematic map that categorizes themes based on the quadrant in which they are located. Motor themes are located in the upper-right quadrant, while basic themes are found in the lower-right quadrant. The lower-left quadrant focuses on emerging or disappearing subjects. In contrast, the upper-left quadrant is dedicated to highly specialized topics.

Keywords indicate the subject area and fundamental concepts discussed in an article. Analyzing the frequency of these keywords can provide valuable insights for researching dysphagia in head and neck cancer-related publications, enhancing the effectiveness of research. Moreover, the word cloud of 50 Keywords was analyzed using NVivo 12 plus and R Studio (Fig. 3).

DISCUSSION

Based on the analysis of the two different applications, it was found that some similarities often appeared in the articles, such as chemoradiotherapy, dysphagia, cisplatin, antineoplastic, and survival. This figure also shows the network visualization of each cluster, which is apparent from the color of each cluster. In this case, the colors red, green, blue, and yellow are present. The

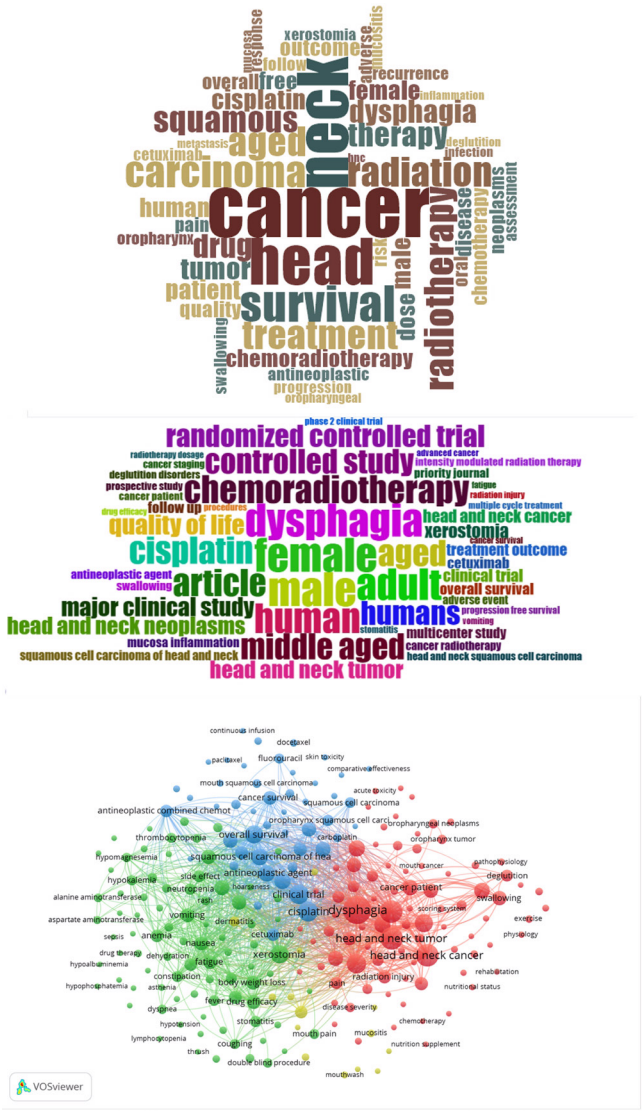

Figure 3: Top 50 most frequent keywords and network mapping of 151 articles

VOSviewer software detected 232 keywords from 151 Scopus-indexed publications published between 2019 and 2023 that fulfilled the data analysis criteria, resulting in the identification of four different clusters.

Cluster 1 is dedicated to addressing typical problems resulting from the adverse effects of chemotherapy. It encompasses a wide range of negative instances, including acute renal failure, loss of body weight, and the experience of pain caused by cancer. The broad scope of this cluster implies a thorough analysis of the diverse difficulties and complexities that patients undergoing chemotherapy for head and neck cancer may encounter. A comprehensive perspective on the effects of chemotherapy on patients' well-being involves considering aspects like genetics, prognosis, and smoking. Cluster 2 focuses on the physiological side effects of chemotherapy, highlighting the evaluation of patient's health, the results of treatment, and the physical impacts experienced by patients. It examines the effects of chemotherapy on patients' physical health, specifically focusing on dysphagia, depression, and lymphedema, and offers valuable insights into the complex consequences of these issues. The addition of intensity-modulated radiation therapy (IMRT) and rehabilitation demonstrates an intentional incorporation of advanced treatment techniques and supportive measures to reduce adverse side effects.

Cluster 3 is centered around the aspects of quality of life, chemotherapy, and survival rates, with a specific focus on the whole patient experience. It includes the rates of cancer survival, compliance with medicine, and the relative efficacy of various treatments. The cluster indicates a desire to comprehend the effects of chemotherapy on clinical results, as well as patients' general well-being and adherence to treatment plans. Cluster 4 investigates the effects of chemotherapy, with an emphasis on antineoplastic drugs, chemoradiation, and the prevalent side effects of nausea and vomiting. The briefness of this cluster suggests a focused analysis of the medications and their impact on patient symptoms, indicating a more pharmacological and symptom-centered perspective.

As a group, these groups of keywords collectively contribute to a complete understanding of every aspect of dysphagia in the treatment of head and neck cancer. The clusters focus on the physical effects and the broader impact on patients' well-being, survival rates, and compliance with therapy. The clusters in this study provide a valuable multidimensional approach for physicians, researchers, and policymakers that aim to improve patient outcomes in the setting of chemotherapy for head and neck cancer. The Scopus database, which only covers a few points, such as document selection based on journal articles, year ranges, language, keywords, and topic areas, is the limitation of this bibliometric analysis. Also, the research provided only the Scopus database as a source for articles from various scientific publications. A future researcher can use the limitations of this study to conduct further research.

CONCLUSION

Based on bibliometric analysis, we describe a comprehensive overview of dysphagia in head and neck cancer (HNC) from 2019 to 2023. The United States is the largest contributor, especially in 2020. There are four thematic groups analyzed using VOSviewer and NVivo, namely complications due to treatment, patient quality of life, pharmacological interventions, and patient chances of survival or recovery. Keywords are dominated by the multidisciplinary nature of current research developments or trends, namely chemoradiotherapy, cisplatin, and quality of life. The results of this study highlight the importance of finding new ways to treat swallowing problems in patients with head and neck cancer, focusing on what matters most to the patients. This study can be used as a basis for systematic guidance

for further research, clinical publications, and policy development based on evidence.

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