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Thematic mapping and bibliometric analysis of research on quality of life in laryngeal cancer patients

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Abstract
In this study, 1000 articles written in English on the quality of life of laryngeal cancer patients until 2025 were accessed from the Web of Science database and bibliometric analyses were performed using the obtained data.
The dataset includes 5369 authors from 338 journals, with 18 authors participating as lone researchers. The dataset's journals' publication start dates and citation counts were assessed. An analysis of the distribution of publications over time revealed that 2024 had the most articles (66), followed by 2020 and 2021 (63 each). Three area charts were utilized to depict the links between articles, authors, and keywords. A word cloud analysis found that significant concepts such as "quality of life," "head," "neck cancer," "radiotherapy," and "squamous-cell carcinoma," were central to the research. The publications Head and Neck-Journal for the Sciences and Specialties of the Head and Neck, European Archives of Oto-Rhino-Laryngology, and Laryngoscope were found. Among the most important publications in the subject were discovered to include Laryngoscope, the European Archives of Oto-Rhino-Laryngology, and Head and Neck-Journal for the Sciences and Specialties of the Head and Neck.
These results suggest that papers describing the quality of life of patients with laryngeal cancer from various angles could be used as a reference for researchers and professionals in the area.

Keywords: Bibliometrics, trend, publications, larynx, quality of life.

I. Introduction

Laryngeal cancer accounts for approximately 1–2% of all malignant tumors and about 40% of head and neck cancers (Yıldırım, 2011). Chemotherapy, radiotherapy, and laryngectomy are the main treatment modalities for laryngeal cancer (Çelik, 2007; Bakır, 2015; Koç, 2013). Over the past decade, a significant increase has been observed in the incidence of laryngeal cancer, which represents approximately 2–5% of all newly diagnosed cancers worldwide each year. Various factors, including heredity, asbestos, wood dust, coal, different metals, hormones, air pollution, viral infections, and diet, have been implicated in its etiology. However, the most clearly established carcinogenic factor is tobacco, and alcohol has been shown to have a synergistic effect when combined with tobacco use (Binbay et al., 2015).

Treatment of head and neck cancers may negatively affect cosmetic appearance due to the complex anatomical structure of the region, and may lead to varying degrees of impairment in speech, swallowing, and respiration (Vartanian et al., 2004). Assessing quality of life is important not only for evaluating the effects of treatment in head and neck cancers but also for developing more effective treatment strategies based on these assessments (Deleyiannis et al., 1999; Allal et al., 2003).

Quality of life is a multidimensional concept that encompasses physical, functional, psychological, and social well-being. Cancer and its treatment regimens can adversely affect each of these dimensions in various ways. The primary goal of treatment is to minimize factors that negatively impact quality of life. Quality of life assessments provide valuable feedback from patients and are important for evaluating the effectiveness of treatment. Detailed evaluations offer critical information for determining appropriate treatment approaches and for assessing long-term outcomes of cancer treatment and rehabilitation. In this context, quality of life reflects the patient’s subjective assessment rather than the oncological or surgical success of treatment. The long and intensive nature of treatment for laryngeal cancer may significantly impair quality of life.

In the future, quality of life outcomes of patients presenting with different tumor stages may help guide optimal treatment strategies—including surgery, radiotherapy, and rehabilitation—based on individual needs. Treatment-related side effects and metastases may impair respiratory, swallowing, speech, and chewing functions. Depending on the dose and volume of radiotherapy, patients may experience pain, mucositis, xerostomia, and loss of taste. Existing clinical studies in this patient group have largely focused on tumor control, survival, and treatment modalities (Çukurova et al., 2017).

In a study by Minovi et al. (2008), the outcomes of 53 patients who underwent laser microsurgery for laryngeal carcinoma and 16 patients who received adjuvant radiotherapy in addition to laser microsurgery were evaluated. Patients were followed for an average of 59 months (range: 20–111 months). Quality of life was assessed using the EORTC QLQ-C30 and the head and neck–specific EORTC QLQ-H&N35 questionnaires, and results showed that patients who received adjuvant radiotherapy had poorer general health status.

The present study aims to evaluate the post-treatment quality of life of patients with laryngeal cancer, review the existing literature on this topic, identify the most productive authors, journals, institutions, and countries in this field, and determine the most frequently studied research themes.

II. Materials and Methods

Materials

The research data were obtained from the Web of Science database by searching the keyword "Quality of Life of Laryngeal Cancer Patients," yielding a total of 1000 articles published between 1996 and 2025. The search results were collected based on journal validity within the dataset, overall citation networks of the articles, most frequently used concepts, word clouds, trending topics, keyword co-occurrence maps, thematic maps, authors' countries, publication counts by country, and collaboration networks among authors, universities, and countries, as well as each country's network connectivity and scientific productivity.

To generate the results related to the retrieved articles, the R-Studio software was used. Within R-Studio, the "bibliometrix" package was executed, and the "biblioshiny" function was utilized for bibliometric analysis (Aria & Cuccurullo, 2017).

This study was presented orally at the "6th International Congress of Applied Statistics (UYIK-2025)" and only its abstract was published in the conference proceedings book.

Methods

The concept of "bibliographic analysis" was first introduced in 1922 by E. Wyndham Hulme, a lecturer at the University of Cambridge, and was defined as "the elucidation of scientific and technological processes through the counting of documents." One of the earliest scholars associated with the field, Pritchard (1969), described bibliometrics as the application of statistical and mathematical methods to books and other communication media.

The concept of bibliometrics involves applying mathematical and statistical techniques to written communication in order to classify and analyze quantitative characteristics. Through bibliometric methods, large-scale information sources—such as scientific publications—are examined, and processes related to the expansion and development of existing knowledge are analyzed (Bozca, 2022).

Bibliometric analysis provides visual mapping of the most highly cited studies related to a research topic, the most productive and influential authors, journals, institutions, countries, and the collaborative relationships among these entities (Kurutkan & Orhan, 2018). Within bibliometric methodologies, publications are categorized by countries, universities, research groups, journals, or authors, and analytical techniques such as science mapping and performance-based analysis are utilized (Gaviria-Marin et al., 2019).

The science mapping technique provides an overview of the structure and temporal development of a research field. This technique aims to analyze and visualize knowledge extracted from a specific domain based on relational networks (Noyons et al., 1999). The science mapping process includes co-authorship, bibliographic coupling, co-word analysis, co-occurrence, co-citation analyses, and visual representations of these relational networks (Egghe & Rousseau, 2002; van Eck & Waltman, 2022; Henriksen, 2016; Hu & Zhang, 2015; Khandelwal et al., 2022).

Bibliographic coupling: Two documents are considered bibliographically coupled when they cite at least one common reference in their bibliographies (Kessler, 1963). A bibliographic coupling network can be expressed by the formula:

$$B_{\text{cocit}} = A \cdot A'$$

where A is the Document × Cited Reference matrix.

Scientific collaboration analysis represents a network in which nodes correspond to authors and edges denote co-authorship relationships (Glänzel & Schubert, 2004). An author collaboration network can be constructed using the formula:

$$B_{\text{coll}} = A' \cdot A$$

where A is the Document × Author matrix.

Co-word analysis constructs a conceptual structure by mapping terms extracted from keywords, titles, or abstracts in a bibliographic collection using a co-occurrence network. A co-word network can be obtained using the formula:

$$B_{\text{coc}} = A' \cdot A$$

where A is the Document × Word matrix (Aria & Cuccurullo, 2017).

To generate the results from the retrieved articles, the R-Studio software was utilized. Within R-Studio, the "bibliometrix" package was executed, and the "biblioshiny" function was used for conducting the bibliometric analysis (Aria & Cuccurullo, 2017).

III. Results

Within the scope of studies conducted on the quality of life of patients with laryngeal cancer, a total of 1000 articles published between 1996 and 2025 were identified in 338 journals indexed in SCI-Expanded, SSCI, ESCI, and AHCI. These publications were retrieved using "biblioshiny," the web-based interface of the *bibliometrix* package in the R programming language. Statistical descriptions of the data included in the study are presented in Table 1.

Table 1. Descriptive statistics of the research data

Description	**Results**
MAIN INFORMATION ABOUT DATA	
Timespan	1996:2025
Sources (Journals, Books, etc.)	338
Documents	1000
Annual Growth Rate %	6,05
Document Average Age	9.71
Average citations per doc	24.18
References	18842
DOCUMENT CONTENTS	
Keywords Plus (ID)	1601
Author's Keywords (DE)	1828
AUTHORS	
Authors	5369
Authors of single-authored docs	18
AUTHORS COLLABORATION	
Single-authored docs	20
Co-Authors per Doc	7.07
International co-authorships %	12.7
DOCUMENT TYPES	
Article	789
Article; book chapter	4
Article; early access	10
Article; proceedings paper	57
Letter	4
Meeting abstract	10
Proceedings paper	8
Review	116
Review; early access	2

As shown in Table 1, a total of 789 research articles published within the scope of studies on the "quality of life of laryngeal cancer patients" were retrieved from the Web of Science database. Among the 5,369 authors who contributed to the field, 20 authored single-author publications. The average number of co-authors per article was determined as 7.07, and the annual growth rate of publications in the field was calculated as 6.05%. The yearly distribution of publications related to the research topic is presented in Figure 1.

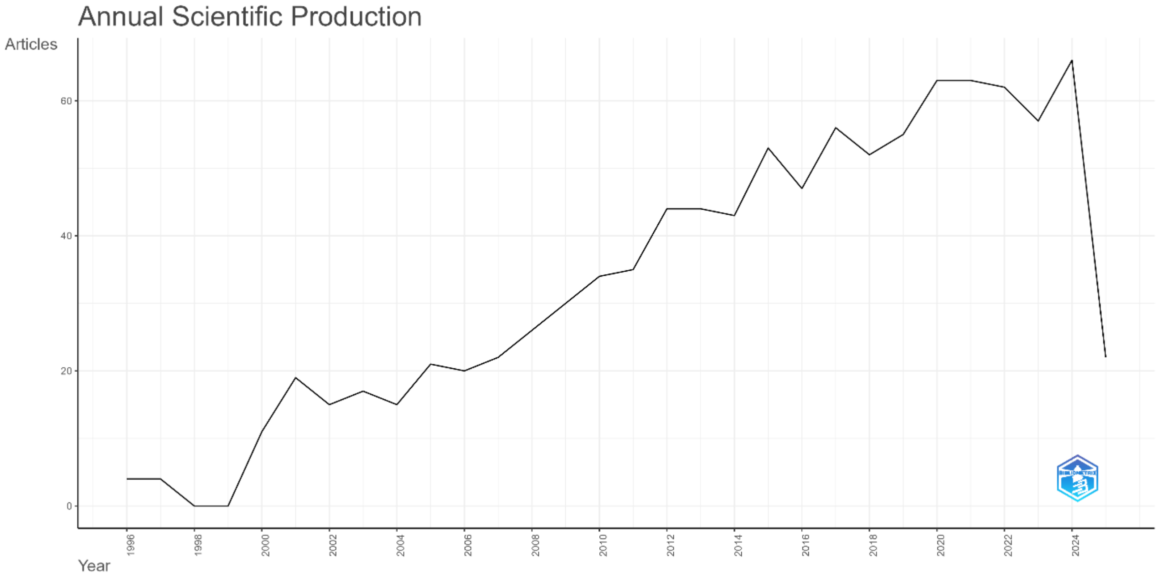

Figure 1. Distribution of Publications by Year

As shown in Figure 1, the number of articles published on the topic has generally followed a fluctuating trend. Since 2015, the annual number of publications has remained above 500 until 2023. The years with the highest number of publications are 2024, 2020, 2021, 2022, and 2023, with 66, 63, 63, 62, and 57 articles respectively. This pattern indicates a growing interest in the subject in recent years. Information regarding the leading journals in terms of publication count is presented in Table 2 and Figure 2.

Table 2. Journals in which the articles were published

Sources	**Articles**
Head and Neck-Journal for The Sciences and Specialties of The Head and Neck	68
European Archives of Oto-Rhino-Laryngology	67
Laryngoscope	51
Otolaryngology-Head and Neck Surgery	36
Oral Oncology	22
Journal of Voice	19
Journal of Laryngology and Otology	18
International Journal of Radiation Oncology Biology Physics	17
Acta Oto-Laryngologica	15
Supportive Care in Cancer	15

When Table 2 and Figure 2 are examined, Head and Neck Journal for the Sciences and Specialties of the Head and Neck has the highest number of articles published on this subject, with 68. This is followed by European Archives of Oto-Rhino-Laryngology with 67 articles, and Laryngoscope with 51 articles.

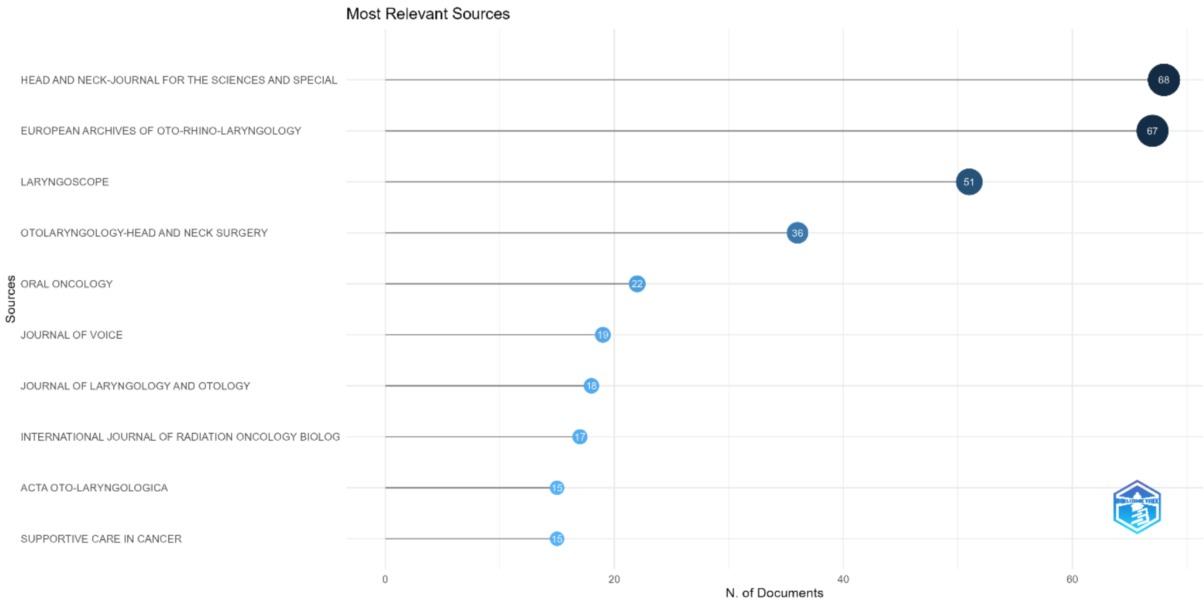

Figure 2. Journals that publish the most articles

It is also possible to examine the institutions with the most connections from the data set (Figure 3).

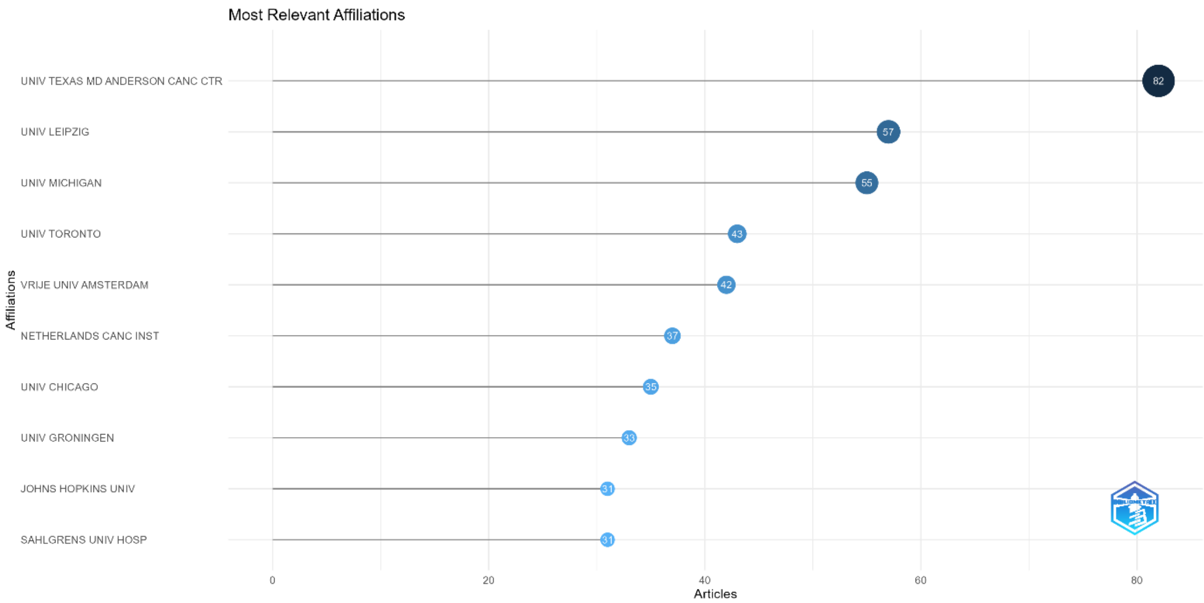

Figure 3. Most Relevant Institutions

As shown in Figure 3, the Univ. Texas Md. Anderson Cancer Center, Univ. Leipzig, and Univ. Michigan stand out as the institutions that conduct the most research on the quality of life of laryngeal cancer patients. The most frequently used words in studies on the quality of life of laryngeal cancer patients are shown in Table 3. The corresponding word cloud is shown in Figure 4.

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Table 3. Most Frequently Used Words

Words	Occurrences
Quality-of-life	413
Head	323
Neck-cancer	234
Radiotherapy	233
Squamous-cell carcinoma	180
Carcinoma	140
Cancer	135
Surgery	133
Radiation-therapy	121
Outcomes	120

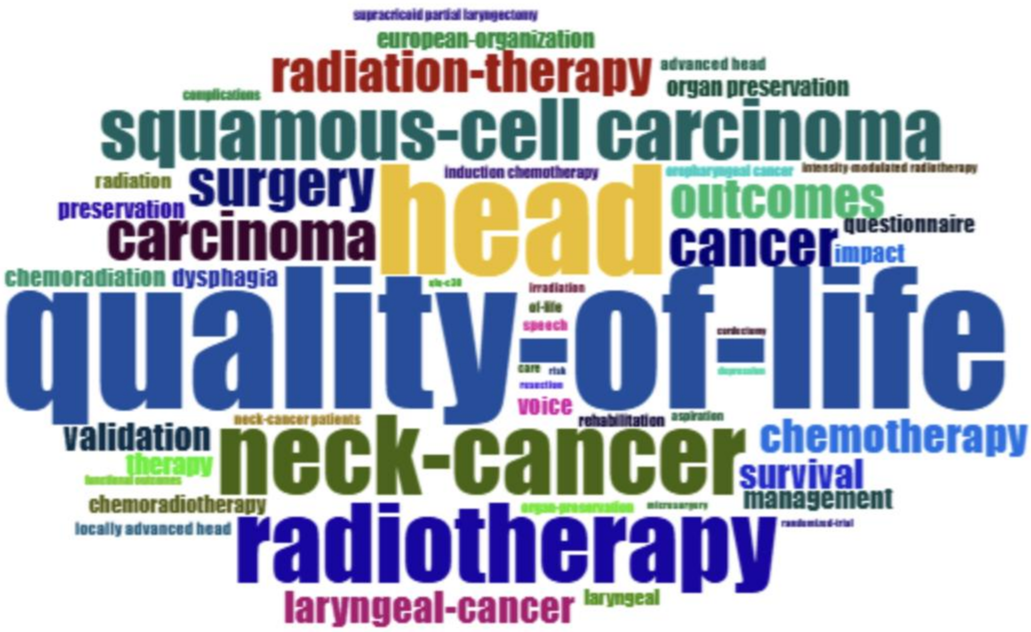

Figure 4. Word Cloud

The word cloud presented in Table 3 and Figure 4 illustrates the keywords most frequently used by authors in this research field. In a word cloud, the increase in the size and central placement of a term indicates a higher frequency of use. It is evident that the most commonly used terms specific to the subject area appear near the center of the visualization. When examining the relative prominence of frequently used concepts, the terms "quality-of-life," "head," "neck-cancer," "radiotherapy," "squamous-cell carcinoma," "carcinoma," "cancer," "surgery," "radiation-therapy," and "outcomes" emerge as the most significant. Figure 5 presents the trending topics in the field.

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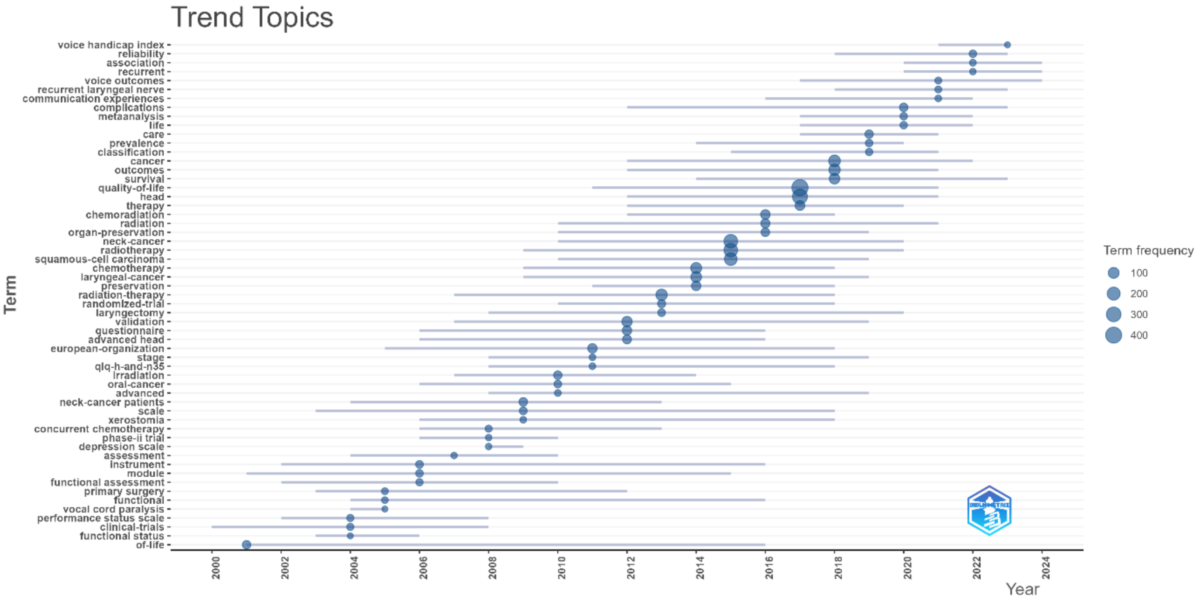

Figure 5. Trend topics

Figure 5 presents the trending topics in the relevant research area. In this study, the size of the bubbles was determined based on a minimum keyword frequency of three occurrences, while the annual word count was limited to a maximum of five occurrences per year. Keywords were evaluated accordingly.

The term *"quality-of-life"* was a trending topic between 2011 and 2021, with its peak trend occurring in 2017. The words *"head"* and *"therapy"* were trending from 2012 to 2021, also peaking in 2017. *"Neck-cancer"* trended between 2010 and 2020, with 2015 being the year of highest prominence. *"Radiotherapy"* was trending from 2009 to 2020, peaking in 2015, while *"squamous-cell carcinoma"* was mostly observed between 2010 and 2019, with its peak also in 2015. The term *"cancer"* appeared frequently between 2012 and 2022, reaching its highest trend in 2018, and *"outcomes"* was popular from 2012 to 2021, peaking in 2018. The topic of *"survival"* trended from 2014 to 2023, with its peak in 2018.

Figure 6 illustrates the keyword co-occurrence network for the analyzed field.

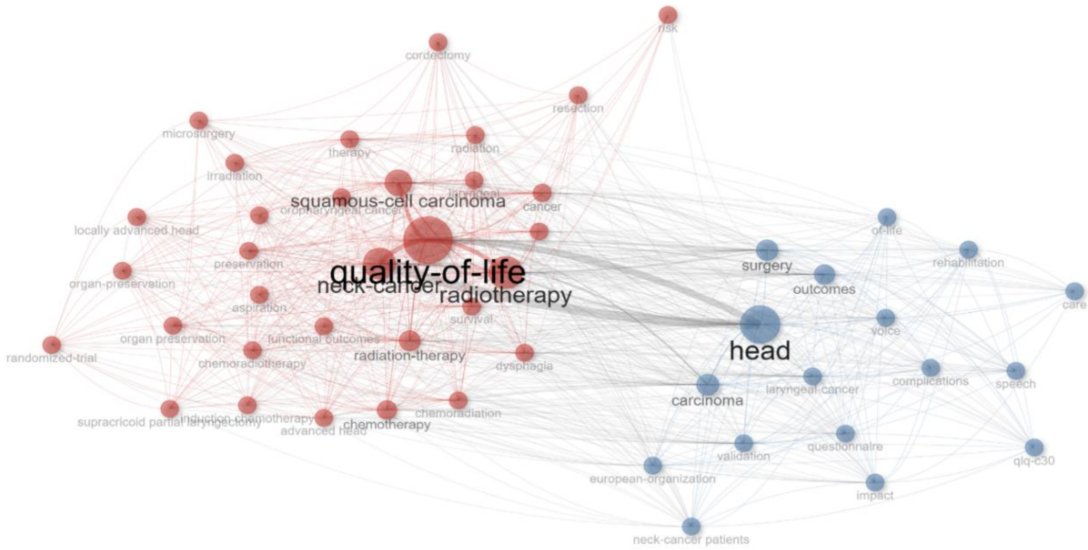

Figure 6. Word network

Figure 6 presents the keyword network map, which consists of two distinct clusters. The red cluster primarily includes terms such as *"quality-of-life," "neck-cancer," "radiotherapy,"* and *"squamous-cell carcinoma."* The blue cluster encompasses keywords such as *"head," "outcomes," "surgery," "carcinoma,"* and *"poisson."* The thematic mapping of these concepts is presented in Figure 7.

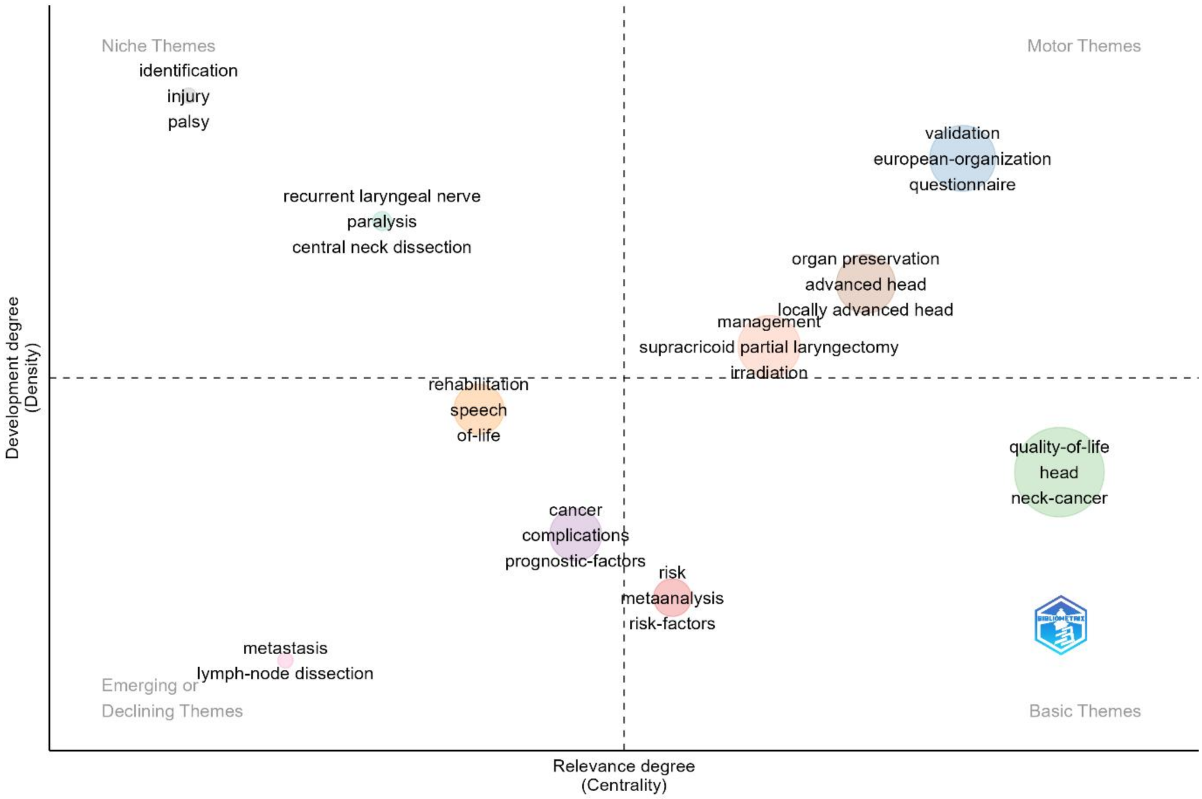

Figure 7. Thematic mapping of concepts

Examining the thematic map of keywords presented in Figure 7, it can be observed that terms such as *"validation," "european-organization," "questionnaire," "organ preservation," "advanced head," "locally advanced head," "management," "supracricoid partial laryngectomy,"* and *"irradiation"* are classified as motor themes. These concepts are both central and widely used, indicating that their frequent usage and strong connections with other publications make them the most influential themes in the literature.

The terms *"identification," "injury," "palsy," "recurrent laryngeal nerve," "paralysis,"* and *"central neck dissection"* are classified as niche themes. Meanwhile, *"rehabilitation," "speech," "of-life," "cancer," "complications," "prognostic-factors," "metastasis,"* and *"lymph-node dissection"* are found among emerging or declining themes. The keywords *"quality-of-life," "head," "neck-cancer,"* along with *"risk," "meta-analysis,"* and *"risk-factors"* fall into the category of basic themes.

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Figure 8 presents a graph illustrating the rise and decline of keywords identified within the scope of the research.

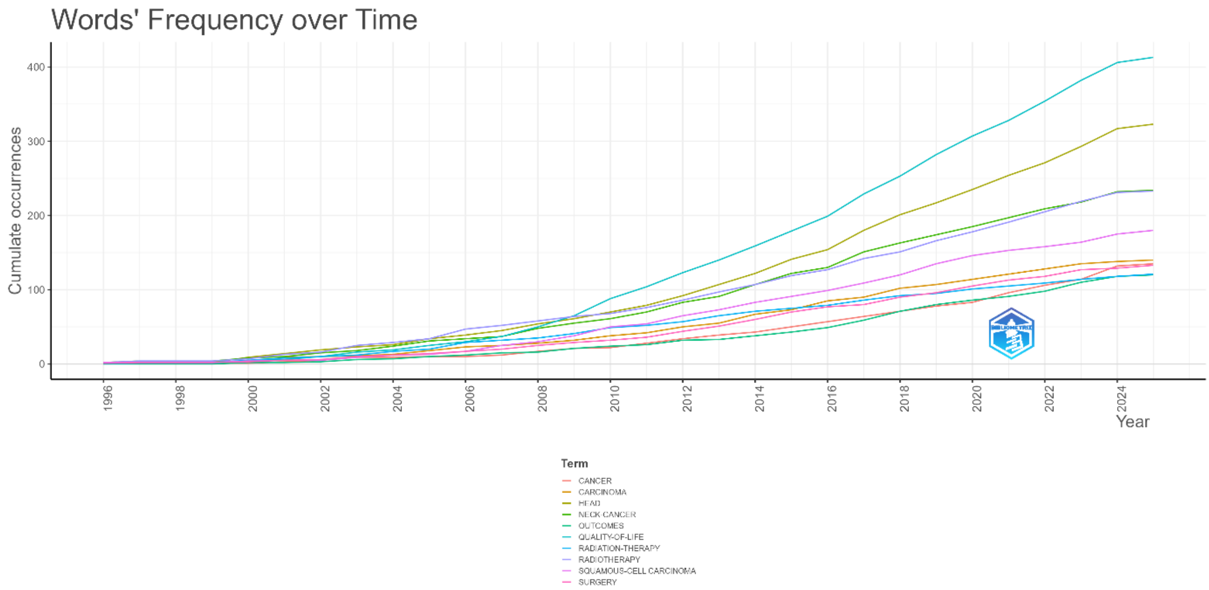

Figure 8. Cumulative word growth

Figure 8 presents the cumulative word dynamics graph of keyword formation, illustrating the rise and decline of key terms used by authors between 1996 and 2025. The most prominent terms in the field include *"quality-of-life," "head," "neck-cancer," "radiotherapy," "squamous-cell carcinoma," "carcinoma," "cancer," "surgery," "radiation-therapy,"* and *"outcomes."* Among the most frequently used keywords, *"quality-of-life"* has shown a continuous upward trend since 2000, while *"head," "neck-cancer,"* and *"radiotherapy"* have exhibited an increasing trend since 2000, and *"squamous-cell carcinoma"* has shown a rising trend since 2003.

The authors who have published the highest number of articles within the scope of the topic are presented in Figure 9.

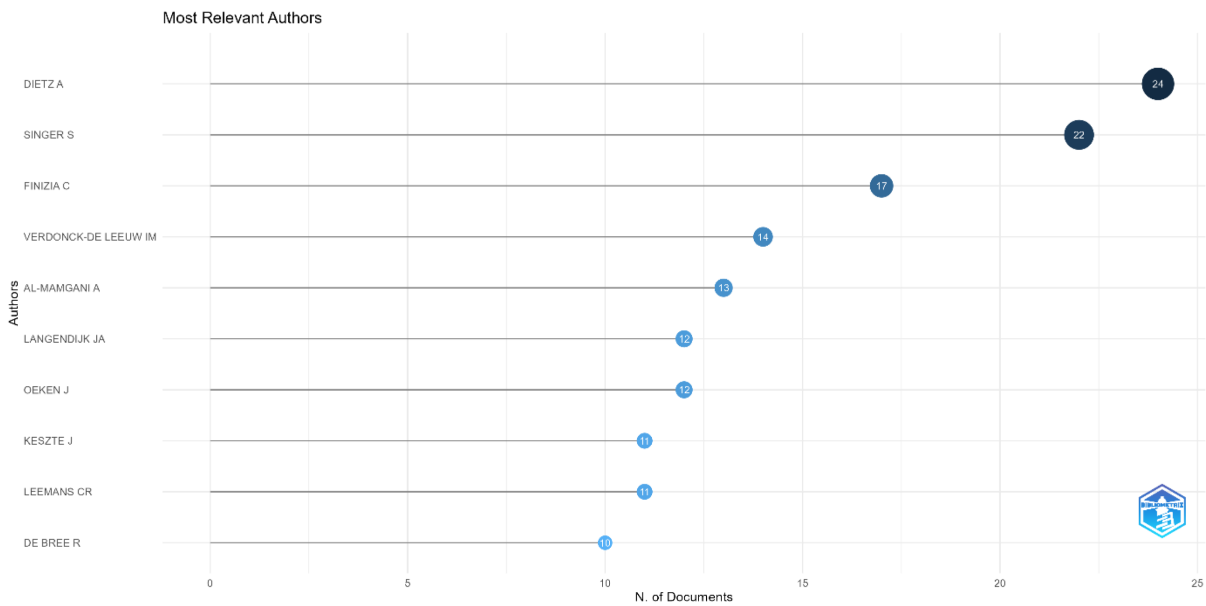

Figure 9. Authors who produced the most articles on the subject

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As shown in Figure 9, within the analyzed time period, the author with the highest number of publications on the quality of life of patients with laryngeal cancer is Dietz A (F = 24). This is followed by Singer S (F = 22), Finizia C (F = 17), Verdonck-de Leeuw IM (F = 14), and Al-Mamgani A (F = 13), who have also contributed a significant number of articles. Figure 10 illustrates how the collaboration network among these authors is structured.

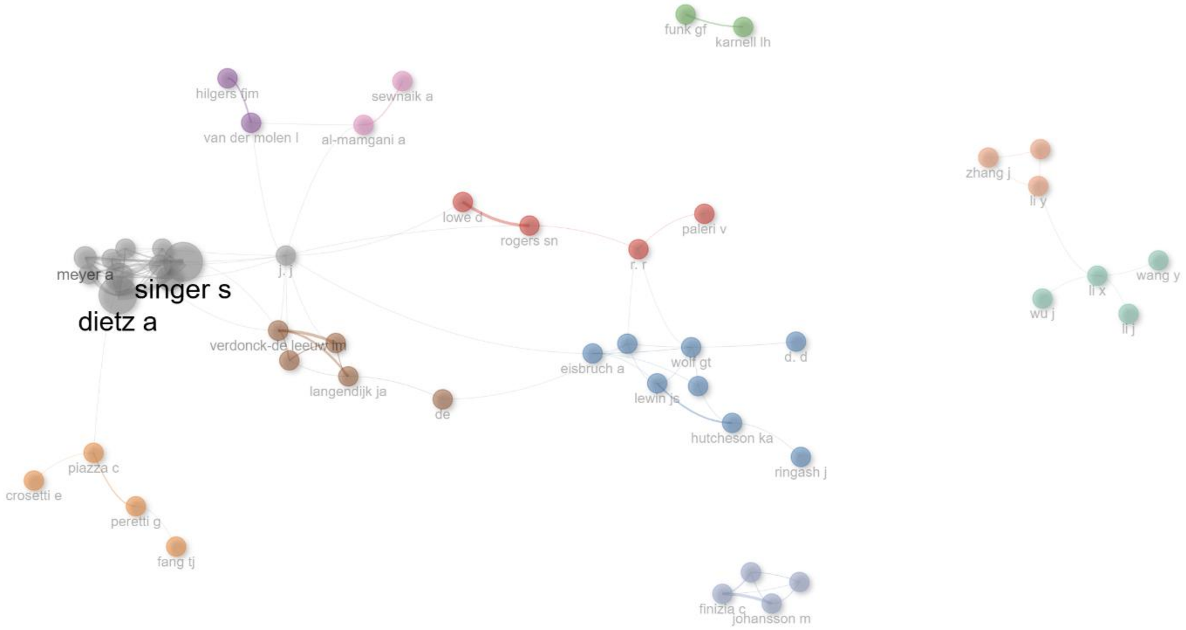

Figure 10. Collaboration network among authors

In Figure 10, the author collaboration network was analyzed based on the data obtained through keyword-based restrictions within publications on the quality of life of patients with laryngeal cancer. Authors who collaborated within the same cluster are represented by the same color. The size of the nodes indicates the extent of collaboration, with Dietz A and Singer S identified as the most collaborative authors. Hilgers FJM and Van Der Molen L are shown to be closely related, as are Karnell LH and Funk GF. Mutual collaboration is observed between Al-Mamgani A and Sewnaik A, while Verdonck-De Leeuw IM, Langendijk JA, Leemans CR, De Bree R, and DE also appear interconnected. These authors hold a prominent position within the collaboration network.

Figure 11 presents a graph illustrating the growth of universities in terms of publication output.

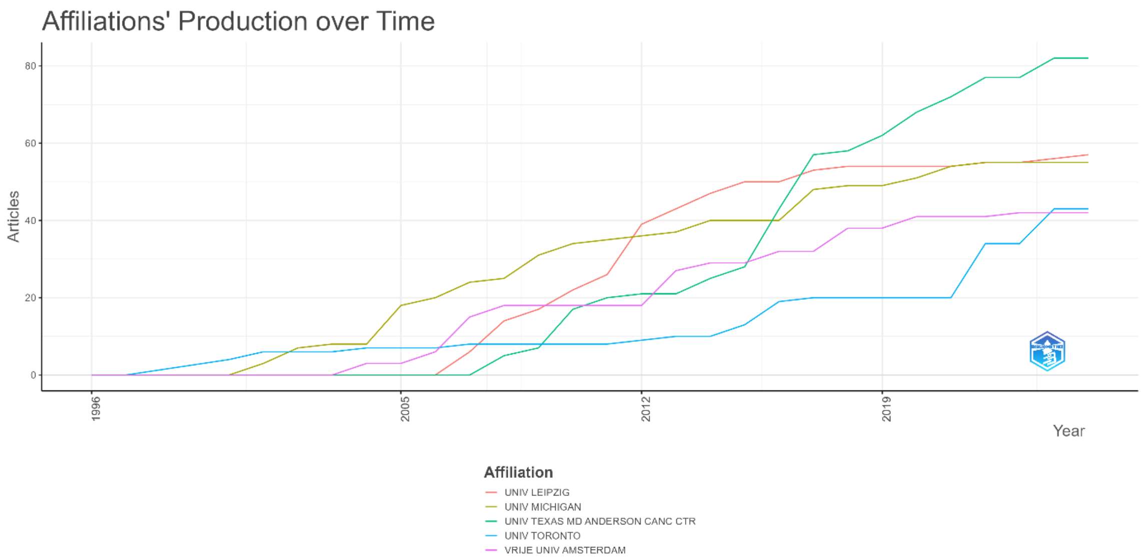

Figure 11. Publication Increases in Institutions

Examining the publication growth of universities in Figure 12, it can be noted that the University of Texas at Austin in the USA began publishing in 2008 and reached a total of 230 publications by 2024. The University of Paris in France started publishing in 2000 and reached a total of 212 publications by 2024. The University of California, Berkeley in the USA began contributing in 2000 and achieved 197 publications by 2024. The University of Oxford in the UK started publishing in 2000 and reached 170 publications by 2024, while the University of Melbourne in Australia began in 2002 and also reached 170 publications by 2024.

The map illustrating publication collaboration between countries is presented in Figure 12. The number of publications representing each country's contributions is provided in Table 5.

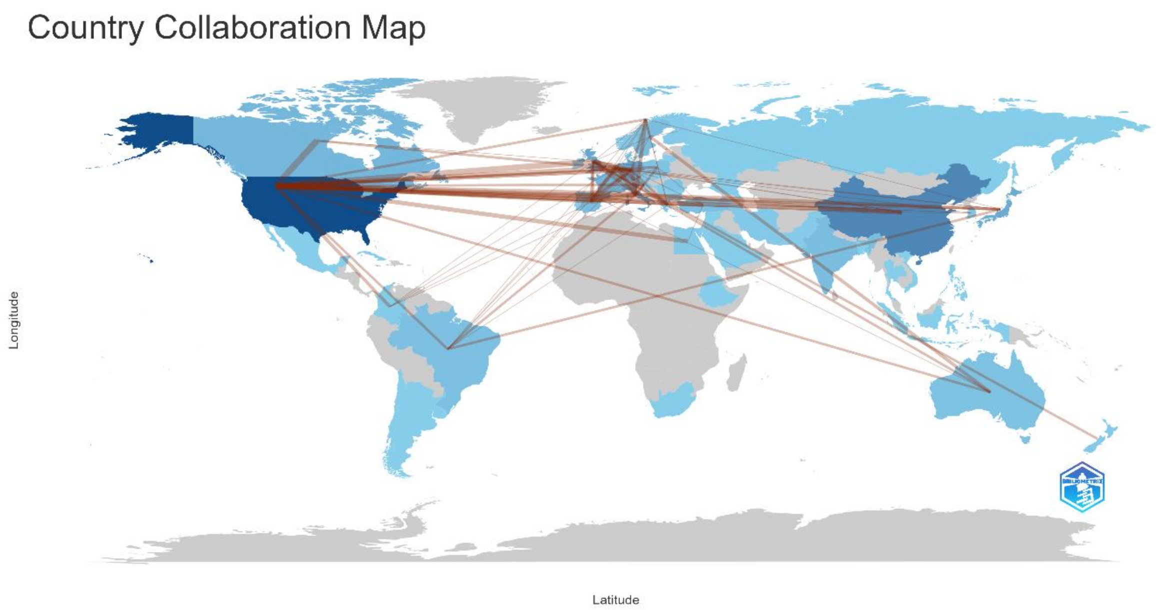

Figure 12. Map of Broadcast Collaboration by Country

Table 5. Countries with the Most Frequent Collaborations

Country	Frequency
USA	1049
CHINA	552
GERMANY	424
ITALY	351
NETHERLANDS	341
JAPAN	252
UK	244
FRANCE	175
CANADA	153
BRAZIL	107

When Figure 12 and Table 5 are examined, the country with the highest frequency of cooperation is the United States (N=1049), followed by China (N=552) and Germany (N=424) in third place.

IV. Conclusion

A bibliometric analysis was conducted on data obtained from the Web of Science database regarding research on the quality of life of patients with laryngeal cancer. The relationships within this research area were evaluated from various perspectives.

The highest number of publications on the topic, 66 articles, was reached in 2024. An analysis of the journals with the most publications in the dataset revealed that *Head and Neck – Journal for the Sciences and Specialties of the Head and Neck* ranked first with 68 articles, followed by *European Archives of Oto-Rhino-Laryngology* with 67 articles and *Laryngoscope* with 51 articles.

In research on the quality of life of patients with laryngeal cancer, the USA is the most productive and influential country, demonstrating the widest collaborative network. The University of Texas MD Anderson Cancer Center was identified as the most influential institution in this field. Academic institutions worldwide are engaged in deep collaboration to support the development of this research area. The most influential authors are Dietz A, Singer S, and Finizia C.

Keyword analysis indicates that the main focus of research in this field revolves around *"quality-of-life," "head," "neck-cancer," "radiotherapy,"* and *"squamous-cell carcinoma."* Based on the timeline analysis, the two clusters obtained can be considered the primary dimensions of research on the quality of life of patients with laryngeal cancer.

Overall, these findings suggest that bibliometric analysis can provide important guidance for the expansion of research in critical topics, such as the quality of life of patients with laryngeal cancer, and serve as a valuable reference for statistical studies in the field.

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