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Bibliometric Analysis of Nursing Studies in the Field of Stroke

İnme Alanında Hemşirelik Çalışmalarının Bibliyometrik Analizi

Şengül Akdeniz[1], Alev Yıldırım Keskin[2]

[1]Department of Healthcare Services, Akdeniz University, Vocational School of Healthcare Services, Antalya, Türkiye
[2]Department of Nursing, Selçuk University, Akşehir Kadir Yallagöz Health School, Konya, Türkiye

ABSTRACT

Background: This study aimed to describe the global development and current status of nursing studies in the field of stroke and to evaluate the research trends of scientists in related fields.

Methods: This study is a descriptive and retrospective bibliometric research study. The data set comprised 2440 articles obtained from the Web of Science Core Collection (WoSCC) database on 5 September 2024. In addition to the statistical data available in the WoSCC database, descriptive statistics were generated in the Excel programme. The data were visualised with the VOSviewer package programme, and figures and graphs were produced.

Results: The study identified 2,440 publications, created between 1974 and 2024, authored by 6,713 researchers affiliated with 2,368 institutions in 72 countries and published in 169 different journals. In terms of the overall collaboration network, the three journals with the strongest connections and the most publications are the Journal of Neuroscience Nursing, the Journal of Clinical Nursing and the Journal of Advanced Nursing. The journals with the highest number of publications are based in the Americas and Europe. When keywords on stroke were examined in chronological order, the following were identified as hot topics: 'critical stroke care', 'older adults', 'stroke rehabilitation' and 'anxiety'.

Conclusion: This study is a review of nursing articles in the field of stroke over the past 50 years. This bibliometric analysis study provides a comprehensive perspective on nursing issues in the field of stroke. The most studied topics were found to be those focusing on effective management of post-stroke care and collaboration, and nurses' awareness of stroke risks. The most cited topics were identified as caregivers after stroke and rehabilitation of stroke. It is recommended that researchers, academics, and clinical nurses examine the most cited journal publications to build their own literature on nursing research in the field of stroke.

Keywords: Stroke, nursing, bbliometric analysis, scientific mapping, web of science.

ÖZ

Amaç: Bu çalışma, inme alanında hemşirelik çalışmalarının küresel gelişimini ve mevcut durumunu tanımlamayı ve ilgili alanlardaki bilim insanlarının araştırma eğilimlerini değerlendirmeyi amaçlamıştır.

Yöntemler: Bu çalışma tanımlayıcı ve retrospektif bir bibliyometrik araştırma çalışmasıdır. Bu araştırma Web of Science Core Collection (WoSCC) veri tabanında 5 Eylül 2024 tarihinde elde edilen 2440 inme makalesi ile gerçekleştirilmiştir. WoSCC veri tabanında bulunan istatistiksel verilere ek olarak, Excel programında tanımlayıcı istatistikler oluşturulmuştur. Verilerin figürsel ve grafiksel sunumları VOSviewer paket programı ile elde edilmiştir.

Bulgular: Çalışmada 2440 yayın tespit edilmiş, bu yayınlar 1974-2024 yılları arasında yapılmış, 72 ülkenin 2368 kurumunda 6713 araştırmacı yazar tarafından üretilmiş ve 169 farklı dergide yayınlanmıştır. Genel işbirliği ağı bakımından Journal of Neuroscience Nursing, Journal of Clinical Nursing ve Journal of Advanced Nursing dergileri en güçlü bağlantıları olan ve en fazla yayına sahip üç dergidir. En fazla yayına sahip dergiler Amerika ve Avrupa kıtası merkezlidir. İnme konusunda anahtar kelimeler kronolojik sırayla incelendiğinde "kritik inme bakımı", "yaşlı yetişkinler ", " inme rehabilitasyonu" ve "anksiyete" güncel konular olarak belirlendi.

Sonuç: Bu çalışma, 50 yıllık geçmişteki inme alanında hemşirelik makalelerini inceleyen bir çalışmadır. Bu bibliyometrik analiz çalışması, inme alanında hemşirelik konularına kapsamlı bir bakış açısı sunmaktadır. En çok çalışılan konunun; inme sonrası bakımın etkin yönetimi ve iş birliği, hemşirelerin inme risklerinin farkında olmasına odaklanan konular olduğu belirlendi. En çok atıf alan konuların ise; inme sonrası bakım vericiler ve inmenin rehabilitasyonuna yönelik olduğu saptandı. Araştırmacıların, akademisyenlerin ve klinik hemşirelerinin, inme alanındaki hemşirelik araştırmalarına ilişkin kendi literatürlerini oluşturmak için en çok atıf alan dergi yayınlarını incelemeleri önerilir.

Anahtar Kelimeler: İnme, hemşirelik, bibliyometrik analiz, bilimsel haritalama, web of science.

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Corresponding Author: Şengül Akdeniz, sengulakdeniz@akdeniz.edu.tr

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INTRODUCTION

Stroke is the second most common cause of death worldwide after heart diseases, and its incidence increases proportionally with age.[1] It is estimated that approximately 17 million people suffer a stroke globally each year, with 140,000 cases occurring annually in our country. According to the latest report by the Turkish Statistical Institute (TÜİK), of the 565,594 deaths that occurred in 2021, 33.4% were caused by diseases of the circulatory system, and cerebrovascular diseases accounted for 18.9% of this rate.[2] Medically, the term "stroke" is defined as the death of brain cells and loss of function in the affected area of the brain due to the narrowing, blockage, or rupture of brain blood vessels, which causes a reduction or complete cessation of blood, oxygen, and nutrient flow to brain tissue.[3-7]

It is a well-known fact that stroke nurses have a very important role in providing and sustaining care for stroke patients.[3,4,6,7] Nurses assess swallowing, nutrition, urinary monitoring, and weight control in stroke patients. They monitor recovery, risk factors, and medication adherence, and facilitate patients' transition to community care.[8,9] Additionally, nurses provide self-care management to help stroke survivors maintain their independence.[10,11]

Considering stroke as a leading cause of death and its potential to cause long-term disability, rapid and effective diagnosis, treatment, and care management of stroke are of great importance. Significant focus has been placed on scientific studies in the field of stroke for prevention, care of stroke patients, and management of complications. Nurses play a critical role in these studies and lead important advances in stroke management.[3,6,8,9] Technological developments also contribute to progress in this area. Given the variety of necessary interventions for stroke, an increase in nursing studies related to stroke is expected in the future, as it is today.

Literature reviews are important in academic research as they provide a general overview of a specific research area, gather and categorize relevant information, and identify areas requiring further study. The proliferation of academic journals and publications, coupled with the exponential increase in scientific knowledge production, further emphasizes the need for comprehensive reviews. However, researchers often rely on evidence obtained from prestigious journals without considering a broader range of sources.[12,13] In conclusion, it has become increasingly difficult to stay up to date and categorize large volumes of information using traditional review methods. This situation has led to a rise in the popularity of bibliometric analysis, which enables a comprehensive examination of the entire body of literature within a research field. The growing advancement of computer technology, the internet, and bibliographic electronic databases has made bibliometric analyses possible. Bibliometric analysis has emerged as an important tool to measure the scientific outputs of various scientific elements (e.g., articles, authors, keywords, journals, institutions, and countries) within any research domain, and to examine how the intellectual, social, and conceptual structure of the relevant field evolves over time based on the relationships and interactions among these elements.[14-16] Bibliometric techniques allow for mapping the intellectual and conceptual structure of a research area in a way that complements previous reviews. Bibliometrics applies a systematic procedure for selecting, organizing, and visualizing information from large databases through mathematical algorithms. Using this approach, researchers can effectively track the status, developments, and gaps in their respective fields.[12-14]

In this study on nursing publications in the field of stroke, a bibliometric analysis and literature review of articles indexed in the Web of Science (WoS) database by Clarivate Analytics up to 2024 was planned with two specific objectives. First, it aims to conduct a descriptive study using quantitative and qualitative bibliometric performance indicators to identify the main articles, journals, and scholars that have significantly contributed to the development of stroke research. While quantitative indicators are represented by the number of publications, qualitative indicators measure the academic impact of the research through metrics such as citation count. Therefore, the use of bibliometric performance analysis provides researchers with new perspectives and offers an updated overview of the stroke field by identifying the journals and authors that form the intellectual foundation of the stroke literature. The second aim of this study is to identify trends and patterns in this research field based on co-word analysis. Co-word analysis is a bibliometric tool that examines the co-occurrence of keywords in publications within a specific field and analyzes the relationships among these keywords. Thus, the use of co-word analysis allows us to determine the conceptual structure of the field.[12-16]

In this study, a bibliometric analysis was employed to evaluate the trends in articles published on nursing studies in the field of stroke and to synthesize the existing findings. This study will assist researchers in identifying the most influential authors, journals, and institutions in the field of stroke, thereby contributing to a deeper understanding of stroke and enriching the existing literature.

Our study seeks to answer the following questions:

1. What is the annual change in the number of publications and citations related to nursing studies in the field of stroke?
2. Which are the most influential articles related to nursing studies in the field of stroke?
3. Who are the most productive and influential authors, countries, institutions, and journals in the field of nursing studies on stroke?
4. What is the nature of the relationship among authors, institutions, and countries (co-authorship analysis)?
5. What is the nature of the relationship among the most researched topics/concepts (co-word analysis)?
6. What is the co-citation analysis of the most cited references?

MAIN POINTS

- This bibliometric analysis examined nursing studies in the field of stroke indexed in the Web of Science (WoS) database between 1974 and 2024.
- Nursing studies in the stroke field involved contributions from 2,368 institutions and 6,713 researchers from 72 countries.
- The United States (USA) stood out as the country publishing the highest number of articles.
- A total of 169 different journals publishing nursing articles in the stroke field were identified, with the Journal of Neuroscience Nursing being the journal with the highest publication volume.
- According to co-citation analysis, measurement tools such as the Barthel Index and Mini Mental Test (MMT) play a vital role in post-stroke patient assessment.

MATERIAL AND METHODS

Study Design

This study is a descriptive retrospective bibliometric research study. The BIBLIO checklist was used in the reporting of this study. To review the trends and current topics examined in existing articles related to nursing studies in the field of stroke, a methodology consisting of two sequential steps, as explained in this section, was followed. The first step is the data search protocol. The second step includes the methodology for organizing and analyzing the dataset.

Data Collection

Firstly, the data source for the study was determined. In the process of obtaining the study data, the Web of Science Core Collection (WoSCC) database was selected. Within the search strategy, MeSH terms such as the word "stroke" and its combinations were entered into the topic field. The following keywords were used in the database: (TS = "stroke" OR "ischemic stroke" OR "cerebral infarction" OR "cerebral embolism" OR "cerebrovascular disease"). The data of the study were collected on September 5, 2024 Inclusion criteria were: (1) articles published in English; and (2) articles published in the field of nursing within the WoSCC category. Exclusion criteria were: early access articles, books, book chapters, conference papers, and editorial publications. The studies listed in the WoSCC database were downloaded by clicking the "Export" button and selecting the "tab delimited file" option as "full record and cited references."

Data Analysis

At this stage, version 1.6.20 of the VOSviewer software was used to analyze the data.[17] The software was used to perform citation analysis, co-authorship, co-occurrence, and co-citation analyses by focusing on various analysis units such as authors, countries, institutions, journals, and keywords. VOSviewer provides three types of visualizations: network visualization, overlay visualization, and density visualization. The maps created, visualized, and analyzed using VOSviewer contain items, which may include publications of interest, researchers, or terms. There may be a link between any pair of items. Examples of such links include bibliographic coupling between publications, co-authorship between researchers, and co-occurrence between terms. In the network visualization, items can be shown with their labels and, by default, a circle. The size of the label and the item's circle is determined based on the item's importance. The higher the impact of an item, the larger its label and circle. For some items, the label may not be displayed. This is done to prevent labels from overlapping. The color of an item is determined by the cluster to which it belongs. Lines between items represent links. By default, up to 1000 lines are displayed, representing the 1000 strongest links between items.[15,16]

Analysis Methods Used in the Study

In this study, bibliometric analysis methods including citation analysis, co-author analysis, co-word analysis, and co-citation analysis of cited references were used.

Citation Analysis

The VOSviewer program enables citation analysis of documents, sources, authors, institutions, and countries. Citation analysis is a method used to identify collaborations among scientific publications and to map research fields. It is also used to evaluate the impact of research outputs and to observe knowledge transfer between fields.[15,16]

Co-author Analysis

Co-author analysis examines collaboration and interaction among authors. This analysis is used to understand collaboration patterns and to identify prominent authors in scientific studies. The VOSviewer program is used to conduct co-authorship analysis among authors, institutions, and countries. As expectations regarding the quantity and quality of academic publications increase, multi-authored works and collaborations have become even more important. Co-author analysis not only measures collaboration in scientific publications but also serves as a valuable tool for revealing social ties among authors, institutions, and geographic regions. Additionally, this analysis can identify collaborations between institutions and countries by using bibliographic data.[12,13,15]

Co-word Analysis

Co-word analysis examines the co-occurrence frequency of terms in texts. This analysis is used to identify the relationship between a specific topic or word and other words. Co-word analysis can be used to investigate the conceptual structure of studies. It also helps to identify similar topics and research trends.[15,16]

Co-citation Analysis

Using the VOSviewer program, co-citation analysis can be performed on cited references, cited sources, and cited authors. This analysis method is used to establish thematic similarity between two studies and to identify related previous works. For a strong co-citation analysis, many authors need to have been cited together before. Authors, sources, or documents that are frequently cited together are assumed to have strong relationships, and these documents or authors usually receive high citation counts individually as well.[12-16] Before each analysis, the relevant data were thoroughly reviewed, and VOSviewer's thesaurus files (synonym dictionaries) were used to merge author, journal, and institution names written in different languages or characters or to unify words with the same or similar meaning.

Validity, Reliability and Accuracy

In this study, the literature review was conducted independently by the authors and consensus was reached. Bibliometric studies generally analyze works from a single database. The selection of studies to be included and the possible quality control require the content screening process to be both rigorous and rapid. Both authors performed simultaneous searches in the Nursing category of the WoSCC database on separate computers using the same keywords. They agreed on the filtering procedures applied up to the data collection date, September 5, 2024.

Ethical Considerations

This study is a descriptive and retrospective bibliometric analysis based on data retrieved from the Web of Science Core Collection database. Since the study does not involve human or animal subjects and does not include personal or sensitive data, ethical committee approval was not required in accordance with institutional and national research ethics guidelines.

RESULTS

The search resulted in a total of 3,302 nursing studies published in the field of stroke for all years (1974-2024). Among these, 2,568 were identified as stroke-related articles in the nursing field. Twenty-six of these were excluded because they were early access articles, 10 were conference proceedings, and 9 were book chapters. Studies in languages other than English were also excluded: Spanish (n=27), Korean (n=23), Portuguese (n=16), German (n=7), Italian (n=4), French (n=2), Polish (n=2), and Norwegian (n=2). Bibliometric analysis was conducted on 2,440 articles meeting the inclusion criteria.

The annual trends of the number of articles published and citations received in nursing studies related to stroke are shown in Figure 1. The annual publication volume is considered an important indicator of academic interest and the intensity of activity in a research field. The articles included in this study were published between 1974 and 2024, as shown in Figure 1. The first article in this field, titled "Measurement of stroke care nursing proficiency," was published by Miller and colleagues in 1974 in the International Journal of Nursing Studies.18 When annual publication counts are examined, the most productive year was identified as 2021, with 240 studies. Between 1974 and 2005, the average annual number of articles showed a very slow increasing trend. From 2005 to the present, annual publications and citation counts have shown a general upward trend. These results indicate that the number of studies focusing on stroke is gradually increasing.

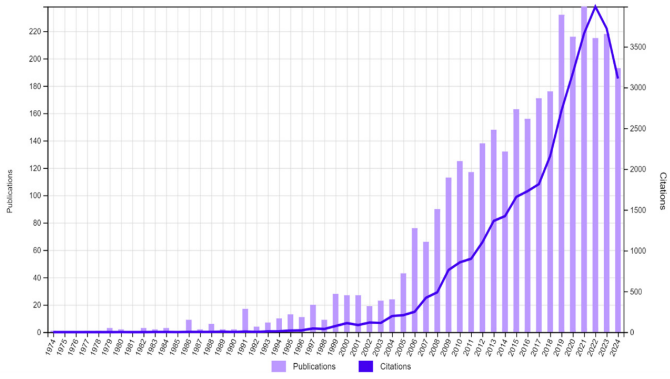

Figure 1. Publication and Citation Numbers Related to Nursing Studies in the Field of Stroke (1974-2024).

The five most cited articles in the field of stroke between 1974 and 2024 were analyzed. The most frequently cited topics were pioneering articles on caregivers after stroke and stroke rehabilitation. Among journals, the main source was the Journal of Advanced Nursing (Table 1).

To evaluate the performance of articles published on stroke, the five most cited articles from the recent period of 2021-2024 are shown in Table 2. These articles focus on post-stroke care, rehabilitation, stress-related interventions, and the necessity of formal and informal care in stroke management. The International Journal of Nursing Studies is the main source for these articles (Table 2).

Table 1. Top 5 Most Influential Articles on Stroke in Nursing (1974-2024)

No	Article Title	Author(s)	Journal Title	Publication Year	Annual Average Citation	Total Citation
1	Testing a model of post-stroke exercise behavior	Shaughnessy et al.	Rehabilitation Nursing	2006	8.37	159
2	Barriers and facilitators to exercise among stroke survivors	Damush et al.	Rehabilitation Nursing	2007	8.78	158
3	Living with stroke: a phenomenological study	Burton, CR	Journal of Advanced Nursing.	2000	6.12	
4	Task-oriented training in rehabilitation after stroke: systematic review	Rensink et al.	Journal of Advanced Nursing.	2009	9.44	151
5	Self-efficacy and its influence on recovery of patients with stroke: a systematic review	Korpershoek et al	Journal of advanced nursing	2011	10.64	149

Table 2. The 5 Most Effective Current Articles in the Field of Stroke in Nursing (2021-2024)

No	Article Title	Author(s)	Journal Title	Publication Year	Annual Average Citation	Total Citation
1	Virtual reality for limb motor function, balance, gait, cognition and daily function of stroke patients: A systematic review and meta-analysis	Zhang et al.	Journal of advanced nursing	2021	17.75	71
2	Characteristics of self-care interventions for patients with a chronic condition: A scoping review	Riegel et al.	International journal of nursing studies	2021	15.5	62
3	Enablers and barriers in hospital-to-home transitional care for stroke survivors and caregivers: A systematic review	Chen et al.	Journal of clinical nursing	2021	11.25	45
4	Effectiveness of dyadic psychoeducational intervention for stroke survivors and family caregivers on functional and psychosocial health: A systematic review and meta-analysis	Mou et al.	International journal of nursing studies	2021	7	28
5	Dysphagia screening in residential care settings: A scoping review	Artiles et al.	International journal of nursing studies	2021	7	28

In Table 3, the most contributing and productive authors in the research field are listed according to the number of documents, along with their affiliated institutions, countries, citation counts, and total link strength values. The top three most productive authors contributing the most to the field are Sandy Middleton, DaiWai M. Olson, and Li-Hong Wan.

Citation analysis was conducted covering four main areas: authors, authors' affiliated institutions, countries, and journals.

Table 3. Most productive authors and their affiliated institutions

Institution / Country	Author	Number of publications	Number of citations	Total connection power
Australian Catholic University/ Australia	Sandy Middleton	17	139	11
Texas Southwestern University / USA	DaiWai M. Olson	14	90	5
Sun Yat-sen University/People's Republic of China	Li-Hong Wan	13	154	37
Georgia State University/ USA	Dawn M. Aycock	11	99	29
Georgia State University/ USA	Patricia C. Clark	11	122	29
University of Illinois/ USA	Holli A. DeVon	11	154	2
Rome Tor Vergata University/ Italy	Rosaria Alvaro	10	219	131
Australian Catholic University/ Australia	Simeon Dale	10	53	9
University of São Paulo/ Brazil	Thelma Leite de Araujo	10	45	1
University of Oslo/ Norway	Marit Kirkevold	10	327	4

Citation Analysis of Authors

Author Citation Analysis is presented in Figure 2. It shows the fifty-three most productive authors with at least five publications, who have the highest citation counts and total link strength (TLS), a metric that quantitatively expresses an item's overall level of interaction and importance within the bibliometric network. The total link strength value is used to understand the centrality, significance, or influence of the item within the network. An author with a high total link strength may indicate extensive collaboration or interaction with many other authors in the field. These authors are visualized as eight clusters in turquoise, red, green, blue, yellow, orange, pink, and purple colors, respectively, using the scientific mapping method. A cluster is a group of items on a map. Clusters are labeled using cluster numbers. The color of an item corresponds to the cluster it belongs to. In Figure 2, each color represents a different cluster. The distance between two authors on the map approximately indicates their relationship; generally, the closer two authors are, the stronger their relationship. In VOSviewer, items and labels are represented by circles. The size of the circle and label reflects the strength of the item. Lines between circles indicate connections between items.[17]

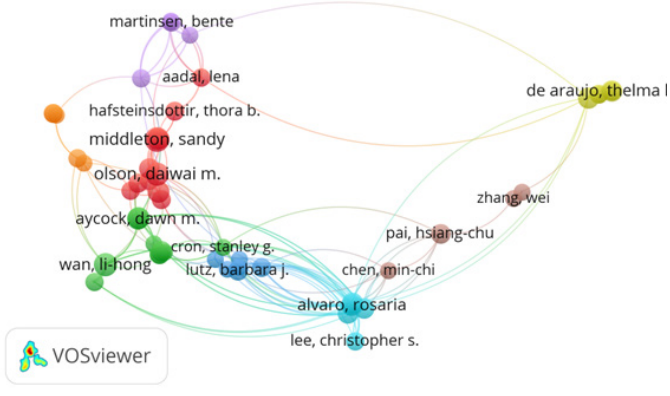

Figure 2. Citation Analysis of Authors.

During this mapping, some authors were excluded outside the threshold in a way that would not change the result. In Figure 2, Ercole Vellone (219 citations, 10 articles) ranks first with a total link strength of 150; Rosaria Alvaro (129 citations, 10 articles) is second with a TLS of 150; Silvio Simeone (217 citations, 9 articles) is third with a TLS of 145; and Pucciarelli Gianluca (189 citations, 9 articles) is fourth with a TLS of 138.

A total of 72 countries contributed to this study. The most productive countries according to citation analysis are shown in Figure 3. Based on author affiliations in the included studies, it was determined that researchers from 72 countries conducted the studies.

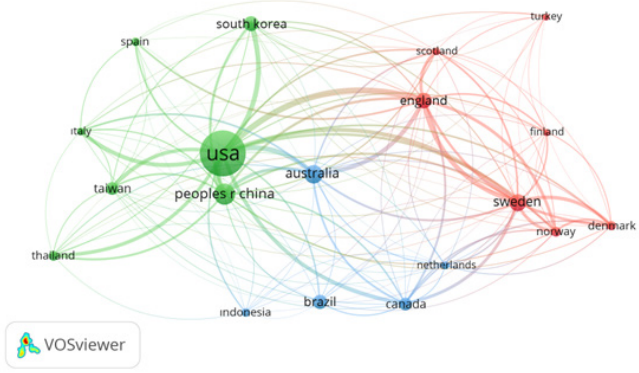

Figure 3. Citation Analysis by Countries.

Figure 3 shows the collaboration networks established among 19 countries with at least 20 publications each, out of the total 72 countries analyzed. The networks are divided into three clusters represented by green, blue, and red colors. The United States, with 851 articles, has the highest number of publications, constituting nearly half of all articles. China ranks second with 188 articles, followed by Australia with 138 articles. General collaboration is presented in three different clusters with various colors, and the thickness of the lines indicates the strength of the connection between two countries. The distance between countries represents how closely related they are in the research field. Examining publications affiliated with Turkiye , it was found that there are 29 studies published in the stroke field and that collaborations occurred with ten different countries.

The most productive institutions according to the citation analysis are presented in Figure 4. Considering the researcher affiliation information of the included studies, it was determined that a total of 2,368 institutions conducted these studies.

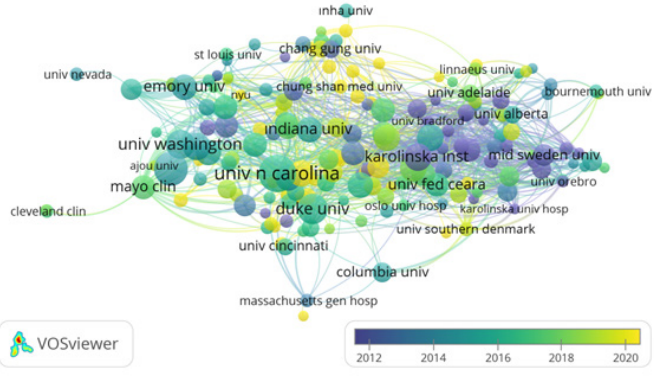

Figure 4. Overlay Visualization of Institutions by Year Based on Citation Analysis.

Figure 5. Citation Analysis of Institutions Affiliated with Authors.

When examining the visual networks shown in the map in Figure 4, it can be inferred that stroke research over time, especially around the year 2020, increasingly focused on institutions from the People's Republic of China, such as Sun Yat-Sen University, Hong Kong University, and Chung Shan Medical University. It is also possible to say that institutions grouped within the same color cluster in Figure 4 were the more pioneering organizations in those same years. The connections between institutions represent co-authorship relationships.

Figure 5 displays the overall collaboration networks representing the strongest connections established through the analysis of eight institutions among the 2,368 included in this study, each having at least 100 citations and at least 20 publications. These networks consist of three clusters colored green, blue, and red, respectively. Figure 5 also shows the top three most productive institutions both in terms of publication count and citation numbers, namely Karolinska University, University of Pittsburgh, and Duke University.

According to the citation analysis, the most productive journals are given in Figure 6. Examination of the journals where the included studies were published revealed that nursing studies in the field of stroke have been published across a total of 169 journals.

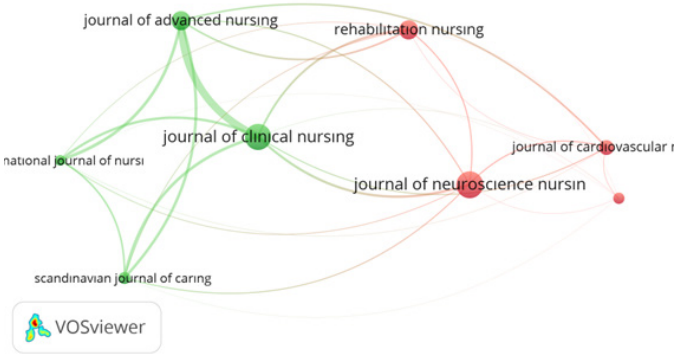

Figure 6. Citation Analysis of the Most Productive Journals.

The distance between two journals in the visualization approximately represents their relationship in terms of co-citation connections. Generally, the closer two journals are, the stronger their relationship is. The strongest co-citation connections between journals are also shown with lines. According to Figure 6, among 169 different journals, collaboration networks representing the strongest connections were visualized as two clusters in green and red, formed by analyzing eight journals with at least 500 citations and 50 publications each. The top three journals with the highest number of publications were Journal of Neuroscience Nursing (n=168), Journal of Clinical Nursing (n=165), and Journal of Advanced Nursing (n=112).

Co-Author Analysis

A total of 6,713 authors from 72 countries contributed to published nursing studies in the field of stroke. The co-authorship analysis of the authors revealed that 57 authors from 6,713 authors each had at least five co-authors.

Figure 7 visualizes author relationships in the studied field. Instead of including all authors, this visualization focuses on those surpassing a specific threshold of connection strength. Using this method, instead of showing the cluster of 57 authors with at least five publications each, seven different authors forming the largest connected element cluster in the network are presented. This methodological choice ensures the identification and focus on the most influential and central authors in the analysis.

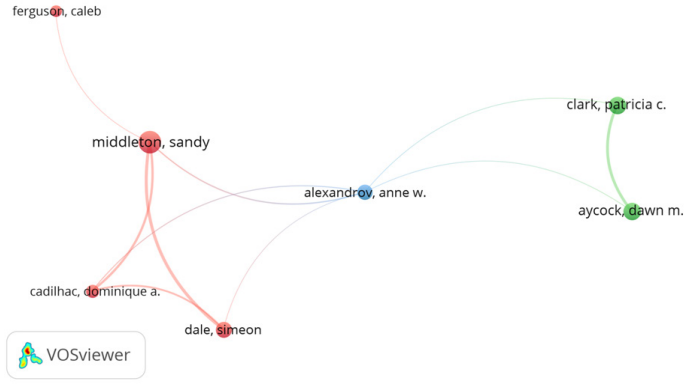

Figure 7. Co-Author Analysis.

Authors with the strongest connections are grouped into three clusters represented by red, green, and blue colors. Authors within the same color cluster share similar themes and demonstrate a co-authorship relationship. The proximity of the circles indicates a co-authorship relationship between authors, while the thickness of the connecting lines reflects the strength of this relationship. Sandy Middleton has been identified as the author with the highest total link strength and possesses strong co-authorship ties. She is in the same color cluster as Dominique Cadilhac, Simeon Dale, and Caleb Ferguson, indicating potential collaboration. A thick line between Sandy Middleton and Simeon Dale shows a stronger relationship between them. Although located in different groups on the network map in Figure 7, some studies reveal co-authorship between Sandy Middleton and Anne Alexandrov.

Author Keywords Co-occurrence Network

Figure 8 shows the co-occurrence network and clusters of author keywords in stroke literature research. This type of analysis visualizes the most frequently used keywords by authors and displays a layered visualization based on these keywords. It also provides a chronological overview of the co-occurrence network of stroke research, illustrating its development over time.

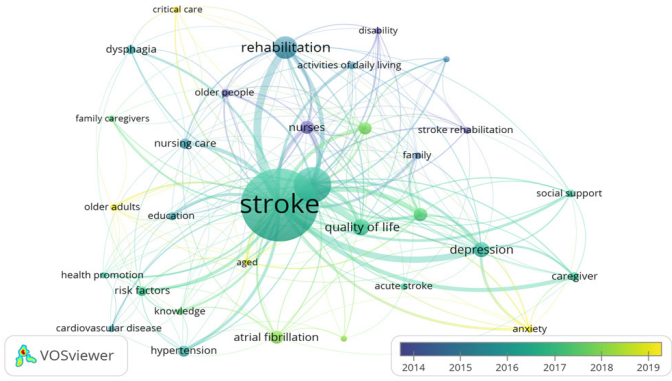

Figure 8. Chronological Overview of the Author Keywords Co-occurrence Network In the 2,440 studies included in the analysis, a total of 3,758 keywords were identified.

The existing networks only display keywords that appear more than twenty times. Instead of showing all 3,758 different keywords, Figure 8 represents the largest connected component consisting of only 32 items. The size of the words in Figure 8 reflects the frequency of keyword usage. The largest keyword is 'stroke' (667 occurrences), followed by 'nurses' (242) and 'rehabilitation' (127) in third place. When examining the chronological use of the most frequently used keywords by authors, those used in earlier periods are visualized in purple, while those from recent periods are shown in yellow. Keywords such as 'disability,' 'nurses,' 'stroke and rehabilitation' were more common in past years. In contrast, keywords like 'critical care,' 'anxiety,' and 'older adults' have become more dominant in recent years. This visual representation of keywords provides insight into the evolution of the field.

Co-Citation Analysis

This type of analysis involves examining the co-citation of referenced sources. Co-citation analysis is a bibliometric method used to reveal the intellectual structure and relationships within scientific literature. In this analysis, the frequency with which two or more publications are cited together by another publication is investigated. The more frequently this relationship is repeated, the stronger the intellectual connection between the two publications is assumed to be.

In Figure 9, among the 52,082 referenced sources, the 47 with at least 20 citations and the highest total link strength were visualized as five clusters colored red, green, blue, yellow, and purple. The sources with the highest citation counts include the article by Mahoney et al. with 95 citations and a total link strength of 116, and the article by Folstein et al. with 49 citations and a total link strength of 49; both of these are located in the blue cluster.[19,20]

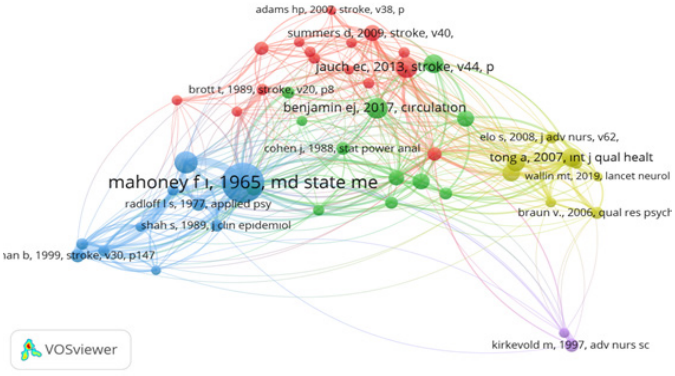

Figure 9. Co-Citation Analysis of Referenced Sources.

DISCUSSION

In this study, a bibliometric analysis of 2,440 nursing articles published in the field of stroke was conducted using the VOSviewer software. Key publications, influential authors, current research topics, and emerging trends were identified. The absence of previous studies in the literature that identify trends in nursing research on stroke, visualize collaborations, and highlight recent developments demonstrates the unique value of this study. In this research, nursing articles published between 1974 and 2024 in the field of "stroke" and indexed in the WoSCC database were examined through descriptive and bibliometric analyses. It is anticipated that this study will provide researchers, healthcare professionals, and institutions with valuable information regarding the most productive authors, countries, and institutions in the field of stroke-related nursing research. Consequently, it will offer insights into emerging research trends, potential collaborations, the most commonly used journals in this area, and the most frequently cited sources. Furthermore, this study is expected to shed light on existing gaps in stroke research and thereby contribute to the expansion and deepening of the current literature in this field.

The findings of the bibliometric analysis indicate a significant increase in the number of articles published in this field since 2005. This trend continued into 2021, with the highest number of articles being published in that year. The increasing number of studies in this field is expected to contribute to the development of a comprehensive body of literature. Furthermore, our analysis shows a marked decline in the number of studies conducted in 2022. It is estimated that this decrease is likely related to the COVID-19 pandemic period. As is known, during the pandemic, communication restrictions were experienced between healthcare workers and patients due to isolation measures. In addition, patients encountered difficulties in accessing healthcare facilities and services. A significant decrease in the number of admissions to stroke centers has also been reported.[21] Today, the number of individuals diagnosed with stroke continues to rise each year. In this context, nursing studies in the field of stroke are expected to remain an important area of focus in the future.[1,2]

The stroke-related articles reviewed were produced by 6,713 researcher-authors affiliated with 2,368 institutions across 72 countries and were published in 169 different journals. Examining the countries, authors, or journals with the highest number of publications related to the topic provides insight into their productivity. The country, institution, author, or journal with the highest number of publications is considered the most productive.[12,13] In our study, in terms of countries/regions with the most publications on nursing and stroke, the majority of articles originated from the United States, the People's Republic of China, and Australia, which is strongly associated with the economic development of these countries. Additionally, the healthcare budget may be an important factor. According to the analysis in this study, the United States was identified as the most productive and collaborative country in nursing research on stroke. According to current data, in 2022, stroke was responsible for one in every six deaths caused by cardiovascular disease in the US. In the US, stroke is one of the leading causes of long-term severe disability, particularly by reducing mobility in more than half of patients aged 65 and older. Accordingly, the United States is among the countries with the highest care burden due to stroke. To address this issue, the U.S. ad-

vocates for the use of individual behavior change interventions and provides substantial support to researchers in this field. Furthermore, numerous funds and programs support stroke-related research in the United States. The Centers for Disease Control and Prevention actively works to reduce stroke-related deaths and disabilities through national initiatives and programs.[22] Considering all these factors and the country's available resources, it is not surprising that the U.S. has the highest number of publications and collaborations.

In our study, Karolinska Institute, the University of Pittsburgh, and Duke University were identified as the most productive institutions in terms of both the number of publications and citations (Figure 5). Karolinska Institute, which ranked first with 32 publications and 335 citations, is a research-oriented medical university located in Stockholm, Sweden, and is one of the world's leading medical research institutes. Similarly, the University of Pittsburgh, located in the Americas, ranked second with 28 publications and 334 citations. In third place is Duke University, located in the United Kingdom, with 24 publications and 191 citations. Based on these data, these institutions are considered to be more influential in stroke research within the field of nursing.
In our study, the majority of nursing publications on stroke were published in journals such as the Journal of Neuroscience Nursing, Journal of Clinical Nursing, and Journal of Advanced Nursing (Figure 6). Analyzing the journals that publish the most articles on stroke and nursing provides insight into their productivity. In academic literature, journals with high impact factors are generally considered more significant and authoritative. Therefore, it is recommended that researchers, healthcare professionals, and institutions examine these journals to gain insight into the themes and research trends in this field, with the aim of developing a robust evidence base for stroke-related nursing studies. In addition to the findings of country and institution analyses, the publishers of these high-volume journals are also largely centralized in the Americas and Europe.

Our study revealed that the United States is the most productive and collaborative country in terms of country, institution, and journal network analyses. Additionally, it was found that there are 29 studies conducted in our country in this field and collaborations have been established with ten different countries. These results may be attributed to the economic, technological, and educational advantages of these countries, as well as the financial resources they allocate to support research activities. In line with these findings, it is recommended that researchers from developing countries enhance their collaborations with researchers from developed countries in future studies.

The researcher collaboration process can be defined as the act of sharing knowledge, ideas, and resources, which facilitates the development of new concepts and the emergence of new research areas, thereby increasing research productivity.[12,13] In the author collaboration network analysis, it was determined that 53 authors, representing 0.8% of the 6,713 authors and having at least five publications, have stronger connections with each other. Ercole Vellone, with 219 citations, 10 publications, and a total link strength of 150, ranks as the top author. Rosaria Alvaro, with 129 citations and 10 publications, holds the second highest rank. Silvio Simeone ranks third with 217 citations and 9 documents, while Gianluca Pucciarelli is in fourth place with 189 citations and 9 documents (Figures 2 and 7). Authors with the highest total link strength in the field of stroke research, such as Ercole Vellone, Rosaria Alvaro, Silvio Simeone, and Gianluca Pucciarelli, have a history of co-authoring research articles. The institution to which these researchers are affiliated, the University of Rome Tor Vergata, ranks fifteenth in terms of total link strength among 48 institutions with at least 10 publications and at least 100 citations, out of 2,368 institutions publishing on stroke in the field of nursing, with a total of 2,440 stroke-related publications.[23]

A quantitative analysis of the number of articles and citations of authors in the field of stroke nursing reveals that Sandy Middleton is the author with the highest number of publications, indicating that she is the most prolific author. Additionally, the number of citations her publications have received is also noteworthy (Table 3 and Figure 7). Sandy Middleton is a leading researcher who has received the "Article of the Year" award.[24] Sandy Middleton, Dominique Cadilhac, Simeon Dale, and Caleb Ferguson are in the same color cluster, indicating that they are engaged in similar themes and may share a co-authorship relationship. Caleb Ferguson's research focuses on atrial fibrillation, stroke prevention, and healthcare improvement. He has contributed to national clinical practice guidelines, including those of the National Heart Foundation of Australia, the Cardiac Society of Australia and New Zealand, and the Stroke Foundation.[25] The thickest line between Sandy Middleton and Simeon Dale indicates a closer relationship between them compared to other authors. Although Sandy Middleton and Anne Alexandrov are in different clusters, the network map shown in Figure 7 indicates that they have co-authored some studies.[26] In Türkiye, notable authors contributing to the field of stroke include Tülek et al., Yılmaz et al., Küçükakgün et al., Şahbaz and Medin-Ceylan, Çekici and Yurttaş, Küçükakgün and Atay, Bal and Koç, Avcı and Gözüm, and Kalav et al.[6,9,10,27-32] It is recommended that nurse researchers working in the field of stroke follow the studies of these authors.

In our study, a total of 3,758 distinct keywords were identified. The keyword network analysis indicates that, between the years 1974 and 2024, the largest node was formed by the keyword "stroke," followed by "nursing" and "rehabilitation." The size of the node indicates the number of connections. As Van Eck and Waltman (2010) pointed out, mapping and clustering reinforce each other.16 Figure 8 presents the evolution of authors' keywords over time. Along with other visual networks, this provides insight into the evolution of the field. In the field of stroke research, it can be concluded that the terms critical care, anxiety, and older adults have been increasingly used.

In academic research, co-citation analysis examines two authors and their studies to establish connections between subjects. It identifies relevant and significant works.[12,13,16] By embodying the invisible intellectual relationships and interactions in the scientific literature, co-citation analysis is an indispensable tool for gaining an in-depth understanding of the dynamics, key components, and developmental trajectory of a research field. In co-citation analyses, if a study is frequently cited together with other studies, it can be considered significant.[19,20,33] In Figure 9, the study by Mahoney et al. (1965) on the Barthel Index, which appears in the blue cluster, has the highest number of citations and link strength because it introduced an important index for measuring independence in rehabilitation.[19] The Barthel Index has been extensively examined for its reliability and validity.[34]

The second most frequently cited reference in the blue cluster is the study by Folstein et al.[20] The Mini-Mental State Examination (MMSE), introduced by Folstein and colleagues, is a fundamental tool in neurology and psychiatry. It is commonly used to assess cognitive function in the elderly.[35,36] With a total link strength of 45 and 46 citations, the most frequently cited article in the red cluster is the study by Jauch et al. This study provides guidance on the early treatment of patients with acute ischemic stroke. It was published as a guideline for healthcare professionals by the American Heart Association/American Stroke Association.[37] In the green cluster, the most cited article is the one by Benjamin et al., which has a total link strength of 41 and 46 citations. This article is a report prepared by the American Heart Association and presents data on heart disease and stroke statistics.[33] These studies are of great importance in the field of stroke and are considered to have significantly influenced the literature.[33,34,37] The frequent co-citation of the Barthel Index and the Mini-Mental State Examination in stroke-related analyses highlights how critical it is to address a patient's physical independence and cognitive status as an inseparable whole in post-stroke care and research. These two measures are considered essential tools for comprehensively evaluating the overall condition of stroke patients and developing individualized rehabilitation strategies.

Study Limitations

Some limitations of the study can be listed as follows. Given that the literature was obtained solely from the Web of Science database, it is possible that some relevant publications may have been overlooked. Additionally, since only articles were included in the analysis, certain important perspectives might have been missed. The inclusion of only English-language publications may also limit the generalizability of the study. For these reasons, further bibliometric analyses are needed to examine nursing publications on stroke from different databases. Moreover, the findings of this study are limited to the time at which the literature search was conducted. If a similar study were conducted at a different time, the results in terms of publication and citation numbers might vary.

CONCLUSION

In this research study, a bibliometric analysis was conducted to examine published studies related to nursing research in the field of stroke. The analysis was carried out on publications indexed in the Web of Science database between the years 1974 and 2024. It revealed several important findings, including the identification of the most productive authors, countries, journals, institutions, and keywords in this field. The analysis showed that a total of 6,713 researchers from 2,368 institutions in 72 countries contributed to the articles examined. The United States was identified as the country with the highest number of published articles. From an institutional perspective, Karolinska Institute, the University of Pittsburgh, and Duke University were found to be the leading institutions in terms of both publication volume and citation impact. The study also identified 169 different journals that published nursing articles on stroke, with the Journal of Neuroscience Nursing having the highest publication volume. This research highlights international collaboration and emphasizes the institutions and journals that have made significant contributions to nursing studies on stroke.

Ethics Committee Approval: This study is a descriptive and retrospective bibliometric analysis based on data retrieved from the Web of Science Core Collection database. Since the study does not involve human or animal subjects and does not include personal or sensitive data, ethical committee approval was not required in accordance with institutional and national research ethics guidelines.

Informed Consent: Not applicable, as the study did not involve human participants.

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept - Ş.A., A.Y.K.; Design - Ş.A., A.Y.K.; Supervision - Ş.A., A.Y.K.; Resources - Ş.A., A.Y.K.; Materials - Ş.A., A.Y.K.; Data Collection and/or Processing - Ş.A., A.Y.K.; Analysis and/or Interpretation - Ş.A., A.Y.K.; Literature Search - Ş.A., A.Y.K.; Writing Manuscript - Ş.A., A.Y.K.; Critical Review - Ş.A., A.Y.K.

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