

# Picture of multiple sclerosis studies in nursing: A bibliometric study

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## ABSTRACT

**Objectives:** This study aimed to bibliometrically examine nursing publications regarding multiple sclerosis.

**Materials and methods:** This bibliometric study was carried out with 405 articles published in the Web of Science database between January 1980 and January 2023, identified with the English keywords “multiple sclerosis” and “nursing.”

**Results:** The average publication age of the studies was 10.8 years, and the annual increase rate was 3.74%. The most active (48.6%) country was the USA, and the nursing journal with the most publications (18.5%) was the Journal of Neuroscience Nursing. “Fatigue” was the most frequently used theme, “women” and “sexuality” were the motor themes, “caregiver” and “palliative care” were developed but isolated themes, and “mental health” and “adolescence” were emerging or declining themes.

**Conclusion:** This bibliometric analysis provided a comprehensive overview of the state of multiple sclerosis research in nursing over 42 years. The number of studies was limited, the average age was small, and the annual growth rate was low. The studies focused on fatigue, and the topics that need more research were demonstrated. The results of the study can guide nurses in future multiple sclerosis studies.

**Keywords:** Bibliometric analysis, multiple sclerosis, nursing.

Multiple sclerosis (MS) is an inflammatory demyelinating and neurodegenerative disease of the central nervous system with increasing frequency and prevalence that affects 2.8 million people worldwide.<sup>[1,2]</sup> While its etiology continues to be investigated, several genetic and environmental factors are known to play a role in its pathogenesis.<sup>[3,4]</sup> It is emphasized that this chronic and progressive disease, the leading cause of nontraumatic neurological disability in young adults, occurs frequently in the 20 to 40 age group, the most productive period of life.<sup>[1,2]</sup> Multiple sclerosis negatively affects individuals in many areas (psychological, sociocultural, and economic) with fatigue, sensory complaints such as burning, tingling, pain, and numbness in extremities, motor complaints such as loss of strength, deterioration in muscle tone, bladder and bowel disorders, vision

problems, depression, and emotional fluctuation.<sup>[5]</sup> It also presents with cognitive challenges<sup>[6]</sup> and reduces the quality of life.<sup>[2]</sup>

The fact that MS affects individuals' lives in a multidimensional way creates the need for lifelong support and management.<sup>[7]</sup> This situation highlights the necessity of a multidisciplinary approach in managing the disease and improving health. The nurses in this team are an important cornerstone,<sup>[8]</sup> as ensuring continuity in care provides a deeper understanding of the needs of these individuals,<sup>[8]</sup> supports the stability and recovery of the disease, reduces relapses, delays the progression of the disease, and improves the quality of life.<sup>[9]</sup> However, rapid developments in the diagnosis and treatment of MS have affected the nursing profession, and the nurse's roles such as advocacy, education, research, consultancy, and medication management have

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**Received:** January 08, 2024 **Accepted:** September 18, 2024 **Published online:** December 20, 2024

**Cite this article as:** Uslu E, Yıldırım N. Picture of multiple sclerosis studies in nursing: A bibliometric study. Turk J Neurol 2024;30(4):244-253. doi: 10.55697/tnd.2024.15.



become more complex.<sup>[3]</sup> This situation requires nurses to be aware of field-specific studies and to update themselves in the face of rapidly increasing and changing information.

The advances in genetics, molecular medicine, pathology, and imaging systems have encouraged researchers around the world to publish a large number of articles, aiming to better understand the etiology, clinical picture, diagnosis, and treatment and care processes of MS.<sup>[10]</sup> This increasing interest in MS research makes it necessary to determine the extent of the relevant literature to demonstrate the current state of the field and to be able to identify new research areas.<sup>[11]</sup> Bibliometric analyses emerge as an opportunity in this context.<sup>[12]</sup>

Bibliometric analysis is a popular and rigorous method for exploring and analyzing large volumes of scientific data. These analyses are powerful statistical tools that light the way for researchers.<sup>[12]</sup> The contributions of the research components in the bibliometric analysis process are the subject of performance analysis, while the connections between the components are the subject of scientific mapping.<sup>[11]</sup> These analyses allow the exploration of article and journal performances, research trends, and the intellectual structure specific to a particular field in the current literature. It enables researchers and clinicians to unpack the evolutionary nuances of a specific field while shedding light on the emerging areas in that field. Such assessments are also essential for countries and universities to produce science-based policies.<sup>[12]</sup> However, its application in MS and nursing research is limited.<sup>[13]</sup>

Considering that MS leads to many multidimensional difficulties with possible effects on the quality of life, that nurses have an important role in the management of these difficulties, and that studies in this field are updated rapidly, we believe that a bibliometric study on MS and nursing research would contribute to the literature in keeping up with the information about the field and in transferring the knowledge into practice. Hence, this study aimed to demonstrate the quantitative and content features of MS publications in the field of nursing from a bibliometric perspective. In this context, the study examined the quantitative features of field-specific publications, the issues guiding the field, the issues that continue to develop in the field, the issues that have developed in the field but remained isolated, and the emerging or declining issues in the field.

## MATERIALS AND METHODS

This bibliometric study was conducted in accordance with the guidelines of Donthu et al.<sup>[12]</sup> with the four suggested steps: (i) defining the purpose and scope of the bibliometric study; (ii) selecting the most appropriate bibliometric analysis; (iii) collecting data for bibliometric analysis; (iv) performing the bibliometric analysis and writing down the findings. Ethics committee approval was not obtained because this study did not have a direct impact on humans and/or animals and secondary data was used. The study was conducted in accordance with the principles of the Declaration of Helsinki.

### Data collection

The study was carried out with publications on MS in nursing published in the Web of Science (WoS) database between January 1980 and January 2023, retrieved with the keywords “multiple sclerosis” and “nursing.” This search yielded 483 MS publications in the field of nursing. Studies published as research or review articles in English were included. The exclusion criteria included letters to the editor, book/book chapters, and congress papers as publication type and studies in languages other than English. The study was conducted with 405 publications that met the inclusion criteria. Studies were excluded (n=78) because 15 were published in languages other than English (Turkish, n=7; Portuguese, n=3; Spanish, n=2; Korean, n=1; Italian, n=1; French, n=1), 44 were not research articles or reviews (editorial materials, n=26; news items, n=12; book chapters, n=5; letters to the editor, n=1), 10 were abstracts, two were early access papers, and seven were duplicate publications.

In selecting the publications, all bibliographic data obtained from the WoS database were downloaded in BibTeX format first, uploaded to the Biblioshiny application, and converted into bibliometric data. At this stage, the studies were examined in terms of publication type and publication language, and those that did not meet the inclusion criteria were excluded. The bibliometric data file was exported in Excel format. At this stage, repetitive data were identified and removed, and the data set was finalized. The final version of the data set was then reloaded into the program, synonyms were combined (multiple sclerosis=multiple, sclerosis, MS; qualitative study=qualitative research; nursing=nurses; adolescence=adolescent; quality of life=quality of, life; caregiver=caregivers), and the analysis process was initiated. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)

flowchart showing the publication selection process is presented in Figure 1.

**Data analysis**

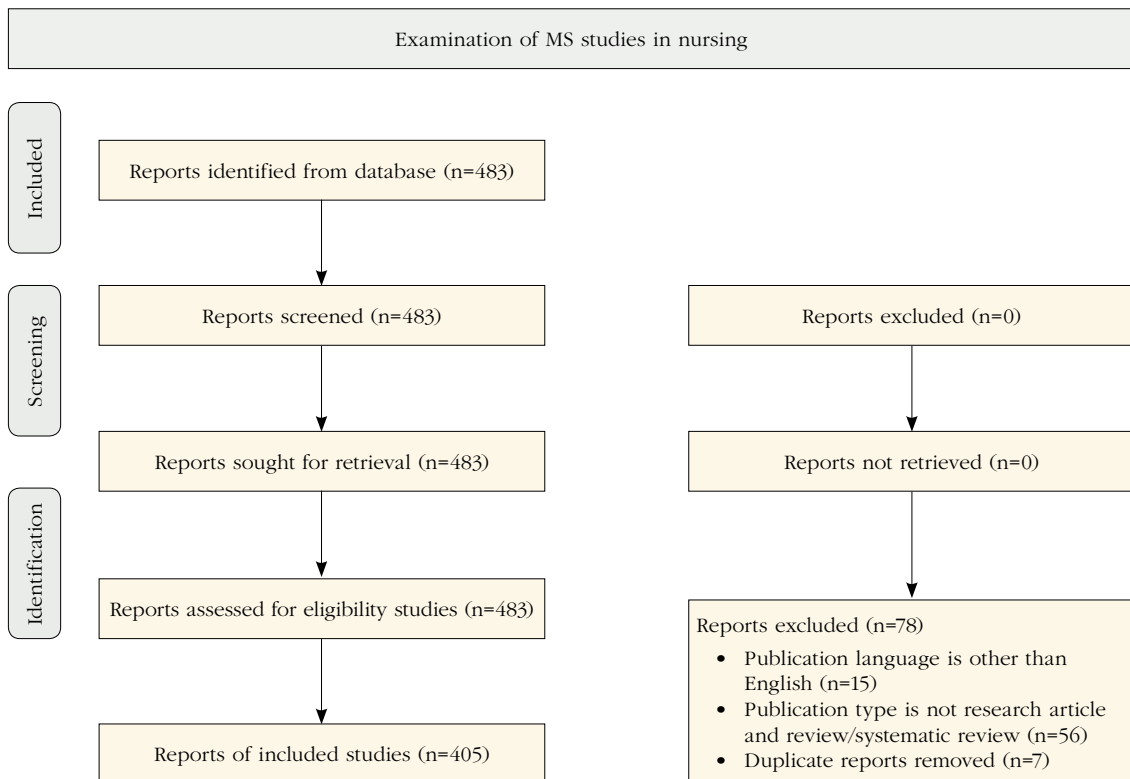
The Bibliometrix tool of the open-access R version 4.2.2 (R Foundation for Statistical Computing, Vienna, Austria) was used during the research. The R programming language is designed specifically for statistical calculations. The R package and the Bibliometrix tool are recommended for performing comprehensive scientific mapping analyses.<sup>[14]</sup> In this study, analyses were reported and visualized with the Biblioshiny interface in the Bibliometrix tool. During the analysis of the data, the relevant information was discussed under three main headings: basic information, word cloud and thematic map.

Basic information included information about the content, years, authors, sources, and citations of the relevant publications. Analyses of the data were presented as frequency, percentage, or proportional values (Table 1).

Word cloud summarized the topic by reducing a data set to the most frequently encountered words, thus providing a general idea about the topic and visualizing the data set. Words were rated

according to their frequency in the dataset, with the more frequently used words being represented in a larger font, highlighted in different colors. The size of the words in the word cloud highlighted the trends in that field.<sup>[15]</sup> In the analysis of the word cloud in this study, “author's keywords” were used, and the first 50 frequently used keywords were included in the cloud. The findings were presented in the text as frequency and percentage (Figure 2).

A thematic map was used to describe the view of researchers in a certain field, key themes, and patterns. This map also revealed valuable information about the conceptual and intellectual structure of that field.<sup>[16]</sup> Each node on the map represented a network cluster. Words in the node indicated words with higher network occurrence values. Node size was proportional to cluster word occurrence frequency. Node location was based on the cluster centrality and density.<sup>[17]</sup> Two hundred fifty author’s keywords and fast greedy algorithm were used for thematic analysis. The minimum cluster frequency was five, and the number of levels for each cluster was one to three (Figure 3).



**Figure 1.** Article selection process.

**TABLE 1**  
Key information on the publications

Key information	Results	%
Data		
Documents	405	–
Time range of publications	1980-2022	–
Average age of publication	10.8	–
Annual growth rate of publications	–	3.82
Authors		
Number of authors	1064	–
Author collaboration		
Co-author per document	3.23	–
International co-authorship	–	8.8
Publication type		
Research paper	379	93.6
Review	26	6.4
Publication content		
Number of keywords used in publications	945	–
Number of sources used in publications	13091	–
The top five country of most effective corresponding authors		
United States of America	197	48.6
Türkiye	30	7.40
England	25	6.17
Australia	24	5.9
Iran	23	5.6
The top five journals with the most publications on the subject		
Journal of Neuroscience Nursing	75	18.5
Journal of Advanced Nursing	31	7.6
Journal of Clinical Nursing	29	7.1
Nursing Research	16	3.9
Rehabilitation Nursing	16	3.9

Nodes were sized based on the number of publications in which the keyword appeared. Dotted lines divided the map into four quadrants based on centrality and density. A thematic map defined four theme typologies based on the quarter in which they were placed. These were motor themes, basic themes, niche themes, and emerging or declining themes.<sup>[16,17]</sup>

- Centrality was a measure of the theme's relevance. It demonstrated the relationship and external harmony of a subject with others. The stronger the centrality, the more important the subject was to the field.
- Density was a measure of how the theme developed. It revealed the inner strength and

inner harmony of a subject. Higher density indicated a more coherent and integrated subject.

- Motor themes were the themes in the upper right quadrant. They were characterized by high centrality and high density and considered to be developed and vital themes for the research field. These well-developed themes had strong internal and external bonds.
- Basic themes were the themes in the lower right quadrant. They were characterized by high centrality and low density. They indicated the themes that continued to evolve for the research area, exhibiting

well-developed external bonds and minor internal bonds.

- Niche themes were the themes in the upper left quadrant. They were characterized by low centrality and high density and indicated that the research area contained developed but isolated themes. They exhibited weak external bonds and strong internal bonds.
- Emerging or declining themes were the themes in the lower left quadrant. They were characterized by low centrality and low density and were considered emerging or declining themes for the research field. They had weak internal and external bonds. These themes referred to the changing importance and popularity of a topic over time and helped researchers understand trends in the literature. Declining of a subject may indicate that the topic is no longer adequately researched and its popularity is decreasing. The emergence of a topic may be an indication that that topic is now attracting more attention.

#### Validity and reliability

To conduct the study appropriately, a bibliometric analysis guide<sup>[12]</sup> and PRISMA steps were used to clearly express the publication selection process.<sup>[18]</sup> Furthermore, random publications were selected from the dataset to evaluate whether they were suitable for the purpose of the study.

## RESULTS

The average age of publication was 10.8 years. The annual increase rate of publications was 3.74%. A total of 1,055 authors wrote 379 studies (n=379) and 26 review or systematic reviews in the field, with an average of 17.56 citations for each publication (Table 1).

The most active country among the countries of the authors of nursing publications on MS was the USA (48.6%), followed by Türkiye with 29 (7.4%) publications. The Journal of Neuroscience Nursing was the nursing journal with the most publications on MS with 75 (18.5%) publications, followed by the Journal of Advanced Nursing with 31 (7.6%) publications (Table 1).

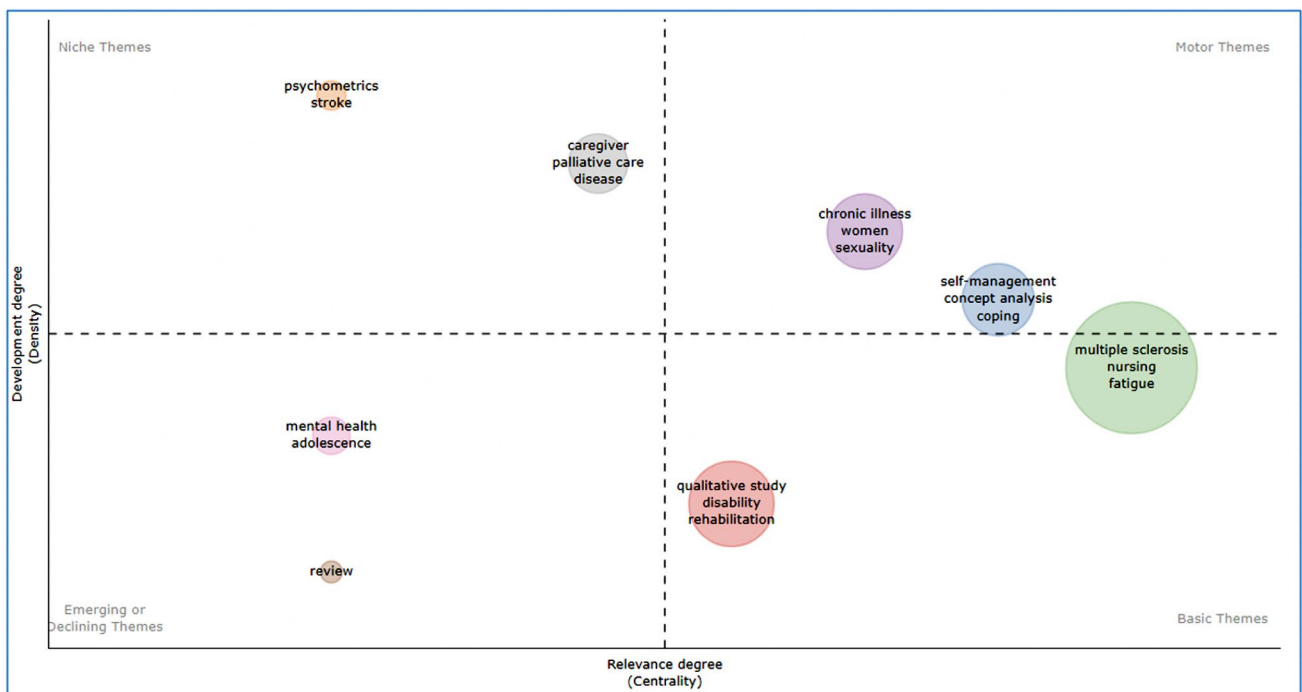
In the word cloud showing the keywords used by the authors, the prominent keywords were “multiple sclerosis” (n=190, 29%), “nursing” (n=73, 11%), and “fatigue” (n=55, 8%), followed by “quality of life” (n=28, 4%), “chronic illness” (n=16, 2%), “depression” (n=16, 2%), “qualitative study” (n=16, 2%), and “disability” (n=13, 2%; Figure 2).

According to the thematic map of author's keywords (Figure 3), the keywords within the nodes were the network clusters with the highest cooccurrences among themselves in publications. Accordingly, “multiple sclerosis,” “nursing,” and “fatigue” was the cluster with the highest cooccurrence and the highest centrality. Although



Figure 2. Author's keywords word cloud.





**Figure 3.** Author's keywords thematic map.

a significant portion of this cluster was in the field of basic themes, there was also a part in the motor themes. Another significant portion of the nodes was in the motor themes area. These clusters in the motor theme area were the most studied topics and orienting themes. The motor themes section included the keywords “women” and “sexuality,” as well as “self-management” and “coping,” while the keywords “stroke,” “caregiver,” and “palliative care” were niche themes indicating a developed but isolated work field. The theme “mental health” and “adolescents” was among the emerging or declining themes of the field.

## DISCUSSION

The results of the quantitative features revealed that publications on MS in nursing had a history of 42 years, the number of studies was limited, the average age was small, the annual growth rate was low, the most influential country was the USA, and the most influential journal was Journal of Neuroscience Nursing. Content feature results indicated that studies mostly focused on “fatigue,” studies on “women” and “sexuality” were developed, studies on “caregiver” and “palliative” themes were developed but isolated, and studies on “mental health” and “adolescent” themes were declining or emerging.

## Quantitative features of the studies

In this study, it was noteworthy that studies on MS and nursing research began to emerge in 1980. It is mentioned that there has been a significant increase of 79.3% in the number of articles published about MS in the past two decades.<sup>[19]</sup> A previous bibliometric study demonstrated that scientific studies on MS had a growth rate of 82.18% from 2003 to 2012.<sup>[20]</sup> On the other hand, in our study, the annual growth rate of the relevant nursing literature was 4%. Similar to Yang et al.'s<sup>[13]</sup> study, the most effective country was the USA in our study as well. Unlike Yang et al.'s study,<sup>[13]</sup> Türkiye and Iran were among the top five countries in our study. This could be related to the study's inclusion criteria or the growth rate of the field. The rate of increase in MS studies in the field of nursing also varied considerably between countries. The number of publications in the USA was about seven times more than Türkiye, the closest country after the USA. Another study stated that the number of MS articles in the nursing field published in the USA was significantly higher than in other countries/regions, accounting for 44.97% of the global total.<sup>[13]</sup> Socioeconomic status is a key factor in research productivity, as well as population size. Countries with rapidly growing economies are expected to invest more in research

and thus significantly contribute to the growth of MS research.<sup>[21]</sup> This result also points out the importance of cooperation between countries as well as the topics that researchers should focus on by each country. In fact, it has been emphasized that collaborative research positively affects the research process and results. It also has increasing popularity, affects the research process and results positively, and is actively supported by related institutions.<sup>[22]</sup> When we evaluated the results from Türkiye's perspective, the lack of specialization in the field of nursing in MS in Türkiye and the fact that the studies were carried out by volunteer researcher nurses and clinician nurses interested in MS may have limited the number of studies. This study also showed that MS publications were more frequently published in the Journal of Neuroscience Nursing. The fact that MS is a neurological disease may have contributed to this choice, and it can be considered an expected result. It is noteworthy that the other journals in the ranking are journals based on nursing practices. In addition, there are currently no relevant nursing journals in Türkiye that can enter the field of international research in MS or neurology. Therefore, nurses should pay more attention to the results of these leading journals to guide MS nursing research.

### **Content features of the studies**

Researchers use keywords to generate new knowledge, expand the boundaries of knowledge, and explain the main topics they focus on in their articles. These words emphasize the essence of a research paper.<sup>[15]</sup> The word cloud, on the other hand, presents the analysis of the dataset by using these keywords on the basis of an image to provide a general idea about the topic. The thematic map is another way to analyze and visualize the research areas of an academic subject. Such maps reveal analytical visualizations of interactions between scientific concepts, making it possible to analyze and interpret large data sets.<sup>[23]</sup> Therefore, both a word cloud and a thematic map specific to MS and nursing research were created in the study. Both maps indicated that the nursing literature on MS focused more on fatigue. It was also stated that the number of studies on fatigue continued to increase.<sup>[19]</sup> The fact that fatigue is frequently described (38 to 83%) as one of the most disabling symptoms by individuals with MS<sup>[24,25]</sup> may have had an effect on the result. The limited efficacy of treatment options for fatigue in MS despite the high prevalence<sup>[26]</sup> and the fact that fatigue is a nursing diagnosis<sup>[27]</sup> with nurses having an active

role in its management may have led to this topic being studied extensively in the field of nursing. The fact that the fatigue theme is largely contained in the main themes is also proof that the subject continues to develop. Additionally, rehabilitation, which was identified as an area neglected by MS research in the past,<sup>[28]</sup> was among the basic themes. This increased awareness among researchers may have an impact on the quality of life of individuals diagnosed with MS.

Considering the knowledge that women are twice as likely to be diagnosed with MS than men globally,<sup>[1]</sup> it was an expected result that the keyword "women" would be a motor theme in the thematic map. Only 15% of MS professionals stated that they took the sexuality of an individual with MS into consideration, and a significant majority of them believed it to be a boundary violation and that they needed more information on this subject.<sup>[29]</sup> Therefore, they had difficulty in assessing sexuality.<sup>[29]</sup> This topic was among motor themes, which was a notable result of the study. However, the prevalence of sexual dysfunction in women with MS is between 40-80% and in men it is between 50-90%.<sup>[30]</sup> With the key role nurses have in the management of sexual health problems, holistic care practices may contribute to the expression of the sexual problems of the individual with MS.<sup>[31]</sup> In addition, although the thematic map indicated the existence of studies on female sexuality, our study demonstrated the need for further research on sexuality in men with MS.

It was reported that depression was two to five times, anxiety disorders three times, and psychotic disorders two to three times more common in individuals with MS compared to the general population, with adjustment disorder, bipolar disorder, and suicidal ideation also being more common in this population.<sup>[32]</sup> A study examining MS research on a global level showed that there was an increase in studies on depression.<sup>[19]</sup> Although mental health problems are among the factors that can negatively affect the course of MS,<sup>[33]</sup> we observed that the mental health of individuals with MS was a declining or emerging theme in nursing research. Its status as a declining theme would be alarming, while its emergence as a theme would be promising for individuals with MS. In both cases, more attention is needed on the psychosocial care of individuals with MS. A relevant study suggested that "invisible disability" might be more important to the well-being of individuals with MS than physical disability, challenging the

idea that physical disability should be the primary outcome measure of MS.<sup>[34]</sup>

Adolescence was another declining or emerging theme. Given that MS onset is often during young adulthood, which is a highly productive phase of life to build families and careers,<sup>[1]</sup> this was another remarkable result of the study. Since adolescence and young adulthood are closely related periods, the fact that studies on the subject mostly covered young adults may have led to the decline of the adolescent theme. Contrarily, it may be an emerging theme, as developments in MS allow the diagnosis of MS to be made at an early age. The literature on new topics with MS is expected to more than double in the next decade.<sup>[11]</sup> At this point, bibliometric analyses to be planned in the future will reveal clearer information on this subject.

This study showed that “caregiver,” “palliative care,” and “stroke” were developed but isolated themes of the field. Despite the advances in the field, MS continues to be a life-limiting disease that negatively affects the lives of patients and their families due to its symptoms.<sup>[35]</sup> Patients with severe, progressive MS often have complex physical and psychosocial needs for several years. Few treatment options are available to prevent or delay further clinical deterioration in this population. Therefore, more research is needed on the integration of palliative care and MS care.<sup>[36]</sup> It was shown that the frequency of care and the involvement of family members in care increased with the increasing disability levels of individuals with MS, meaning that caregivers had to assume psychosocial, practical, and economic burdens.<sup>[37]</sup> It was emphasized that studies on the roles of caregivers were limited despite the critical importance of the subject.<sup>[38]</sup> This supported the result of our study and underlined the need to focus more on this isolated theme.

Finally, our study also presented some results regarding thematic map research designs. Accordingly, reviews were emerging or declining research designs, qualitative research continued to develop, and concept analysis was a research design with completed development. In a bibliometric study, it was emphasized that a small portion of MS publications (11.76%) consisted of review articles.<sup>[13]</sup> Considering the limitations and dates of MS and nursing publications, field-specific reviews appear to be emerging themes. The qualitative research design provides a deeper understanding of the sociocultural perspectives and impacts of MS, surpassing mere biological or quantitative comprehension. This is because

qualitative research delves into the intricate and multifaceted experiences of individuals, offering insights beyond predetermined expectations of researchers.<sup>[39]</sup> Moreover, using concept analysis in MS research can provide essential information regarding performance and care planning for the diseases.<sup>[40]</sup>

This study had some limitations. First, the results were limited to the time of the literature review. Reviews during different time periods may have yielded different research results. The second limitation was that only the studies included in the WoS index were analyzed since the literature search was carried out in the WoS database. Third, the survey only included journals in the nursing category. Nursing studies in different categories may not have been included in the study. The fourth limitation of the study was that only published researches and reviews were considered so that the bibliometric analysis program could reach all the data it required in the dataset. Finally, the search only included studies published in English since the selected keywords were in English. Keyword choices in other languages may have yielded different results. Nevertheless, this study had some strengths. Only one article was found evaluating MS studies in the field of nursing.<sup>[13]</sup> In the relevant article, issues such as countries, institutions, author distribution, journal impact factors, and keyword distribution regarding MS studies in the field of nursing were discussed. In our study, information about the content of the articles was included, as well as quantitative data. To the best of the researchers' knowledge, this information revealed through the thematic map was evaluated for the first time.

In conclusion, significant results were demonstrated as a result of the bibliometric analysis of the nursing literature on individuals with MS. The number of publications on the subject tended to increase over time but the annual growth rate was still low, and the countries in which the studies were conducted and the journals in which they were published were clustered. In MS and nursing-themed studies, the subject content was focused on fatigue. Caregiver and palliative issues, as well as women and sexuality, were developed but isolated themes. Mental health and adolescence were declining or emerging subjects. These results indicated that the number of MS and nursing-themed publications should increase globally, and cooperation between countries and authors should be strengthened.



Furthermore, subjects that need further studying should be highlighted. Consideration of our results in future studies could positively contribute to the advancement of the scientific literature.

**Data Sharing Statement:** The data that support the findings of this study are available from the corresponding author upon reasonable request.

**Author Contributions:** Concept, literature search, writing: E.U., N.Y.; Design, data collection or processing, analysis or Interpretation: E.U.

**Conflict of Interest:** The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

**Funding:** The authors received no financial support for the research and/or authorship of this article.

## REFERENCES

- Walton C, King R, Rechtman L, Kaye W, Leray E, Marrie RA, et al. Rising prevalence of multiple sclerosis worldwide: Insights from the Atlas of MS, third edition. *Mult Scler* 2020;26:1816-21. doi: 10.1177/1352458520970841.
- Newland P, Basan Y, Chen L, Wu G. Depression and inflammatory markers in veterans with multiple sclerosis. *Biol Res Nurs* 2022;24:123-7. doi: 10.1177/10998004211050082.
- Brodkey MB, Ben-Zacharia AB, Reardon JD. Living well with multiple sclerosis. *Am J Nurs* 2011;40-48. doi: 10.1097/01.NAJ.0000399314.36526.f4.
- Hauser SL, Cree BAC. Treatment of multiple sclerosis: A review. *Am J Med* 2020;133:1380-90.e2. doi: 10.1016/j.amjmed.2020.05.049.
- Homayouni A, Vasli P, Estebsari F, Nasiri M. Reducing care burden and improving adherence to health-promoting behaviors among family caregivers of patients with multiple sclerosis through a healthy lifestyle empowerment program. *BMC Nurs* 2022;21:229. doi: 10.1186/s12912-022-00961-8.
- Maloni H. Cognitive impairment in multiple sclerosis. *J Nurse Pract* 2018;14:172-177. doi: 10.1016/S1474-4422(08)70259-X.
- Dobson R, Giovannoni G. Multiple sclerosis - a review. *Eur J Neurol* 2019;26:27-40. doi: 10.1111/ene.13819.
- Witzig-Brändli V, Lange C, Gschwend S, Kohler M. "I would stress less if I knew that the nurse is taking care of it": Multiple Sclerosis inpatients' and health care professionals' views of their nursing-experience and nursing consultation in rehabilitation-a qualitative study. *BMC Nurs* 2022;21:232. doi: 10.1186/s12912-022-01013-x.
- Porter B, Keenan E. Nursing at a specialist diagnostic clinic for multiple sclerosis. *Br J Nurs* 2003;12:652-6. doi: 10.12968/bjon.2003.12.11.11314.
- Araujo CR, Moreira MA, Lana-Peixoto MA. Profile of the Brazilian scientific production in multiple sclerosis. *Braz J Med Biol Res* 2006;39:1143-8. doi: 10.1590/s0100-879x2006000900001.
- Shafin N, Ismail CAN, Mustafa MZ, Ghani N, Ahmad AH, Othman Z, et al. Thematic analysis of multiple sclerosis research by enhanced strategic diagram. *Mult Scler* 2022;28:2160-70. doi: 10.1177/13524585221075542.
- Donthu N, Kumar S, Mukherjee D, Pandey N, Lim LW. How to conduct a bibliometric analysis: An overview and guidelines. *J Bus Res* 2021;133:285-296. doi: 10.1016/j.jbusres.2021.04.070.
- Yang L, Tu S, Feng L, Lai X, Wang R. Bibliometric analysis of multiple sclerosis nursing research based on Web of Science. *Ann Palliat Med* 2021;10:7551-9. doi: 10.21037/apm-21-1057.
- Aria M, Cuccurullo C. Bibliometrix: An R-tool for comprehensive science mapping analysis. *J Informetr* 2017;11:959-975. doi:10.1016/j.joi.2017.08.007.
- Tripathi M, Kumar S, Sonker SK, Babbar P. Occurrence of author keywords and keywords plus in social sciences and humanities research: A preliminary study. *Collnet J Scientomet* 2018;12:215-232. doi: 10.1080/09737766.2018.1436951.
- Jain J, Walia N, Singh S, Jain E. Mapping the field of behavioural biases: a literature review using bibliometric analysis. *Manag Rev Q* 2022;72:823-855. doi: 10.1007/s11301-021-00215-y.
- Bibliometrix. Knowledge Synthesis 3 Structures. Bibliometrix. Retrieved 19.02.2023. Available at: <https://Bibliometrix.org/biblioshiny/biblioshiny3.html> [Accessed: 19.02.2023]
- Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71.
- Ismail II, Saqr M. A quantitative synthesis of eight decades of global multiple sclerosis research using bibliometrics. *Front Neurol* 2022;13:845539. doi: 10.3389/fneur.2022.845539.
- Aleixandre-Benavent R, Alonso-Arroyo A, González de Dios J, Vidal-Infer A, González-Muñoz M, Sempere ÁP. Bibliometric profile of the global scientific research on multiple sclerosis (2003-2012). *Mult Scler* 2015;21:235-45. doi: 10.1177/1352458514540357.
- Shelton RD, Foland P. The race for world leadership of science and technology: status and forecasts. *Sci Focus* 2009;1:369-380.
- Kothari A, MacLean L, Edwards N, Hobbs A. Indicators at the interface: managing policymaker-researcher collaboration. *Knowl Manage Res Pract* 2011;9:203-214. doi: 10.1057/kmrp.2011.16.
- Zhang XL, Zheng Y, Xia ML, Wu YN, Liu XJ, Xie SK, et al. Knowledge domain and emerging trends in vinegar research: A bibliometric review of the literature from WoSCC. *Foods* 2020;9:166. doi: 10.3390/foods9020166.
- Bass AD, Van Wijmeersch B, Mayer L, Mäurer M, Boster A, Mandel M, et al. Effect of multiple sclerosis on daily activities, emotional well-being, and relationships: The Global vsMS Survey. *Int J MS Care* 2020;22:158-64. doi: 10.7224/1537-2073.2018-087.

25. Kluger BM, Krupp LB, Enoka RM. Fatigue and fatigability in neurologic illnesses: Proposal for a unified taxonomy. *Neurology* 2013;80:409-16. doi: 10.1212/WNL.0b013e31827f07be.
26. Heine M, van de Port I, Rietberg MB, van Wegen EE, Kwakkel G. Exercise therapy for fatigue in multiple sclerosis. *Cochrane Database Syst Rev* 2015;2015:CD009956. doi: 10.1002/14651858.CD009956.pub2.
27. Carpenito-Moyet LJ. *Nursing diagnosis: Application to clinical practice*. Philadelphia: Lippincott Williams & Wilkins; 2006.
28. Tesio L, Gamba C, Capelli A, Franchignoni FP. Rehabilitation: The Cinderella of neurological research? A bibliometric study. *Ital J Neurol Sci* 1995;16:473-7. doi: 10.1007/BF02229325.
29. Altmann P, Leithner K, Leutmezer F, Monschein T, Ponleitner M, Stattmann M, et al. Sexuality and multiple sclerosis: Patient and doctor perspectives. *J Sex Med* 2021;18:743-49. doi: 10.1016/j.jsxm.2021.01.178.
30. Drulovic J, Kusic-Tepavcevic D, Pekmezovic T. Epidemiology, diagnosis and management of sexual dysfunction in multiple sclerosis. *Acta Neurologica Belgica* 2020;120:791-797. doi: 10.1007/s13760-020-01323-4.
31. Ayaz S. Sexuality and nursing process: a literature review. *Sex Disabil* 2013;31:3-12. doi: 10.1007/s11195-012-9280-6.
32. Davis BE, Lakin L, Binns CC, Currie KM, Rensel MR. Patient and provider insights into the impact of multiple sclerosis on mental health: A narrative review. *Neurol Ther* 2021;10:99-119. doi: 10.1007/s40120-021-00240-9.
33. Menculini G, Mancini A, Gaetani L, Bellingacci L, Tortorella A, Parnetti L, et al. Psychiatric symptoms in multiple sclerosis: A biological perspective on synaptic and network dysfunction. *J Neurol Neurosurg Psychiatry* 2023;94:389-95. doi: 10.1136/jnnp-2022-329806.
34. Green R, Cutter G, Friendly M, Kister I. Which symptoms contribute the most to patients' perception of health in multiple sclerosis? *Mult Scler J Exp Transl Clin* 2017;3:2055217317728301. doi: 10.1177/2055217317728301.
35. Cimino V, Chisari CG, Toscano S, Patti F. Palliative care in multiple sclerosis. *Handb Clin Neurol* 2023;191:129-38. doi: 10.1016/B978-0-12-824535-4.00009-4.
36. Solari A, Giordano A, Sastre-Garriga J, Köpke S, Rahn AC, Kleiter I, et al. EAN Guideline on Palliative Care of People with severe, progressive multiple sclerosis. *J Palliat Med* 2020;23:1426-43. doi: 10.1089/jpm.2020.0220.
37. Bayen E, Papeix C, Pradat-Diehl P, Lubetzki C, Joël ME. Patterns of objective and subjective burden of informal caregivers in multiple sclerosis. *Behav Neurol* 2015;2015:648415. doi: 10.1155/2015/648415.
38. Maguire R, Maguire P. Caregiver burden in multiple sclerosis: Recent trends and future directions. *Curr Neurol Neurosci Rep* 2020;20:18. doi: 10.1007/s11910-020-01043-5.
39. Learmonth YC, Motl RW. Physical activity and exercise training in multiple sclerosis: A review and content analysis of qualitative research identifying perceived determinants and consequences. *Disabil Rehabil* 2016;38:1227-42. doi: 10.3109/09638288.2015.1077397.
40. Dehghani A, Keshavarzi A, Jahromi MF, Shahsavari Isfahani S, Keshavarzi S. Concept analysis of coping with multiple sclerosis. *Int J Nurs Sci* 2018;5:168-73. doi: 10.1016/j.ijnss.2018.04.009.