Original Article

Bibliometric analysis of multiple sclerosis nursing research based on Web of Science

Lichao Yang, Shuangyan Tu, Ling Feng, Xin Lai, Rui Wang

Department of Neurology, West China Hospital, Sichuan University/West China School of Nursing, Sichuan University, Chengdu, China

Contributions: (I) Conception and design: All authors; (II) Administrative support: All authors; (III) Provision of study materials or patients: All authors; (IV) Collection and assembly of data: All authors; (V) Data analysis and interpretation: All authors; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Ling Feng. Department of Neurology, West China Hospital, Sichuan University/West China School of Nursing, Sichuan University, Chengdu 610041, China. Email: fengling286497@163.com.

Background: A bibliometric analysis which are widely used to gauge the scholarly impact of any scientific publication was conducted to give a basic overview of research publications on multiple sclerosis nursing.

Methods: Publications on multiple sclerosis nursing were retrieved by using a bibliometric method based on the Web of Science database [1900–2018].

Results: A total of 825 papers collected from 49 countries were retrieved in this study. The number of publications on multiple sclerosis nursing has increased steadily since 1999, and the top 12 research institutions publishing articles and nine of the ten most prolific authors were from the United States. Articles were most frequently published in the *Journal of Neuroscience Nursing*, and the key words of the top 10 highly cited papers changed from quality of life (QOL) and symptoms to terms including social support, psychological problems, rehabilitation treatment, cognitive impairment, and nursing intervention. While nursing practice and neuroscience nursing were the focus of research, other topics included QOL, functional rehabilitation, symptom management, nursing intervention, and support schemes.

Conclusions: Research into multiple sclerosis nursing in China is at an early stage. Greater attention to the research focus and results of top institutions and core journals, and a focus on highly cited papers are needed to advance the field.

Keywords: Multiple sclerosis; nursing; bibliometric analysis; Web of Science

Submitted Apr 02, 2021. Accepted for publication Jun 15, 2021.
doi: 10.21037/apm-21-1057
View this article at: https://dx.doi.org/10.21037/apm-21-1057

Introduction

Multiple sclerosis is an autoimmune disease characterized by the inflammatory demyelination of white matter in the central nervous system. The disease mostly occurs between 20–40 years old, and the ratio between men and women is about 1:2. As the disease usually produces neurological symptoms or signs at the time of an attack, the defect caused by neurological function is irreversible. While there remains a lack of large-scale epidemiological studies on multiple sclerosis in China, those surveys conducted suggest a prevalence rate in mainland China of [2–10]/100,000 (1-3). Due to the continuous development of an all-round medical service mode, an increasing number of clinical trials, and the application of traditional Chinese medicine treatment methods, the treatment of multiple sclerosis has entered a new stage of development (1,4), further promoting the development of multiple sclerosis nursing. An effective multiple sclerosis nursing model can not only promote the stability and improvement of the disease, but also reduce its recurrence and delay its progress, improving the quality of life (QOL) of patients (5).

This study used a method named bibliometrics to search literature related to multiple sclerosis nursing research in

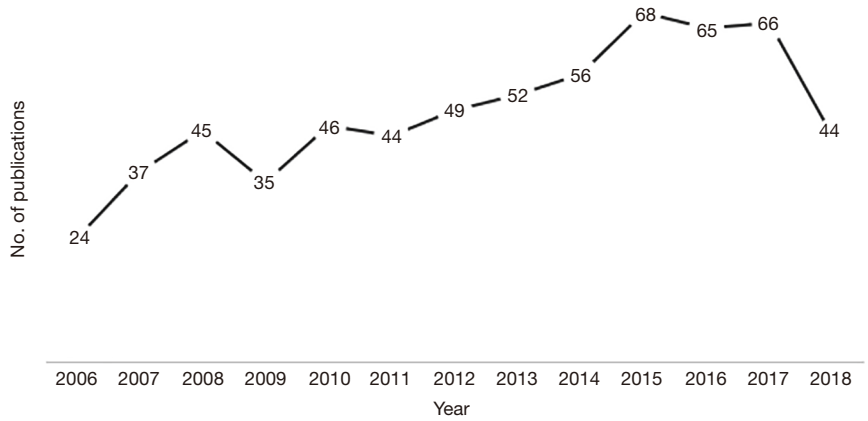

Figure 1 Time distribution and number of publications on multiple sclerosis nursing research.

the Web of Science database, and evaluate the literature distribution, countries and institutions, author distribution, journal influence factors, and keyword distribution to explore and analyze the development status and research hotspots.

Methods

Data sources and retrieval strategies

The Web of Science database was searched for content on multiple sclerosis nursing and the subject words referred to the thesaurus in medical subject headings (MeSH). The retrieval formula was: TS = multiple sclerosis and TS = multiple sclerosis AND (TS = "nurs*" OR OG = "nurs*" OR SU = "nurs*"), the retrieval time span was from January 1, 1900 to July 20, 2018, and the search was not limited to the retrieval language and literature type. The latest data from Web of Knowledge JCR [2017] was used as the reference standard of journal impact factors.

Research and statistical methods

Using the functions of the Web of Science website, the following aspects of publications were analyzed: the year of publication, source journal, author's name, country/region, subject classification, and citation number. After data were generated into documents, they were imported into Microsoft Excel for statistical analysis. In addition, CiteSpace (6) created by Professor Chen Chaomei was used to extract high-frequency keywords. The preliminary research of medical informatics (7) combined document co citation analysis (DCA) with pathfinder network scaling (pfnet), visualization, and animation to develop 3-D knowledge pattern based on limited data sets.

Results

Global publication trend

A total of 825 articles related to multiple sclerosis nursing published between January 1, 1900 and July 20, 2018 were searched. Most were written in English [793] (96.12%) with most others in Italian, Spanish, Turkish, and German. Published Chinese related papers were not included in the literatures searched. Most publications were academic works [635] (76.97%) and reviews [97] (11.76%).

Publication year distribution

As shown in *Figure 1*, the earliest publication in the Web of Science was "Nursing the multiple sclerosis patient" published by Margaret M. Gorey in the American Journal of Nursing in 1936. While between 1936 and 1998, there were only 68 publications related to nursing research of multiple sclerosis, between 1999 and 2006 there were 126, which was 1.85 times the total of the previous 63 years. The growth rate was obvious after 2006, but since 2018 was only counted to July 20, less than one year, the amount of statistical literature for that year was relatively small.

Country territory distribution

Articles from 49 countries/regions published between January 1 1900 and July 20 2018 publications were found, and those from 11 countries/regions with more than 20 published articles met the standard. As shown in

Table 1 Top 11 countries/regions of multiple sclerosis nursing research papers

Ranking	Countries/regions	No. of publications	Proportion (%)	Total cites	No. of citations per paper	H index
1	USA	371	44.970	9521	25.66	47
2	Britain	84	10.182	1,497	17.82	21
3	Canada	55	6.667	2,631	47.84	18
4	Germany	51	6.182	511	10.02	11
5	Australia	38	4.606	803	21.13	16
6	Netherlands	36	4.364	1,287	35.75	14
7	Sweden	29	3.515	492	16.97	13
8	Italy	28	3.394	393	14.04	10
9	France	22	2.667	302	13.73	10
10	Iran	22	2.667	89	4.05	5
11	Turkey	20	2.424	95	4.75	5

Table 1, the USA ranked first in terms of the number of articles published and the total citation frequency, with 371 articles (44.97%), and a h-index of 47. This was far higher than that of the United Kingdom and Canada, which ranked second and third, with only 84 articles (10.182%) published in the former and 55 (6.667%) in the latter, and an h-index of 21 and 18 respectively. In Taiwan and mainland China, four and two papers were published respectively, and the h index was 2 and 1 respectively. However, if ranked by the citation frequency of each paper, Canada ranked first, with 47.84 citations, the Netherlands ranked second (33.75), and the USA ranked third (25.66).

Institutions distribution

As shown in *Table 2*, 12 institutions published more than 10 articles, and the institutions with the first and second number of published articles were in the USA. The total number of articles published by Harvard University and Brigham and Women's Hospital were 43 and 41, respectively, the total citation frequency was 2,867 and 2,744. respectively, and the h index was 26 and 25, respectively. The institution with the third highest number of published articles was King's College London, with a total of 20 papers, a total citation frequency of 293, and an h index of 10. If papers were ranked according to their single citation frequency, Brigham and Women's Hospital in the USA would be ranked first, with a single citation frequency of 66.93, followed by Harvard University with a single citation frequency of 66.67, and Amsterdam Free University, with a single citation frequency of 60.90. In addition, the USA accounted for the majority of the top 20 countries and regions in terms of literature publications with 14, while there were two in Canada, two in the Netherlands, one in the United Kingdom, and one in Australia.

Authorship distribution

Table 3 shows the top 10 authors are from the USA, and the author A. Ascherio. was the most active, contributing to 35 documents, 2,362 citations, and holding an H-index of 22. This was followed by KL Munger, with 22 articles, 1,266 citations and an H-index of 14, and EE Gulick, who published 17 papers with 296 citations and held an h index of 10.

Journal distribution

The top 11 journals are shown in *Table 4*. The *Journal of Neuroscience Nursing* was the most preferred journal with 60 articles, while the *Journal of Advanced Nursing* and *Journal of Clinical Nursing* ranked second and third, with 49 and 34 articles, respectively. If ranked according to the total citation frequency, the journal Neurology ranked first, with 2,312 citations, and the *Journal of Advanced Nursing* and *Nursing Research* ranked second and third, respectively, with a total citation frequency of 1,171 and

Table 2 Top 12 institutions publishing multiple sclerosis nursing research papers

Ranking	Institutions	Countries	No. of publications	Proportion (%)	Total cites	No. of citations per paper	H index
1	Harvard University	USA	43	5.212	2,867	66.67	26
2	Brigham Women's Hosp	USA	41	4.970	2,744	66.93	25
3	Kings College London	Britain	20	2.424	293	14.65	10
4	Rutgers State Univ	USA	17	2.061	305	17.94	10
5	Univ Texas	USA	17	2.061	408	24.00	11
6	Univ Illinois	USA	15	1.818	516	34.40	10
7	Univ Groningen	Netherlands	13	1.576	104	8.00	5
8	Univ N Carolina	USA	12	1.455	45	3.75	5
9	St Louis Univ	USA	10	1.212	135	13.50	4
10	Texas A M Univ	USA	10	1.212	109	10.90	6
11	Univ Texas Austin	USA	10	1.212	37	3.70	4
12	Vrije Univ Amsterdam	Netherlands	10	1.212	609	60.90	4

Table 3 Top 10 authors of nursing research papers on multiple sclerosis

Ranking	Authors	Nationality	No. of publications	Proportion (%)	Total cites	No. of citations per paper	H index
1	Ascherio A	USA	35	4.242	2,362	67.49	22
2	Munger KL	USA	22	2.667	1,266	57.55	14
3	Gulick EE	USA	17	2.061	296	17.41	10
4	Buchanan RJ	USA	13	1.576	137	10.54	7
5	Stuifbergen AK	USA	12	1.455	291	24.25	6
6	Chitnis T	USA	10	1.212	353	35.30	6
7	Hernan MA	USA	10	1.212	1,513	151.30	10
8	Becker H	USA	9	1.091	34	3.78	3
9	Olek MJ	USA	9	1.091	1,485	165.00	9
10	Wang SJ	USA	9	1.091	87	9.67	5

550, respectively. Among the published journals, the *Journal of Neurology* had the highest impact factor (7.609), and the second and third journals were *Multiple Sclerosis Journal* and *Multiple Sclerosis*, with impact factors of 5.28 and 4.23, respectively.

Distribution of highly cited papers

The analysis of highly cited papers revealed 10 publications, including seven from the USA, two from Canada, and one from the Netherlands. The highest citation frequency of a single paper was 889, in a paper focusing on research on general internal medicine, neuroscience, and rehabilitation. It was also observed that research content over time gradually shifted from QOL and symptoms, to social support, psychological problems, rehabilitation treatment, cognitive impairment, psychological problems, and nursing intervention.

Table 4 Top 11 multiple sclerosis nursing research journals

Ranking	Journals	No. of publications	Proportion (%)	Total cites	No. of citations per paper	H index
1	*Journal of Neuroscience Nursing*	60	7.273	456	7.60	0.945
2	*Journal of Advanced Nursing*	49	5.939	1,171	23.90	2.267
3	*Journal of Clinical Nursing*	34	4.121	457	13.44	1.635
4	*Multiple Sclerosis Journal*	27	3.273	395	14.63	5.280
5	*Neurology*	25	3.030	2,312	92.48	7.609
6	*American Journal of Nursing*	24	2.909	31	1.29	1.234
7	*Multiple Sclerosis*	19	2.303	173	9.11	4.230
8	*Nursing Research*	16	1.939	550	34.38	1.725
9	*Research in Nursing Health*	15	1.818	336	22.40	1.762
10	*International Journal of Nursing Studies*	14	1.697	401	28.64	3.656
11	*Western Journal of Nursing Research*	14	1.697	84	6.00	1.323

Table 5 Top 10 research directions in multiple sclerosis nursing research

Ranking	Research direction	No. of publications	Proportion (%)	Total cites	No. of citations per paper	H index
1	Nursing	398	48.242	5,001	12.57	35
2	Neuroscience	253	30.667	5,655	22.35	35
3	Rehabilitation	55	6.667	851	15.47	14
4	General internal medicine	48	5.818	1,765	36.77	17
5	Public environment and occupational health	47	5.697	1,087	23.13	17
6	Health care science services	43	5.212	677	15.74	10
7	Psychiatry	35	4.242	599	17.11	12
8	Geriatrics	18	2.182	161	8.94	7
9	Oncology	17	2.061	654	38.47	10
10	Pharmacology	15	1.818	177	11.80	9

Distribution of research directions

As shown in *Table 5*, research directions with the largest number of papers were nursing and neuroscience, and some other popular directions, such as rehabilitation, general internal medicine, public environment, and occupational health. According to the analysis and ranking of single citation frequency, oncology ranked first, with a single citation frequency of 38.47, followed by general internal medicine and public environment occupational health related research, with a single citation frequency of 36.77 and 23.13, respectively. This demonstrates the citation frequency of each article was not high, at only 12.57 times.

Author keywords

The hot spots in research and their evolution can be extracted by CiteSpace V software (8). As shown in *Table 6*, the keyword or term with the highest frequency was "multiple sclerosis", with a frequency of 477 times, the second was "quality of life", with a total of 155 times, and "disability" ranked third with a frequency of 89 times. The

Table 6 Keywords used in of nursing research literature on multiple sclerosis from 1999 to 2018

Ranking	Frequency	Keywords
1	477	Multiple sclerosis
2	155	Quality of life
3	89	Disability
4	85	Fatigue
5	78	Depression
6	73	People
7	60	Women
8	56	Nursing
9	49	Management
10	48	Impact
11	46	Randomized controlled trial
12	44	Care
13	40	Symptom
14	39	Prevalence
15	38	Disease
16	37	Experience
17	37	Health
18	34	Rehabilitation
19	30	Chronic illness
20	30	Physical activity

keywords or terms "fatigue", "depression", "crowd", and "women" were also used frequently. In addition, although the frequency of "management", "influence", "randomized controlled trial", and other words was not very high, these are also key points in multiple sclerosis nursing research.

Discussion

Analysis of countries/regions, institutions, authors, and source journals of nursing research papers on multiple sclerosis

This study evaluated the ranking of countries/regions, institutions, journals, and authors, mainly based on the number of published papers, citation frequencies, and impact factors. However, compared with impact factors, the number of published papers and citation frequency are more objective. The results showed the number of papers published in the USA was significantly higher than that in other countries/regions, accounting for 44.97% of the global total. In addition, nine of the top 12 institutions publishing papers on multiple sclerosis nursing were in the USA, and the top 10 authors with published papers were also from that country. The USA also accounted for most of the highly cited papers (7), and the top two institutions with published papers ranked first and second were Harvard University and Brigham and Women's hospital.

The top 11 journals published about 36% of multiple sclerosis nursing research papers, which further shows that these journals are active and core in the field of multiple sclerosis nursing research. In addition, they are carriers of information transmission and a communication platform for the most important research in the field. According to the latest data from the Web of Knowledge JCR [2017], the overall impact factor of the top 11 source journals of multiple sclerosis nursing research papers is not high (1–3 points), among which the three journals with higher total citation frequency are *Neurology*, the *Journal of Advanced Nursing*, and *Nursing Research*, which indicates that journals focusing on clinical nursing research have a higher publication rate.

At present, there are no related journals and institutions in the field of multiple sclerosis nursing in China that can enter the international research sphere. Therefore, domestic scholars should pay more attention to the research results of these top foreign journals and institutions, to provide new directions and ideas for domestic multiple sclerosis nursing research, and to improve their own research efforts. Journals with a relatively large number of articles and appropriate influence factors should be selected as far as possible to achieve this.

Analysis of the direction of multiple sclerosis nursing research

The results of this study show that multiple sclerosis nursing research involves multiple directions, but research in clinical nursing practice and neuroscience is the most prominent (9). Compared with other research directions, the number of papers and total citation frequency were higher in these than other research directions. In addition, through further in-depth research, we found that nursing research on multiple sclerosis also focused more on rehabilitation, public environment, occupational health, health care, and service (10), which was reflected in high cited papers and high-frequency keywords. These disciplines

mainly discuss the importance of nursing management and nursing rehabilitation as factors influencing multiple sclerosis (11), or explore the influence of family life and the social environment on multiple sclerosis nursing to comprehensively improve the QOL of patients with multiple sclerosis.

Analysis of hot spots in multiple sclerosis nursing research

The clinical manifestations of patients with multiple sclerosis are multiple in space and time, and across the clinical course, improving the QOL of patients is the key objective and fundamental purpose of nursing research on multiple sclerosis.

Disability is another hot spot in multiple sclerosis nursing research. The degree and level of disability of patients can be evaluated according to the expanded disability status scale (EDSS), and sexual dysfunction (SD) is often ignored in patients with multiple sclerosis (12). It is generally believed that the higher the score of EDSS, the higher the prevalence of sexual dysfunction, and it is suggested that nursing researchers should pay attention to the evaluation of sexual dysfunction, quantify the degree of sexual injury, and improve the QOL of patients with multiple sclerosis (13).

Patients with multiple sclerosis usually show fatigue and depression, but corresponding treatment methods can be adopted for this kind of performance. In addition, according to several controlled studies, fatigue, depression, and pain symptoms in multiple sclerosis patients have a significant negative impact on their QOL (14). It is suggested that these symptoms should be carefully screened, and the factors affecting patients' fatigue should be evaluated from the perspective of clinical practice and nursing education. This not only helps nursing workers to provide psychological support to patients, enable patients to have the ability to cope with fatigue and self-control, but also further improves the QOL of patients (15,16).

With developments in the course and treatment of multiple sclerosis, more attention has been paid to management in nursing research. Multiple sclerosis patients with significant symptoms can improve their QOL through appropriate symptom and adverse reaction management. Disease modifying drugs (DMDs) are used to help reduce the severity of multiple sclerosis symptoms. In addition, according to the relevant clinical data, the treatment compliance of patients with DMDs may influence the treatment effect. Continuous empirical research shows that nursing researchers can effectively improve the compliance of DMDs, patient satisfaction, and QOL by using patient follow-up questionnaires to evaluate and manage the symptoms of multiple sclerosis and adverse factors affecting treatment (17).

It is worth noting that the frequency of care in multiple sclerosis nursing research literature is gradually increasing. As the disease progresses, the ability for self-care diminishes and the involvement of family members increases (18). Several follow-up studies have shown that family members bear the burden from the physical, psychological, emotional, social, economic pressures of assisting patients, suggesting that nursing workers need to pay more attention to the well-being of the family members of patients, provide them with support plans, and determine appropriate intervention measures to help them cope with chronic sadness and improve their QOL (19,20).

These key words and hot spots show that research on multiple sclerosis nursing has gradually improved from single symptom nursing research to multi aspect and multi angle holistic nursing research, which further improves the depth and breadth of research, and its scientific and practical application. At present, the quality of multiple sclerosis nursing research is still in the primary stage. Current literature mainly focuses on nursing observation and the clinical drug treatment or integrated traditional Chinese and Western medicine treatment for multiple sclerosis, and fewer publications focus on psychological nursing and the nursing rehabilitation of patients. The results of this study suggest that in the future, domestic nursing scholars and clinical workers should commence academic research by becoming familiar with hot issues in this field, such as QOL, functional rehabilitation, symptom management, intervention nursing, and support plans.

Limitations

There are some limitations to this study. Firstly, the database might contain erroneous or missing data, which were unable to be identified or rectified. Secondly, we only evaluated publications written in the English language, which limits the analysis.

Conclusions

This study aimed to provide a basic overview of research publications on multiple sclerosis nursing. A bibliometric

analysis of 825 documents published during the last two decades (year 1900 to 2018) was carried out. Through this bibliometric study, we came to an understanding that the publication trend showed a drastic increase during the second decade, and the most productive country working in this field was the USA, where top institutions including Harvard University and Brigham and Women's hospital are located. Likewise, the leading authors in the context of the number of publications and co-citations, as well as the leading journals in terms of the number of publications, were from the USA.

Acknowledgments

Funding: None.

Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://dx.doi.org/10.21037/apm-21-1057). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

1. Howard J, Trevick S, Younger DS. Epidemiology of Multiple Sclerosis. Neurol Clin 2016;34:919-39.
2. Ahmed Z, Fulton D, Douglas MR. Opicinumab: is it a potential treatment for multiple sclerosis? Ann Transl Med 2020;8:892.
3. Cheng Q, Cheng XJ, Jiang GX. Multiple sclerosis in China--history and future. Mult Scler 2009;15:655-60.
4. Song L, Zhou QH, Wang HL, et al. Chinese herbal medicine adjunct therapy in patients with acute relapse of multiple sclerosis: A systematic review and meta-analysis. Complement Ther Med 2017;31:71-81.
5. Porter B, Keenan E. Nursing at a specialist diagnostic clinic for multiple sclerosis. Br J Nurs 2003;12:650, 52-50, 56.
6. Chen C. Searching for intellectual turning points: progressive knowledge domain visualization. Proc Natl Acad Sci U S A 2004;101 Suppl 1:5303-10.
7. Synnestvedt M, Chen C. Visualizing AMIA : a medical informatics knowledge domain analysis. AMIA Annu Symp Proc 2003;2013:1024.
8. Yao L, Hui L, Yang Z, et al. Freshwater microplastics pollution: Detecting and visualizing emerging trends based on Citespace II. Chemosphere 2020;245:125627.
9. Woods JM. Reflections on 50 Years of Neuroscience Nursing: Movement Disorders, Neuromuscular Disease, and Multiple Sclerosis. J Neurosci Nurs 2018;50:5-12.
10. Keramat Kar M, Whitehead L, Smith CM. Characteristics and correlates of coping with multiple sclerosis: a systematic review. Disabil Rehabil 2019;41:250-64.
11. Holland NJ, Madonna M. Nursing grand rounds: multiple sclerosis. J Neurosci Nurs 2005;37:15-9.
12. Fraser C, Mahoney J, McGurl J. Correlates of sexual dysfunction in men and women with multiple sclerosis. J Neurosci Nurs 2008;40:312-7.
13. Calabrò RS, Russo M, Dattola V, et al. Sexual Function in Young Individuals With Multiple Sclerosis: Does Disability Matter? J Neurosci Nurs 2018;50:161-6.
14. Brenner P, Piehl F. Fatigue and depression in multiple sclerosis: pharmacological and non-pharmacological interventions. Acta Neurol Scand 2016;134 Suppl 200:47-54.
15. Tanriverdi D, Okanli A, Sezgin S, et al. Quality of life in patients with multiple sclerosis in Turkey: relationship to depression and fatigue. J Neurosci Nurs 2010;42:267-73.
16. Motl RW, McAuley E. Symptom cluster and quality of life: preliminary evidence in multiple sclerosis. J Neurosci Nurs 2010;42:212-6.
17. Ross AP, Hackbarth N, Rohl C, et al. Effective multiple sclerosis management through improved patient assessment. J Neurosci Nurs 2008;40:150-7.
18. Buhse M. Assessment of caregiver burden in families

of persons with multiple sclerosis. J Neurosci Nurs 2008;40:25-31.
19. Liedström E, Isaksson AK, Ahlström G. Chronic sorrow in next of kin of patients with multiple sclerosis. J Neurosci Nurs 2008;40:304-11.
20. Yam C, Jokubaitis V, Hellwig K, et al. MS, pregnancy and COVID-19. Mult Scler 2020;26:1137-46.

(English Language Editor: B. Draper)

Cite this article as: 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(7):7551-7559. doi: 10.21037/apm-21-1057

