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Knowledge mapping of Guillain-Barré syndrome from January 2013 to October 2023

A bibliometric analysis

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Abstract

Background: With the COVID-19 pandemic and the serious sequelae, foreign factor-induced Guillain-Barré syndrome (GBS) has become a research focus in autoimmune peripheral neuropathies. The study employs a bibliometric system to illustrate the research hotspots and trends in GBS based on pertinent literature from January 2013 to October 2023.

Methods: The Web of Science Core Collection retrieved articles on GBS from January 1, 2013, to October 28, 2023. These articles were then visualized and statistically evaluated using VOSviewer, CiteSpace software, R version 4.2.1, and Microsoft Office Excel 2019.

Results: A total of 4269 articles on GBS were gathered. The United States of America produced the most publications (28.55%, 1219/4269), followed by China (14.22%, 607/4269). The world's leading country was the United States of America, with the most publications, the most substantial international cooperation, and the highest centrality (0.17). Union of French Research Universities (UDICE)-French Research Universities in France was the most productive organization (189 articles). Lancet was the highest cocited journal (2428), and Professor Jacobs, Bart C., was the most prolific author (93). The most significant increases were shown for the keywords coronavirus, respiratory failure, and coronavirus disease 2019. The novel coronavirus is an emerging virus that may cause GBS, indicating a promising area of research.

Conclusions: The study on GBS was illustrated using bibliometrics, and it covers trends in international collaboration, publications, and research hotspots. These findings allow the scientific community to pinpoint the novel ideas and directions that will drive future GBS research.

Abbreviations: GBS = Guillain-Barré syndrome, USA = United States of America, WoSCC = Web of Science Core Collection.

Keywords: bibliometric, CiteSpace, COVID-19, Guillain-Barré syndrome, VOSviewer

1. Introduction

As the most frequent worldwide cause of acquired flaccid paralysis, Guillain-Barré syndrome (GBS) is an infection-induced immune response of the peripheral nervous system, which is characterized by symmetrical limb paralysis, areflexia, involvement of the cranial nerves, and even involvement of respiratory muscles.[1] This kind of disease has a yearly crude incidence of 0.81 to 1.91 per 1000 people, with a 20% rise in incidence every ten years of age.[2] Although it has a complicated pathophysiology, infection with *Campylobacter jejuni* is the leading trigger of GBS.[3] Yuki et al[4] suggested that some other pathogens can cause peripheral nerve demyelination or axonal damage in *C jejuni*-related GBS through molecular mimicry mechanisms, leading to neurological dysfunction. Recent studies further demonstrated the important role of humoral and cellular immunity in GBS.[5] Although plasma exchange and intravenous immunoglobulin have become the mainstays of current treatment for GBS, up to

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The datasets generated during and/or analyzed during the current study are publicly available.

This bibliometric analysis only used publicly available literature data and did not involve the collection of new patient data or experiments, so there is no need for ethical approval.

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20% of people remain unable to walk independently after medication for 1 year.[6]

A new technique to comprehend trends and foci in research can be made by bibliometrics.[7] Over the past century, many researchers have produced high-quality articles on GBS based on the tremendous advances in understanding this disease.[6,8] However, no bibliometric analysis based on CiteSpace and VOSviewer was available. In this study, we created maps of the body of scientific knowledge and summarized the research frontier and foci in this area through comprehensive bibliometric analysis and summarization of the literature in the past ten years, which will lay the groundwork for future research and therapy on the GBS.

2. Methods

2.1. Data retrieval strategies

Using the Science Citation Index Expanded of the Web of Science Core Collection (WoSCC) as the data source, we collected the literature of GBS from January, 1, 2013 to October 28, 2023 on October 28, 2023, according to the specific retrieval rule of the Topic Search = "Guillain-Barre syndrome." The initial data (n = 4269) of English-language articles, including reviews and articles, were carried out independently by 2 researchers (XK and GWW), who then exported the data of full records and cited references. The specific retrieval procedure is depicted in Figure 1.

2.2. Data analysis

Using the Bibliometrix package, the collaboration across countries/regions was displayed in the R programming language (version 4.2.1). The plain text file data downloaded from WoSCC was imported into CiteSpace (version 6.2.R5 Advanced) and VOSviewer (version 1.6.19), both of which are bibliometric programs.[9,10] Country/region, institution, author, and keyword were selected as node types. In the VOSviewer program, the node size and individual node represent the total number and various elements, respectively. The relationships between projects, including collaboration or cocitation, are depicted by the lines between nodes.[11] In the CiteSpace program, elements with centrality > 0.1 are displayed by outside purple rings to indicate the relative essence of the element and measure the component's relevance.[12] Modularity Q (Q) and weighted mean silhouette (S) are the critical cluster analysis evaluation indicators. S > 0.5 denotes the credibility of the clustering results, while Q > 0.3 implies a substantially discovered clustering structure.[13] As each of the raw data used in this study was retrieved from publicly accessible databases, no ethical review was required.

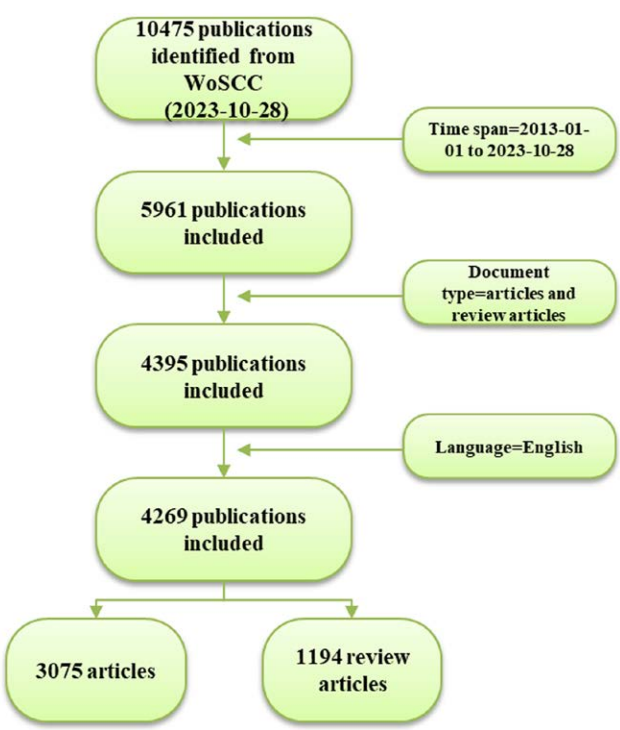

Figure 1. Flow chart for identifying literature. WoSCC = Web of Science Core Collection.

3. Results

3.1. Annual publications and cumulative publications

The volume of publications throughout a given time frame can provide insight into this discipline's development tendency. The retrieval approach indicated a total of 4269 GBS-associated publications. Figure 2 illustrates the increasing tendency of that article number over the past 10 years, and the number reached the peak in 2021 (572 articles), the result of which suggested the hotspot of GBS considered by some academics.

3.2. Countries/regions and institutions

Although 129 countries/regions had published works on GBS, the top 10 countries/regions, together, accounted for almost 93% of all articles (3957/4269) (Table 1). Moreover, the United States of America (USA) (1219 publications), China (607 publications), and England (331 publications) led the ranking of nations with the most publications. This result demonstrated the greatest interest of the 3 nations in GBS. According to the standard that the purple outer circle denotes high centrality, the USA ranked in the first position with a centrality of 0.17, followed by England (0.16), Italy (0.16), the Netherlands (0.16), and Germany (0.1) among the top 20 countries/regions by the number of publications (Fig. 3A). The aforementioned nations with a centrality of more than 0.1 demonstrated their role as a "bridge" in this area (Fig. 3A, Table 1). In Figure 3B, the USA demonstrated the focal point of international cooperation as linkages represent international cooperation between nations. Figure 3C further indicates the cooccurrence map of countries/regions created with VOSviewer.

More than 400 institutions made outstanding contributions to GBS. Among them, Union of French Research Universities (UDICE)-French Research Universities (189) ranked in the first position, followed by Erasmus University Rotterdam (150) and Erasmus MC (150), as shown in Table 2. The top institutions are primarily centered in developed countries in terms of publication number. 1322 ties among 177 institutions meeting the requirements (T > 10) displayed by VOSviewer demonstrated numerous collaborations of these institutions (Fig. 3D).

3.3. Authors and cocited authors

Authors' published articles indicated their contributions to the field's body of knowledge. In this topic, >20,000 authors have published articles. Table 3 includes a ranking of the 10 most productive authors. The 4 most active authors were Jacobs, Bart C. (93); Yuki, Nobuhiro (60); Kusunoki, Susumu (46); and Van doorn, Pieter A. (45). Other authors occupied publications ranging from 22 to 40. Figure 4 demonstrates the authors' communication and teamwork. Authors who were simultaneously cited by at least 2 additional publications are referred to as cocited authors. There were 1270 cocited authors all over. Table 3 indicates a ranking of the ten most cocited authors. The cocited author with the most citations was Hughes, Richard A.C., with 1011 citations, followed by Yuki, Nobuhiro (772 citations) and Willison, Hugh J. (636 citations). Each of the 10 cocited individuals got >350 citations.

3.4. Journals and cocited journals

Overall, 1051 journals have published articles about GBS. Table 4 provides a list of the 10 leading journals by publishing quantity. Vaccine (87 publications), Journal of the Peripheral Nervous System (86 publications), and Muscle Nerve (81 publications) are the 3 journals with the most publications. Table 4 lists the 10 leading cocited journals with more than 1200 citations. The New England Journal of Medicine (n = 2341, IF_{2022} = 158.5), Neurology (n = 2263, IF_{2022} = 9.9), Annals of Neurology (n = 1707, IF_{2022} = 11.2), and Journal of Neurology, Neurosurgery and Psychiatry (n = 1637, IF_{2022} = 11.0) are the following most frequently cited journals after Lancet (n = 2428, IF_{2022} = 168.9). Seven of the top 10 cocited journals are located in the Q1 region.

The journal distribution is also displayed on the dual-map overlay. Different reference pathways are represented by 5 colored ribbons from left to right. The orange citation stream in Figure 5 indicated that papers released in Molecular/Biology/Immunology magazines are commonly cited by those published in Molecular/Biology/Genetics

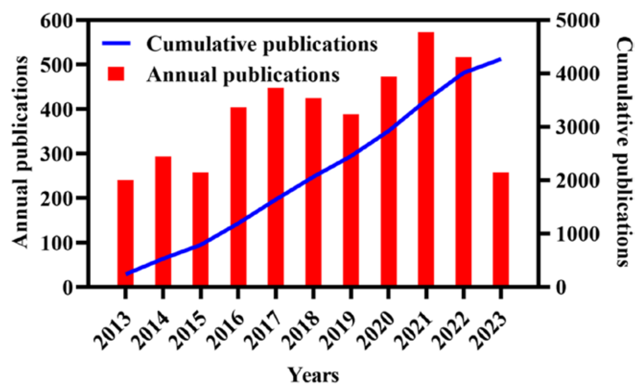

Figure 2. Annual and cumulative publications of Guillain-Barré syndrome.

Table 1

The top 10 countries/regions that donate to Guillain-Barré syndrome.

Rank	Country	Count	Centrality
1	USA	1219	0.17
2	China	607	0.01
3	England	331	0.16
4	Italy	308	0.16
5	France	291	0.09
6	Japan	269	0.03
7	India	243	0.05
8	Germany	242	0.1
9	Brazil	241	0.03
10	The Netherlands	206	0.14

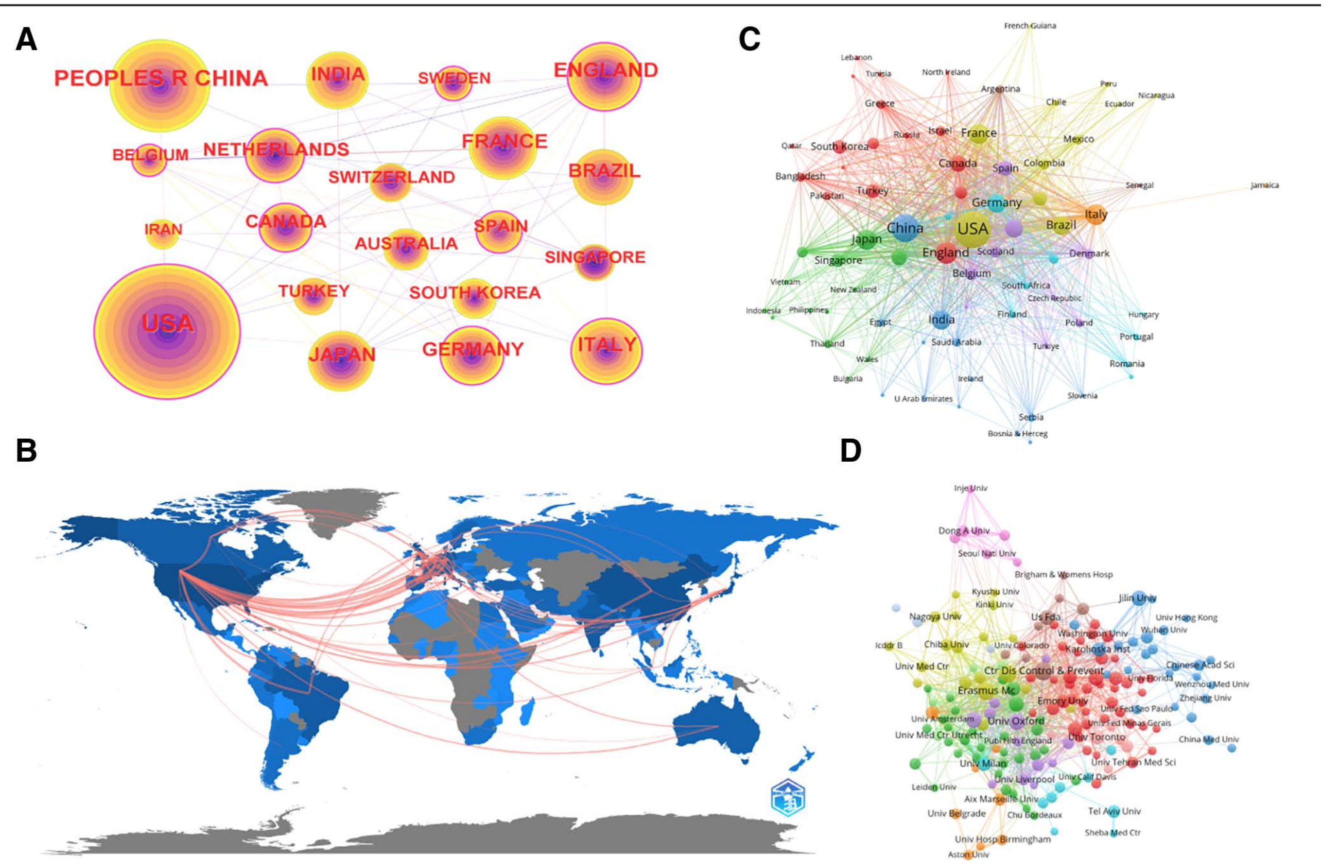

Figure 3. Analysis of country and author in the field of Guillain-Barré syndrome (GBS). (A) The top 20 countries/regions in terms of publication number. (B) A map of the world's geographic dispersion showing its distribution. (C) VOSviewer's visualization map of the countries/regions (T > 4). (D) VOSviewer's visualization map of the institutions (T > 10).

Table 2

The top 10 institutions for Guillain-Barré syndrome publications.

Rank	Institution	Count	Centrality	Country
1	UDICE-French Research Universities	189	0.01	France
2	Erasmus University Rotterdam	150	0.02	The Netherlands
3	Erasmus MC	150	0.02	The Netherlands
4	University of London	131	0.02	England
5	Institut National de la Sante et de la Recherche Medicale (Inserm)	110	0.03	France
6	Centers for Disease Control & Prevention	106	0.04	USA
7	University of Texas System	96	0.02	USA
8	Johns Hopkins University	92	0.02	USA
9	Harvard University	92	0.01	USA
10	University of California System	91	0.03	USA

Table 3

The top 10 Guillain-Barré syndrome authors and cocited authors.

Rank	Author	Count	Centrality	Cocited author	Citation	Centrality
1	Jacobs, Bart C.	93	0.06	Hughes, Richard A.C.	1011	0
2	Yuki, Nobuhiro	60	0.01	Yuki, Nobuhiro	772	0
3	Kusunoki, Susumu	46	0.05	Willison, Hugh J.	636	0
4	van doorn, Pieter A.	45	0.01	Sejvar, James J.	565	0
5	Willison, Hugh J.	40	0.08	Cao-Lormeau, Van-Mai	525	0
6	Kuwabara, Satoshi	29	0.02	Asbury, Arthur K.	514	0
7	Shahrizaila, Nortina	26	0.01	Van Den Berg, B.J.	504	0
8	Islam, Zhahirul	26	0.01	Hadden, Robert D.M.	436	0
9	Zhu, Jie	23	0	Uncini, Antonino	419	0
10	Cornblath, David R.	22	0.06	Kuwabara, Satoshi	367	0

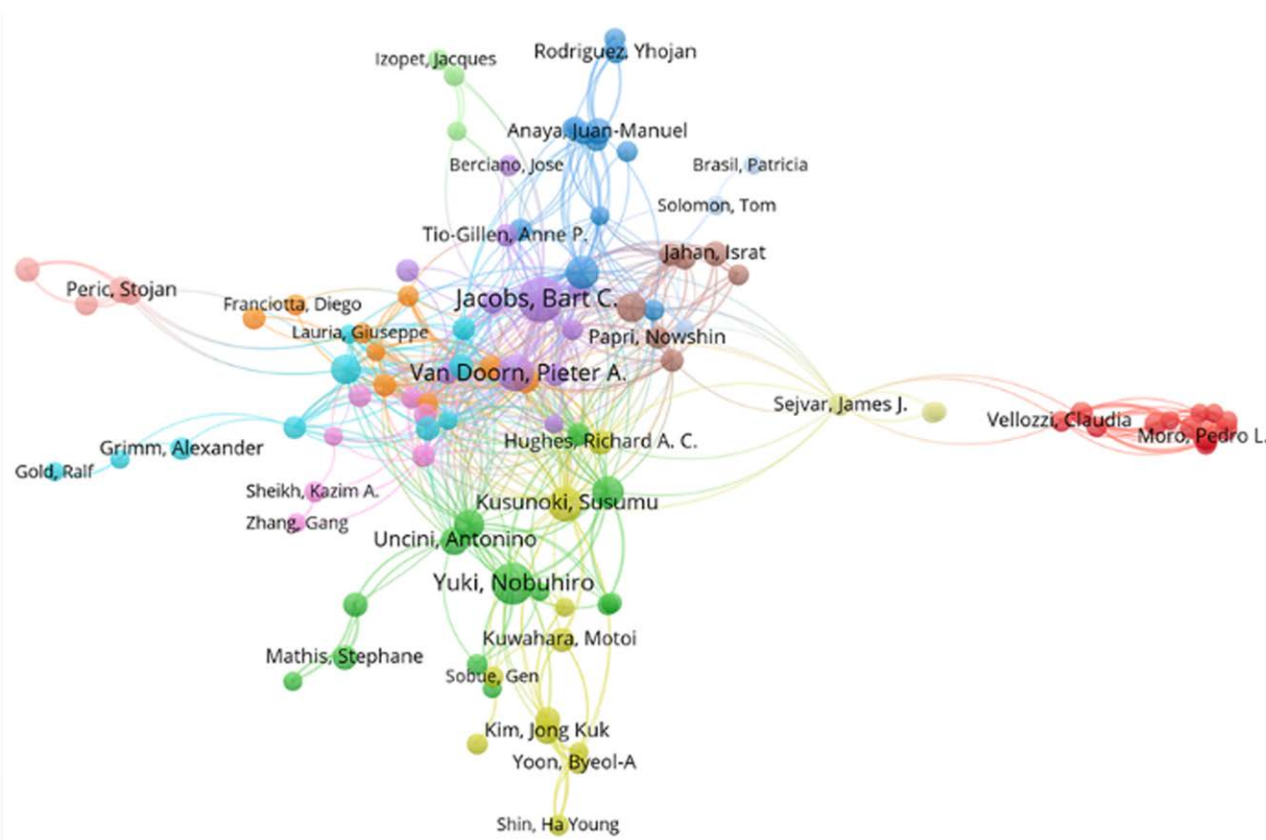

Figure 4. Authors' network map viewed in VOSviewer (T > 7).

Table 4

The top 10 GBS-related journals and cocited journals.

Rank	Journals	Count	IF (2022)	JCR	Cocited journals (cite)	Count	IF (2022)	JCR
1	Vaccine	87	5.5	Q2	Lancet	2428	168.9	Q1
2	Journal of the Peripheral Nervous System	86	3.8	Q2	The New England Journal of Medicine	2341	158.5	Q1
3	Muscle Nerve	81	3.4	Q2	Neurology	2263	9.9	Q1
4	Frontiers in Neurology	79	3.4	Q2	Annals of Neurology	1707	11.2	Q1
5	Journal of the Neurological Sciences	76	4.4	Q2	Journal of Neurology, Neurosurgery and Psychiatry	1637	11.0	Q1
6	Journal of Neuroimmunology	73	3.3	Q3	Brain	1506	14.5	Q1
7	Plos One	70	3.7	Q2	Plos One	1391	3.7	Q2
8	Scientific Reports	64	4.6	Q2	Journal of the Neurological Sciences	1340	4.4	Q2
9	Neurological Sciences	54	3.3	Q2	Muscle Nerve	1318	3.4	Q2
10	Frontiers in Immunology	52	7.3	Q1	Journal of Neurology	1269	6.0	Q1

GBS = Guillain-Barré syndrome, IF = impact factor, JCR = journal citation reports.

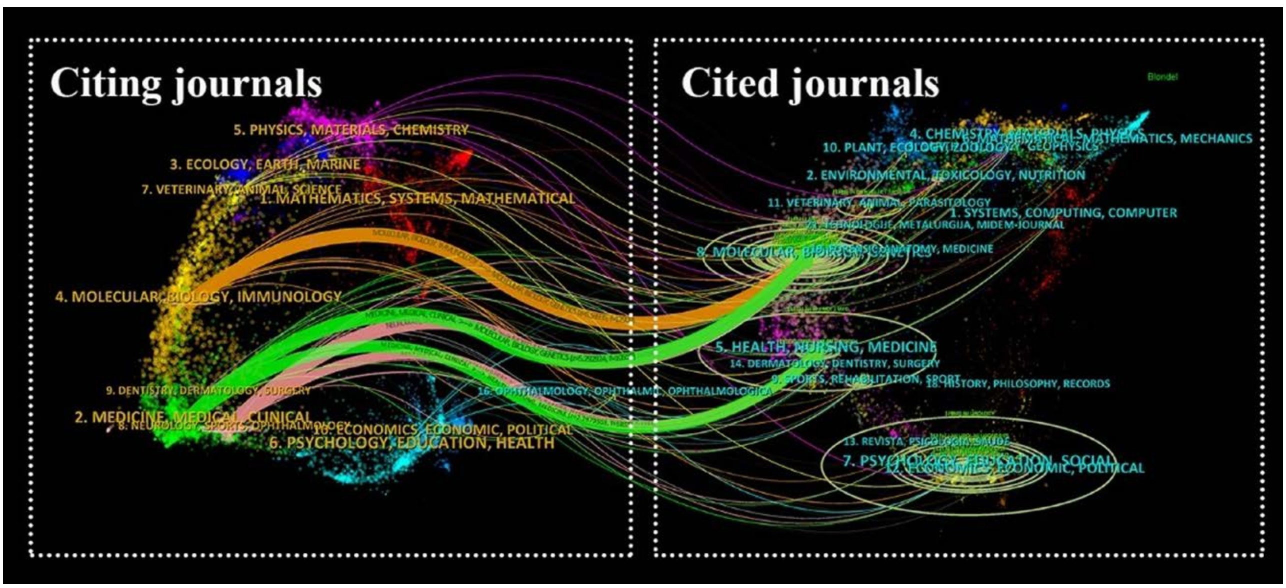

Figure 5. The dual-map overlay of journals on Guillain-Barré syndrome.

magazines. The 2 green pathways show that articles released in Molecular/Biology/Genetics and Health/Nursing/Medicine magazines are commonly cited in Medicine/Medical/Clinical journals. The pink routes demonstrate that works released in Molecular/Biology/Genetics and Health/Nursing/Medicine magazines are commonly cited in Neurology/Sports/Ophthalmology magazines.

3.5. Cocited references and references burst

Table 5 lists the top 10 cocited references. Among them, "Guillain-Barré syndrome outbreak associated with Zika virus infection in French Polynesia: a case-control study" received the highest citations.[14] The article "Guillain-Barre syndrome"[8] ranked in the second position, followed by the article "Zika virus associated with microcephaly."[15] Figure 6 showed the top 20 references with the strongest citation bursts involved in GBS, with 60% of citation burst articles lasting until 2023. Additionally, using the log-likelihood ratio, we created the clustering time diagram for cocited references. The top 10 clusters and their Q (0.844) and S (0.9581) indicated significant and compelling results, which can be summarized into 4 major categories. The first is the preceding inducement, including #0 zika virus, #1 covid-19, #2 sars-cov-2, #3 covid-19 vaccine, #4 coronavirus, and #5 zika, followed by clinical subtype (#6 cidp, and #7 guillain-barre syndrome), vaccine safety (#8 vaccine safety), and model (#9 experimental autoimmune neuritis) (Fig. 7).

3.6. Keywords and hotspots

More than 12,000 keywords were found in the analyzed articles. Table 6 showed the top 10 keywords of "guillain-barre syndrome," "infection," "zika virus," "antibody," "diagnosis," "multiple sclerosis," "disease," "united states," "transmission," and "outbreak." Among these keywords, "infection" and "zika virus" appeared more than 400 times, indicating that preceding infection is still a key topic in the GBS area. VOSviewer generated a keyword cooccurrence network graph (T > 24), 216 keywords with threshold requirements formed 5 clusters of different colors, representing different research directions in GBS (Fig. 8A). The recently appeared yellow node on the right side of Figure 8B demonstrated that current research mainly focuses on preceding infections, particularly on COVID-19 and Zika virus.

The top 25 keywords with the strongest citation bursts in this field of study during the last ten years are displayed in Figure 8C. "coronavirus (strength 10.87)," "respiratory failure (strength 8.65)," and "coronavirus disease 2019 (strength 7.49)" are 3 keywords during the burst period.

Table 5

Top 10 cocited references in the GBS field.

Rank	Reference	Year	Count	Centrality	Journal	IF (2022)	JCR
1	Guillain-Barré syndrome outbreak associated with Zika virus infection in French Polynesia: a case-control study[14]	2016	407	0	Lancet	168.9	Q1
2	Guillain-Barré syndrome[8]	2016	310	0	Lancet	168.9	Q1
3	Zika Virus Associated with Microcephaly[15]	2016	235	0.01	The New England Journal of Medicine	158.5	Q1
4	Guillain-Barré syndrome[16]	2012	196	0	The New England Journal of Medicine	158.5	Q1
5	Diagnosis and management of Guillain-Barré syndrome in ten steps[17]	2019	194	0	Nature Reviews Neurology	38.1	Q1
6	Guillain-Barré syndrome: pathogenesis, diagnosis, treatment and prognosis[18]	2014	174	0	Nature Reviews Neurology	38.1	Q1
7	Guillain-Barré Syndrome Associated with Zika Virus Infection in Colombia[19]	2016	154	0	The New England Journal of Medicine	158.5	Q1
8	Zika Virus Infection in Pregnant Women in Rio de Janeiro[20]	2016	151	0.01	The New England Journal of Medicine	158.5	Q1
9	A Mouse Model of Zika Virus Pathogenesis[21]	2016	126	0	Cell Host Microbe	30.3	Q1
10	Zika Virus Infects Human Cortical Neural Progenitors and Attenuates Their Growth[22]	2016	121	0	Cell Stem Cell	23.9	Q1

GBS = Guillain-Barré syndrome, IF = impact factor, JCR = journal citation reports.

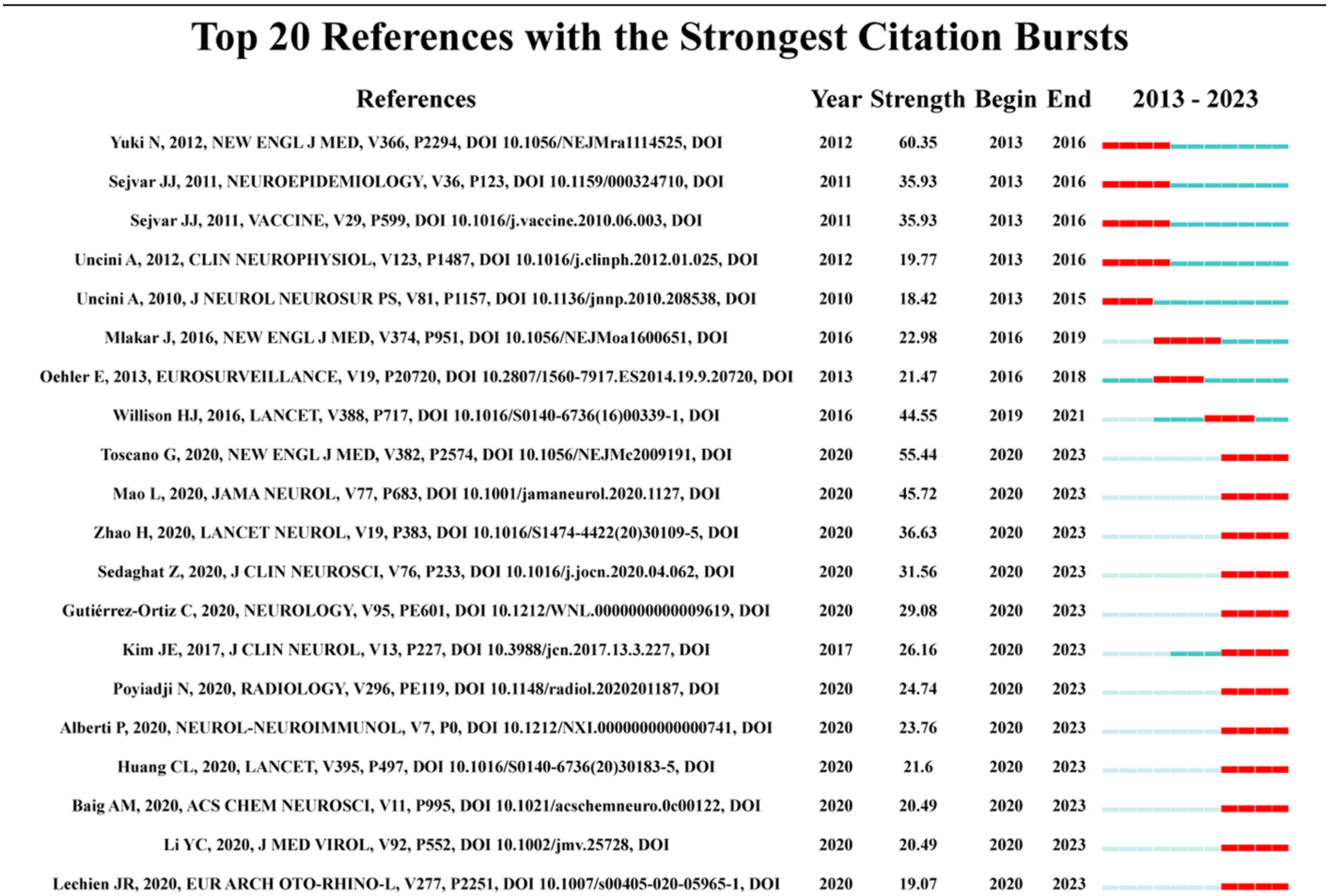

Figure 6. The visualization map of the top 20 references with the strongest citation bursts involved in Guillain-Barré syndrome.

4. Discussion

4.1. General information

In this study, the GBS-associated literature was analyzed using a bibliometric technique. Despite some fluctuations, the publication count on GBS has gradually increased over the past decade, indicating the active research on this topic in recent years. The year 2016 marked the 100th anniversary since GBS was first described. As a critical turning point for GBS, Willison et al[8] reviewed the significant progress in GBS and unresolved problems facing the field. The Lancet published a study titled "Guillain-Barre syndrome outbreak associated with Zika virus infection in French Polynesia: a case-control study,"[14] which first indicated the relationship between Zika

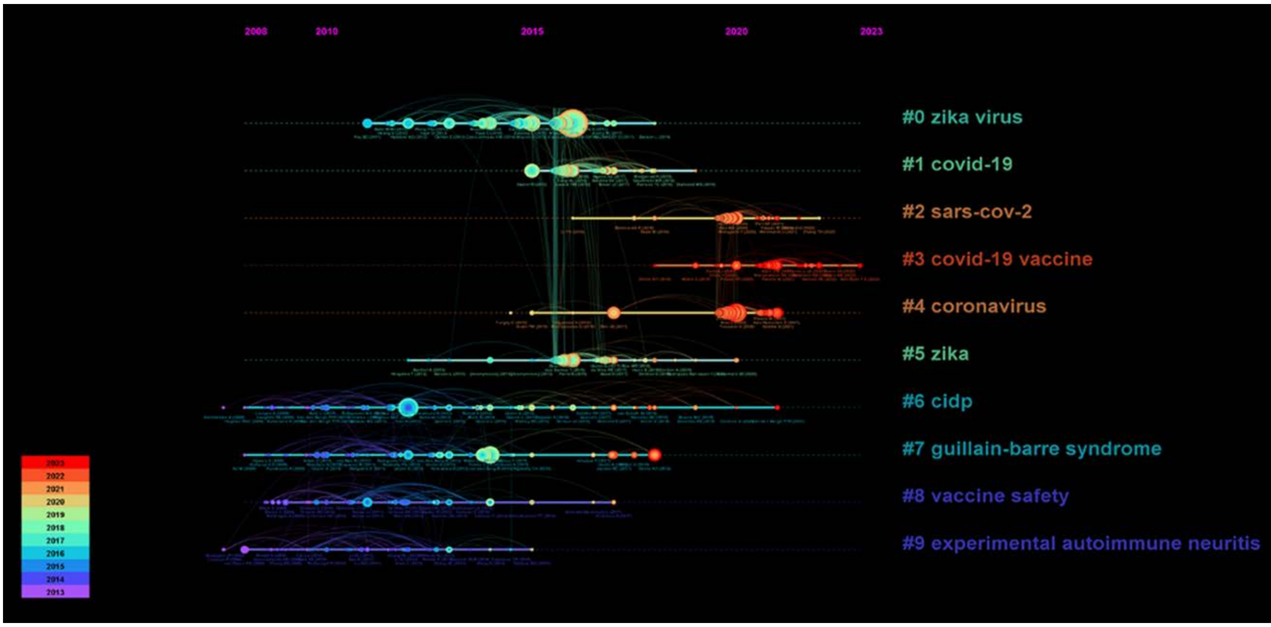

Figure 7. Timeline view of co-citation references for Guillain-Barré syndrome.

Table 6

Top 10 keywords related to Guillain-Barré syndrome.

Rank	Keywords	Count	Centrality
1	Guillain-Barré syndrome	2637	0.01
2	infection	492	0.01
3	zika virus	407	0.01
4	antibody	244	0.02
5	diagnosis	226	0.01
6	multiple sclerosis	204	0.02
7	disease	192	0.03
8	united states	187	0.03
9	transmission	180	0.02
10	outbreak	177	0.02

infection and GBS. Meanwhile, the whole genome of the Zika virus was extracted from fetal brain tissue by Mlakar et al[15] in the same year. In addition, 7 top references were published in 2016, a landmark year for GBS. These studies may result in the apparent increase of articles in 2016 and 2017. Then, the article number fluctuated in the following 2 years. With the COVID-19 epidemic in 2019, the total number of GBS-related articles increased from 2020 to 2022 and reached a peak in 2021 (572 publications). The significant increase in published papers in 2017 and 2021 was related to infection-related events, which may indicate the inseparable link between GBS and infection.

The top 10 countries/regions produced 93% of the world's articles. The USA ranks in the first position in literature number and centrality, showing its most persuasive community in this area. China has the second-highest number of publications despite being a developing country, indicating the rapid progress in this field during the past 10 years. Considering the lower centrality relative to the USA, China should devote more energy to publishing top-notch content in this field. In addition, centrality larger than 0.1 in countries like England, Italy, the Netherlands, and Germany indicated the role of a bridge for them. The USA has the most international cooperation in this field, while the collaboration among other countries is weaker. International cooperation is crucial for producing papers with high quality because the United States scores highly in publications, centrality, and institutional centrality. As a result, each nation should promote the growth of GBS studies by enhancing domestic and international cooperation and encouraging its institutions to participate in research.

The top 10 journals published 722 papers. Researchers can learn about GBS's study trends and frontiers by following these journals. Vaccine, Journal of the Peripheral Nervous System, and Muscle Nerve are the top 3 journals, indicating their special attention on GBS-related research. The journal ranking can provide a reference for submitting GBS-related studies. In addition, for the 10 highest cocited journals, the impact factor of 5 journals is higher than 10, and 7 journals are located in the Q1 region, demonstrating their substantial importance in this field. Publications of Molecular/Biology/Immunology magazines often cited publications from Molecular/Biology/Genetics magazines. While articles in Neurology/Sports/Ophthalmology and Medicine/Medical/Clinical magazines often cited publications from Molecular/Biology/Genetics and Health/Nursing/Medicine magazines. These ribbons illustrate the close connection between different disciplines of life sciences and the potential intersections between them; this connection will strengthen the communication and cooperation of related disciplines to make further contributions to the diagnosis and treatment of GBS.

4.2. Knowledge base

It is possible to deeply understand the knowledge base of this subject by analyzing these cocited references. The second, fourth, fifth, and sixth most cocited articles are review articles that introduced the etiology, pathogenesis, epidemiology, clinical characteristics, diagnosis, treatment, and prognosis of GBS.[8,16–18] These reviews have laid a solid foundation for deep study on GBS. The remaining 6 references were all related to the Zika virus. Among them, the article published in The Lancet in 2016 received the most citations,[14] as this article first confirmed the causality relation between Zika virus infection and GBS development, based on the infection outbreak in late 2013 and early 2014. The third-most cocited work published by Mlakar et al[15] identified the Zika virus in fetal brain tissue and retrieved its entire genome. In addition, Parra et al[19]

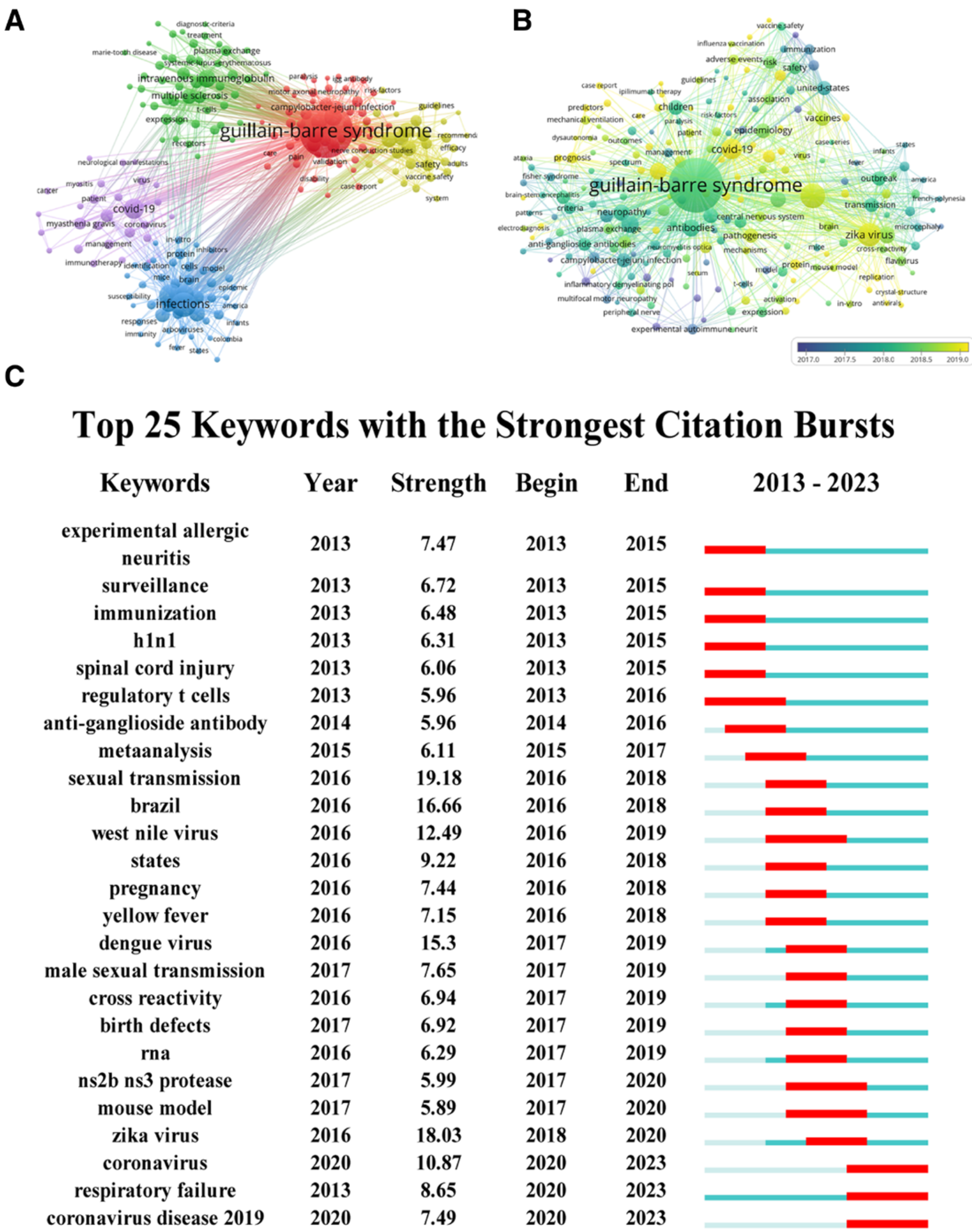

Figure 8. Analysis of keyword in the field of Guillain-Barré syndrome (GBS). (A) VOSviewer's cluster analysis of the keywords (T > 24). (B) The VOSviewer time-overlay keyword map visualization. (C) Visualization map of top 25 keywords with the strongest citation bursts related to GBS.

indicated that lower limb weakness (97%), sensory abnormalities (76%), and facial palsy (32%) were the primary symptoms of Zika-associated GBS in 2016. This study supports the point that infection plays an important role in the development of GBS. Even in the most well-equipped healthcare systems, the rise in GBS cases linked to the Zika virus threatens to exhaust hospital and intensive care resources. Compared to patients with conventional GBS, Zika virus-associated GBS patients have a great likelihood of requiring admittance to an intensive care unit for mechanical assistance. They also concluded that 31% of GBS patients need mechanical assistance, and 59% are admitted to intensive care unit. In the same year, a study of Zika virus-infected pregnant women by Brasil et al[20] found that at least 29% of Zika-positive women had fetal abnormalities. Unfavorable fetal outcomes have also been linked to Zika virus infection during gestation. However, the fetuses of Zika-negative women had no problems. Lazear et al[21] developed an animal model of the Zika virus in 2016 to study the Zika virus's clinical symptoms, such as GBS and birth defects, which is of substantial value for evaluating the effects of vaccines and treatments and comprehending the pathogenesis. In addition, researchers successfully simulated an important effect of Zika on neural development,[22] which provides a way to study the underlying cellular and molecular mechanisms. In our opinion, cocitation analysis can generally providebeneficial GBS-related data, as the 10 highest cocited references reflected the body of GBS research and offered a framework for future study.

4.3. Research hotspots

In this study, we indicated the leading 20 references with the strongest citation bursts. The red line in this figure depicts the time frame for each reference burst, while the green line spans from 2013 to 2023. The citation bursts of 12 articles appeared from 2020 to the present. Except for the 14th article,[23] which describes the correlation between Middle East respiratory syndrome and GBS, all of them are related to COVID-19.[24–33] These phenomena illustrate the correlation between GBS and COVID-19 infection, as well as the important impact of the COVID-19 epidemic on GBS. Meanwhile, these articles also warned clinical workers to pay attention to the damage of the peripheral nervous system caused by infection in clinical diagnosis and treatment.

The timeline chart and map of co-cited references identified key research themes and areas on GBS, respectively. The 2 latest study hotspots in this area are sars-cov-2 (#2), covid-19 vaccine (#3), and coronavirus (#4). In December 2019, the outbreak of COVID-19 devastated global health; 3 groups of the central nervous system (CNS), peripheral nervous system, and musculoskeletal appeared in neurological COVID-19 symptoms.[34] First, most people with severe COVID-19 have an acute cerebrovascular illness due to the inflammatory reaction of brain tissue, thrombotic microangiopathy, and endothelial injury.[35,36] Severe infection is prone to developing stroke, mainly in ischemic cases.[37] Despite the presence of the blood-brain barrier, COVID-19 can enter the CNS and cause deadly encephalitis and meningitis, acute disseminated encephalomyelitis, and encephalopathy.[38–40] Patients experienced elevated temperatures, headaches, vomiting, seizures, and consciousness disorders. Second, similar to GBS, COVID-19 infection also damages the peripheral nervous system, as the patients have areflexia and symmetric weakness in both lower limbs. Cerebrospinal fluid and electrophysiological examinations showed consistent characteristics with GBS.[25,28] Finally, most COVID-19 patients developed skeletal muscle dysfunction and myalgia, accompanied by an increase in creatine kinase levels.[41] These results suggest that COVID-19 dramatically impacts the nervous system. Despite the dire situation, there is no doubt that COVID-19 vaccines are a critical step towards the end of the global impact of the pandemic, and the benefits, both at the individual and group level, far outweigh the risk of neurological complications.[42]

The hotspots of a certain subject of study might be reflected in keywords. Other than "guillain-barre syndrome," the top keywords were "infection" and "zika virus," indicating that infection-related research is essential for further GBS studies with wild viral infections. "Burst keywords" are words that are regularly used in the conversation about a specific subject. They can be used to locate new areas of study.[43] Meanwhile, we found the burst keyword that the burst period lasted from 2020 to 2023 was associated with coronavirus and respiratory failure, which is consistent with the result above, indicating the importance of coronavirus in GBS and that research on coronavirus remains a hotspot for future research in this field. Based on the close association between virus infection and GBS, studies of the virus may be more helpful to understand the pathogenesis of GBS. In addition, the development of targeted drugs based on pathogenesis is expected to achieve precise treatment for patients with different types of GBS.

4.4. Limitations

This paper does, however, have certain limits for a number of reasons. First, even though WoSCC is recognized as the main publication source for bibliometric analysis, only 1 database was analyzed in this work. Second, there is a limited selection of papers in this research; the results may have been impacted by the selection of just English documents. Last but not least, the names of the same institution might change throughout time.

5. Conclusion

In brief, we represent the first study to illustrate the research trends and hotspots in the GBS field using CiteSpace and VOSviewer. The study identifies the prominent contributing countries/regions, institutions, authors, and journals in the discipline. In the literature's co-citation analysis and keyword analysis, we found that the relation between coronavirus, COVID-19 infection, and GBS development were the research hotspots in recent years. Future research should strengthen the cooperation and communication between various research groups and regions on the pathogenesis of GBS and explore therapeutic targets to provide precise treatment for different GBS patients.

Author contributions

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