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ORIGINAL RESEARCH

Comprehensive Bibliometric Analysis of Research Articles on Post-Herpetic Neuralgia and Varicella-Zoster Virus: A 20-Year Review (2003–2022)

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Objective: Post-herpetic neuralgia (PHN) is a debilitating condition that has garnered considerable attention from pain physicians due to its association with the or Varicella-Zoster Virus (VZV). In this study, we aimed to conduct a bibliometric analysis to quantitatively assess the research outcomes related to PHN and VZV over the past two decades (2003–2022).

Methods: We conducted a bibliometric analysis by querying the Web of Science database for articles related to PHN published from 2003 to 2022. In this analysis, we collected relevant information from the database including the number of publications, publication year, source, country, institution, and citation data.

Results: A total of 1073 publications were extracted from the database, with 387 articles (36.1%) being authored by individuals from the United States, making it the leading country in terms of article publications. The top ten institutions that made significant contributions to research on PHN and VZV were primarily concentrated within the United States. Notably, the New England Journal of Medicine and Pain claimed the two highest positions in terms of citation count, with 2482 and 1591 citations, respectively. The topics covered in these articles mainly revolved around "Postherpetic Neuralgia", "Herpes Zoster", "Epidemiology", "Vaccine", and "Quality-of-life".

Conclusion: Over the past two decades, there has been a gradual increase in publications on PHN and VZV, demonstrating significant advancements in academic achievements. Vaccines have proven effective in reducing PHN incidence among the elderly, but there is a lack of research on interventional treatments and underlying mechanisms. To elevate evidence-based medicine, researchers should conduct more controlled clinical trials. Additionally, leveraging pathogenesis research findings can lead to the development of better pain relief medications.

Keywords: bibliometrics, postherpetic neuralgia, herpes zoster virus, varicella-zoster virus, CiteSpace, VOSviewer

Introduction

Postherpetic neuralgia (PHN) is a common and challenging complication of herpes zoster (HZ) or Varicella-Zoster Virus (VZV), characterized by chronic neuropathic pain. PHN refers to the persistent HZ-related pain that persists for at least 3 months after the onset of the HZ rash.[1,2] Studies have indicated that around 13% of patients aged 50 or older with shingles develop PHN, and more than 30% of individuals with PHN endure pain lasting longer than a year.[3,4]

PHN is linked to various types of pain, such as persistent or intermittent pins-and-needles sensation, sharp knife-like pain, burning resting pain, increased sensitivity to painful stimuli (nociceptive hyperalgesia), and pain triggered by touch. This chronic pain can lead to anxiety, depression, sleep disturbances, and even reduced life expectancy in older patients. Given its widespread occurrence and substantial impact on quality of life, the prevention and treatment of PHN are crucial responsibilities for pain physicians.[5] The incidence of PHN varies depending on several factors, including

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geographical location and population characteristics. Studies have reported incidence rates ranging from 10% to 30% among individuals who experience herpes zoster.[6] The duration of pain associated with PHN can also vary, with some individuals experiencing pain for months or even years after the initial herpes zoster rash has resolved.[7] There is evidence to suggest that certain factors may increase the risk of developing PHN. These include the severity and duration of the acute herpes zoster pain, the presence of prodromal symptoms, such as intense itching or burning, and the involvement of multiple dermatomes.[8] Additionally, individuals with compromised immune systems, such as those with HIV infection or receiving immunosuppressive therapy, may have an increased risk of developing PHN.[9] It can also result in increased healthcare utilization and costs, including visits to healthcare providers and the use of pain management strategies.[10]

The impact of PHN on individuals and society is substantial. The chronic pain associated with PHN can significantly impair quality of life, leading to physical, emotional, and social limitations.[11] Excessive inflammatory responses in neurons, which result in reduced central nervous system (CNS) mechanisms inhibiting harmful inputs, along with damaged injury receptors promoting sensitization of peripheral neurons, are believed to be the primary underlying cause of PHN.[12,13] Understanding the epidemiology[14] and mechanism of PHN[15] is crucial for developing effective prevention and management strategies to alleviate the burden of this chronic pain condition. And help to reduce the economic burden on the family and the society.

Bibliometric analysis is a useful method for quantitatively and qualitatively identifying research trends in specific fields.[16] It offers valuable insights into future research directions by analyzing articles or books within a given field during a specific timeframe. This approach enables researchers to effectively identify emerging research topics.[17] Furthermore, bibliometric analysis enables researchers to gain a comprehensive understanding of the research landscape, including active countries, institutions, and authors involved.[18] It helps identify noteworthy scientific publications and significant topics that have emerged thus far, while also highlighting areas that may require further exploration, and use of the information visualization tools to showcase research progress, current status, hot topics, and development trends in specific disciplinary domains.[19] Although bibliometric analysis has been widely utilized to identify research trends in different medical disciplines, such as pain medicine, there is a scarcity of studies that have specifically employed this approach for investigating research related to PHN.[20–22]

Hence, our objective was to conduct a quantitative analysis of the research outputs pertaining to PHN in the context of VZV-related studies published worldwide between 2003 and 2022. Through this comprehensive examination of relevant literature, we aimed to identify potential mechanisms underlying PHN and explore future research directions in this field.

Method

Data Sources and Search Strategies

We performed a bibliometric analysis on PHN research articles published from 2003 to 2022, utilizing the widely-used Web of Science Core Collection (WOSCC) database. Our search terms included “Postherpetic neuralgia” and “Herpes Zoster” or “Varicella-Zoster Virus”. After excluding articles published in 2023 and those not written in English, we identified a total of 1417 original articles and reviews that met our inclusion criteria for analysis.

Data Processing

Initially, we extracted the relevant data from the SCI-Expanded database of WOSCC, capturing information such as the number of papers and citations, H-index, publication year, countries/regions, affiliations, authors, journals, references, and keywords. Subsequently, we manually removed duplicate authors, reviews, and other article types for the purpose of analysis. A total of 1073 articles meeting the inclusion criteria were retrieved from the WoS database (Figure 1A). The articles were exported in plain text format, including full records and cited references, and saved as *.txt files.

Bibliometric Analysis

Two researchers independently analyzed the data to ensure the accuracy of the data and the repeatability of the research. This study used CiteSpace V6.2.R3, 64 bit and VOSviewer 1.6.9 to identify top authors, journals, sources, institutions, countries, co-occurrence of keywords, co-cited journals, co-cited articles, and trends.

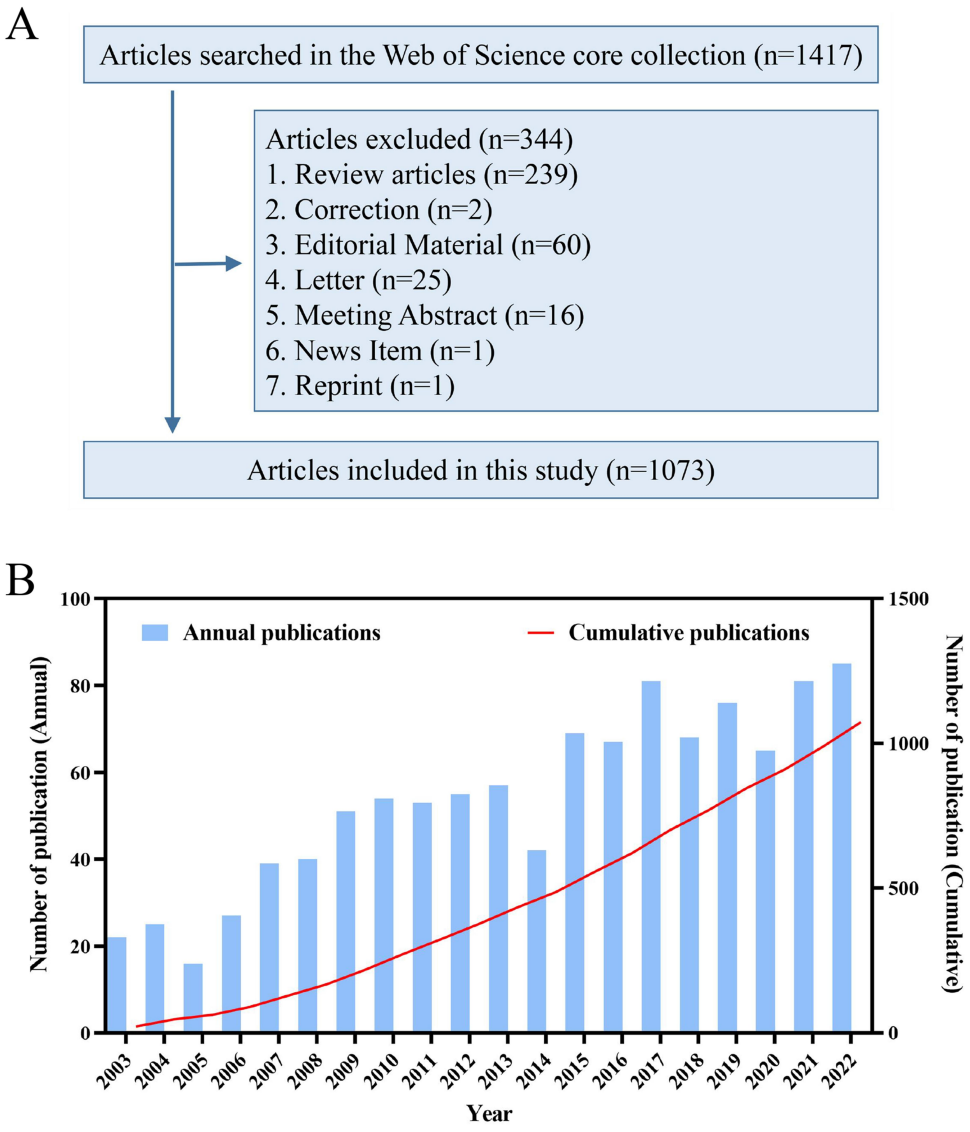

Figure 1 (**A**) Schematic diagram of searching and screening documents; (**B**) Annual and cumulative numbers of publications from 2003 to 2022.

CiteSpace, developed by Professor Chaomei Chen, is a Java application widely used for visualizing and analyzing trends and patterns in scientific literature.[23–26] Another useful tool, VOSviewer, created by Leiden University in the Netherlands, is a freely available software that enables the creation of accessible maps using bibliographic data.[27–29]

Results

Bibliometric Analysis of Publication Outputs

Following the screening process (Figure 1A), a total of 1073 related articles were identified in the bibliometric analysis (the year from 2003–2022). Figure 1B provide insights into the annual and cumulative publications. The results revealed a consistent upward trend in the number of papers published. These findings indicate a growing interest among researchers in this particular field.

Bibliometric Analysis of the Most Influential Journals, Publications, and Authors

In the realm of PHN and VZV or HZ, an extensive analysis uncovered a rich body of research consisting of 377 published journals devoted to this field. Among these, 51 journals have proven particularly dedicated, each publishing at least 5

articles on the subject. It is worth highlighting the remarkable influence of the New England Journal of Medicine (NEJM) and Pain, securing the top two positions in terms of citations with 2482 and 1591 respectively. Undoubtedly, these two journals stand as pillars of authority, boasting the highest number of accumulated citations.

In fact, the top 15 most productive journals, which include the aforementioned two, have collectively contributed 255 articles, amounting to a significant 23.8% of the total publications (as illustrated in Table 1). Their substantial body of work has undeniably played a pivotal role in advancing the knowledge and understanding of PHN and VZV.

Over the past two decades, a total of 29,991 citations have been recorded for articles worldwide that delve into the realm of PHN and VZV. Table 2 presents the top 10 most cited articles directly relevant to PHN and VZV, focusing on topics such as the utilization of the herpes zoster vaccine, the therapeutic efficacy of pain medications, epidemiological insights into PHN and VZV, and identification of risk factors for pain occurrence.

In Table 3, we find the esteemed individuals who have made the most significant contributions to the field of PHN and VZV in terms of citation impact. Notably, Professor Levin, Myron J, renowned for his expertise in the Section of Pediatric Infectious Diseases at the Department of Pediatrics, University of Colorado School of Medicine, emerges as the leading figure among these influential authors. His remarkable body of work has been instrumental in advancing the understanding of PHN and VZV through insightful studies and groundbreaking research.

Table 1 Top 15 Journals in the Literature Contributors of the PHN

Rank	Journal	Number of Documents	Count of Citations	IF (2022)
1	New England Journal of Medicine	5	2482	176.079
2	PAIN	21	1591	7.926
3	Clinical Infectious Diseases	16	1564	20.999
4	Journal of Pain	18	1294	5.383
5	Vaccine	37	1232	4.169
6	Journal of Infectious Diseases	19	1216	7.759
7	Mayo Clinic Proceedings	9	1067	11.104
8	Neurology	6	1063	11.800
9	BMC Infectious Diseases	26	691	3.667
10	Journal of Clinical Virology	9	546	14.481
11	Clinical Journal of Pain	17	523	3.423
12	Ophthalmology	6	500	14.277
13	Pain Physician	33	450	4.396
14	Annals of Internal Medicine	6	375	51.598
15	Human Vaccines and Immunotherapeutics	27	363	4.526

Table 2 The Top 15 Most Influential Articles on PHN and VZV

Rank	Title	Citations	Year	PMID
1	A vaccine to prevent herpes zoster and postherpetic neuralgia in older adults	1584	2005	15930418
2	Pregabalin for the treatment of postherpetic neuralgia: a randomized, placebo-controlled trial	557	2003	12707429
3	A population-based study of the incidence and complication rates of herpes zoster before zoster vaccine introduction	557	2007	17976353
4	Efficacy of the herpes zoster subunit vaccine in adults 70 years of age or older	524	2016	27626517
5	Treatment of neuropathic pain: an overview of recent guidelines	512	2009	19801049
6	Risk of herpes zoster in patients with rheumatoid arthritis treated with anti-TNF-alpha agents	400	2009	19224750
7	The incidence of herpes zoster in a United States administrative database	351	2005	16050886
8	Efficacy, safety, and tolerability of herpes zoster vaccine in persons aged 50–59 years	296	2012	22291101
9	External noninvasive peripheral nerve stimulation treatment of neuropathic pain: a prospective audit	275	2014	25308421
10	Varicella zoster virus infection	269	2015	27188665

Table 3 Top 10 Influential Authors in Citation Analysis in PHN and VZV

Rank	Author	Number of Documents	Count of Citations
1	Levin, Myron J.	25	1840
2	Schmader, Kenneth E.	18	1587
3	Oxman, Michael N.	12	1344
4	Chan, Ivan s. F.	13	1142
5	Dworkin, RH	5	1128
6	Dworkin, Robert H.	10	1108
7	Saddier, Patricia	7	1021
8	Yawn, Barbara p.	9	1007
9	Harpaz, Rafael	20	972
10	Wollan, Peter c.	6	930

Table 4 Top 10 Influential Institutions and Countries in Citation Analysis in the PHN and VZV

Rank	Organization	Documents	Citations	Rank	Country	Documents	Citations
1	University of Colorado	39	5408	1	USA	387	18,583
2	University of Rochester	23	4559	2	China	247	2136
3	Duke University	31	3991	3	England	80	4456
4	University of California, San Diego	23	3856	4	Japan	77	2485
5	Merck Research Laboratories	16	3558	5	Belgium	65	1926
6	Durham Veterans Affairs Medical Center	13	2709	6	South Korea	62	646
7	National Institute of Allergy and Infectious Diseases	10	2614	7	Germany	61	2161
8	Columbia University	7	2383	8	Canada	60	2495
9	University of California, Los Angeles	6	2117	9	Italy	47	974
10	Veterans Affairs San Diego Healthcare System	5	2061	10	France	47	1265

Bibliometric Analysis of the Most Contributed Institutions and Countries

Table 4 provides a comprehensive analysis of the top 10 influential institutions that have played a pivotal role in the field of PHN and VZV research. Remarkably, the University of Colorado and University of Rochester stand out, amassing an impressive total of 33,256 citations for their contributions. Meanwhile, the top 10 productive countries, led by the United States and the People's Republic of China, collectively account for 37,127 citations in articles related to PHN and VZV. Through the aid of Figure 2, we

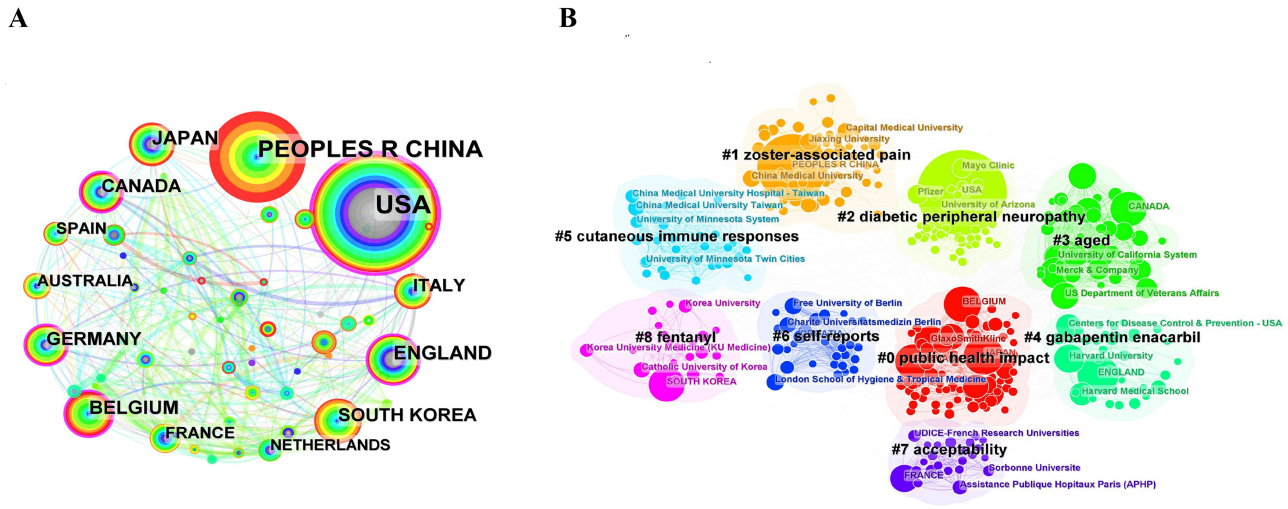

Figure 2 Visualization of the top 10 countries (**A**) and journals (**B**) in the literature contributors of PHN and VZV using Citespace according to different clusters.

visually explore the distribution of these articles across different clusters, uncovering the primary focus on pain related to the herpes zoster vaccine and its broader public health impact.

Notably, our findings emphasize the significant contributions made by the top 10 institutions, particularly highlighting the United States' leading position in driving research pertaining to VZV and PHN. Moreover, the United States stands out for its involvement in studies related to diabetic peripheral neuropathy, showcasing the breadth of their engagement in pain-related research.

Bibliometric Analysis of Co-Cited Journals and Authors

Between the years 2003 and 2022, an extensive analysis identified a total of 12,706 co-cited authors in the field. Among them, 258 authors received noteworthy recognition, each accumulating at least 20 citations. Notably, "Dworkin, rh" emerges as the most frequently co-cited author with an impressive 756 citations, followed closely by "Oxman, MN" with 516 citations. "Johnson, rw" also secured significant co-citations with 402 citations, securing the third position in the list (Table 5). To visually represent the intricate network of co-cited authors, cutting-edge software such as CiteSpace and VOSviewer was employed. The resulting network is beautifully illustrated in Figure 3A and B.

VOSviewer has identified a total of 4458 co-cited journals, with 255 of them receiving over 20 citations. Notably, the journal "Pain" takes the lead in co-citations with an impressive 1944 citations, closely followed by NEJM with 1597 citations. The Journal of Infectious Diseases with 1154 citations, and Vaccine with 1121 citations. In addition to co-citations, the impact factor (IF) of journals also serves as an important metric in the academic community. The NEJM stands out with the highest Impact Factor (IF=158.5), followed by Clinical Infectious Diseases (IF=11.8), Neurology (IF=9.9), and Mayo Clinic Proceedings (IF=8.9), we can see these results in Table 6.

To visually represent the network of co-cited journals, advanced software like CiteSpace and VOSviewer were utilized. The resulting network can be observed in Figure 3C and D.

Keyword Co-Occurrence Analysis, Bursts and Time Zone Analysis

In our study, we conducted keyword co-occurrence analysis using VOSviewer to gain valuable insights into the trends and evolution of research in the field. Table 7 presents the top 20 co-occurrence keywords, with "postherpetic neuralgia" standing out as the most frequent occurrence (n = 811), closely followed by "herpes zoster" (n = 732), "pain" (n = 249), "epidemiology" (n = 212), and "neuropathic pain" (n = 209), among others. Figure 4 visually displays the progression path and evolution of 10 cluster names over time (Figure 4A), along with a time-zone map of the keywords (Figure 4B). From 2003 to 2010, the primary focus revolved around topics like "VZV", "vaccine", "postherpetic neuralgia", and "epidemiology". However, from 2011 to 2022, there was a noticeable shift in focus towards "hyperalgesia", "inflammation", "chronic neuropathic pain", and "zoster-associated pain".

Additionally, Figure 5 highlights the top 23 keyword bursts observed between 2003 to 2022. Notably, there has been a growing interest in "immunization", indicating a transition in research focus from the epidemiology of PHN towards investigating the underlying mechanisms, potentially involving immune responses. These findings suggest a dynamic and

Table 5 The Top 10 Authors in Co-Citation Analysis

Rank	Author	Citations	Institution
1	Dworkin, RH	756	University of Rochester School of Medicine and Dentistry
2	Oxman, MN	516	University of California San Diego School of Medicine
3	Johnson, RW	402	Vanderbilt University Medical Center
4	Yawn, BP	369	Olmsted Medical Center
5	Schmader, KE	315	Duke University Medical Center and Geriatric Research
6	Gnann, JW	272	University of Alabama at Birmingham
7	Schmader, K	268	Durham VA Medical Center
8	Brisson, M	267	Laval University
9	Opstelten, W	254	University Medical Center Utrecht
10	Kawai, K	235	Global Health Outcomes

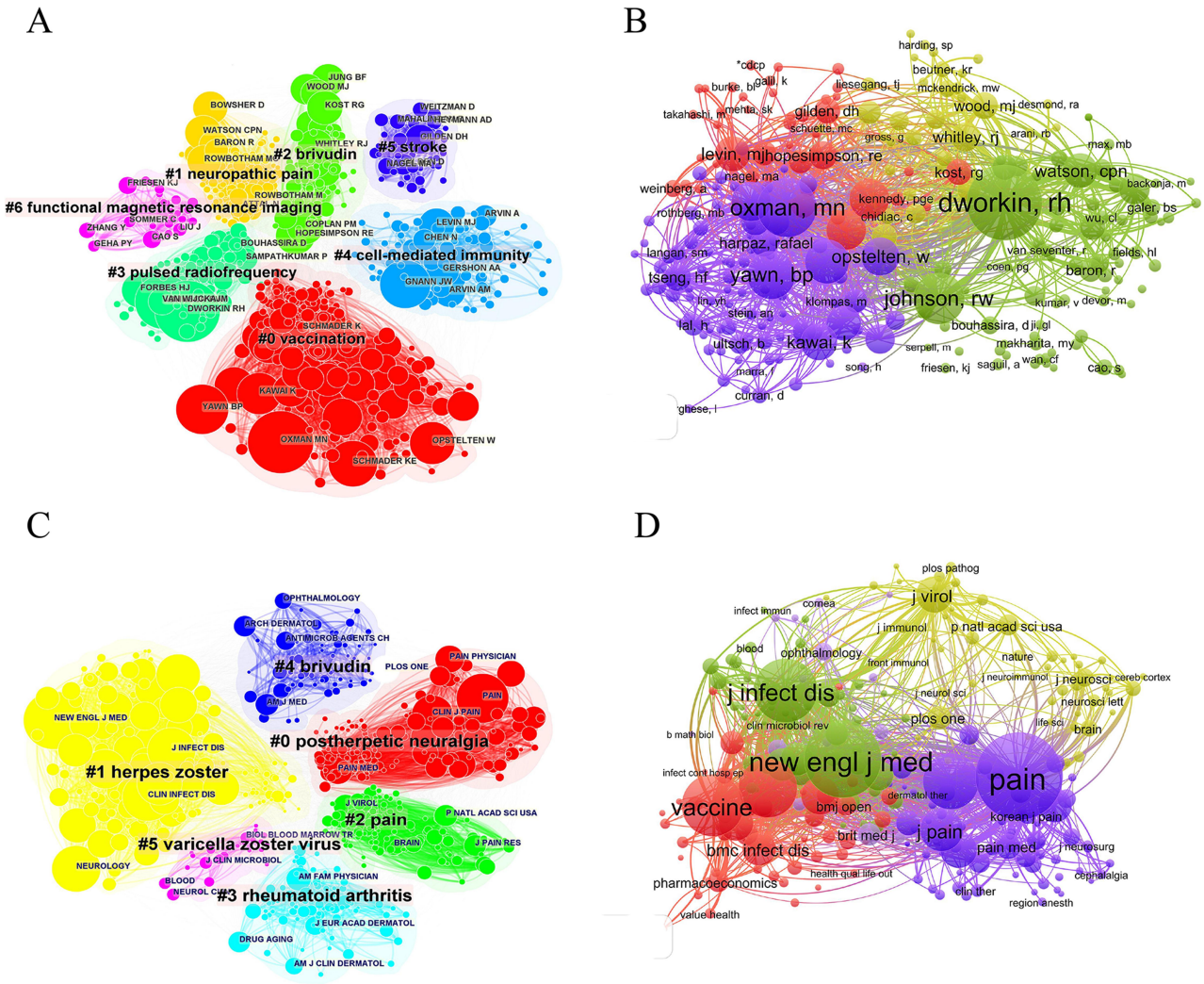

Figure 3 The co-cited authors (**A** and **B**) and co-cited journals (**C** and **D**) in the literature related to PHN and VZV were visualized and analyzed using Citespace and VOSviewer software.

evolving landscape in the research of PHN and VZV, with a clear shift towards exploring the mechanistic aspects and potential implications of immunization.

By employing VOSviewer, we were able to identify a significant total of 17,330 co-cited references spanning the past 20 years. These frequently co-cited references form the bedrock of specific research areas, serving as

Table 6 The Top 10 Journals in Co-Citation Analysis

Rank	Journals	Citations	IF (2022)	JCR (2022)
1	PAIN	1944	7.4	Q1
2	New England Journal of Medicine	1597	158.5	Q1
3	The Journal of Infectious Diseases	1154	6.4	Q2
4	Vaccine	1121	5.5	Q3
5	Clinical Infectious Diseases	1014	11.8	Q1
6	Neurology	946	9.9	Q1
7	The Journal of Pain	610	4.0	Q2
8	Mayo Clinic Proceedings	497	8.9	Q2
9	The Clinical Journal of Pain	477	2.9	Q2
10	Journal of Virology	461	5.4	Q2

Table 7 The Top 20 Co-Occurrence Keywords on the PHN and VZV

Rank	Keyword	Occurrences	Rank	Keyword	Occurrences
1	Postherpetic Neuralgia	811	11	Risk-Factors	117
2	Herpes Zoster	732	12	Shingles	116
3	Pain	249	13	Virus	115
4	Epidemiology	212	14	Impact	114
5	Neuropathic Pain	209	15	Varicella	114
6	Vaccine	144	16	Double-Blind	100
7	Management	128	17	Infection	83
8	Prevention	125	18	Burden	76
9	Quality-of-life	123	19	Cost-Effectiveness	71
10	Efficacy	120	20	Risk	71

crucial foundations for scholarly work. In Table 8, we present the top 10 co-cited references, each receiving more than 20 citations. Among these, one of the most highly cited references originates from the NEJM. This particular reference explores the utilization of the herpes zoster vaccine as a preventive measure against the occurrence of PHN in elderly patients. To gain further insights, we performed a visual analysis of these co-cited

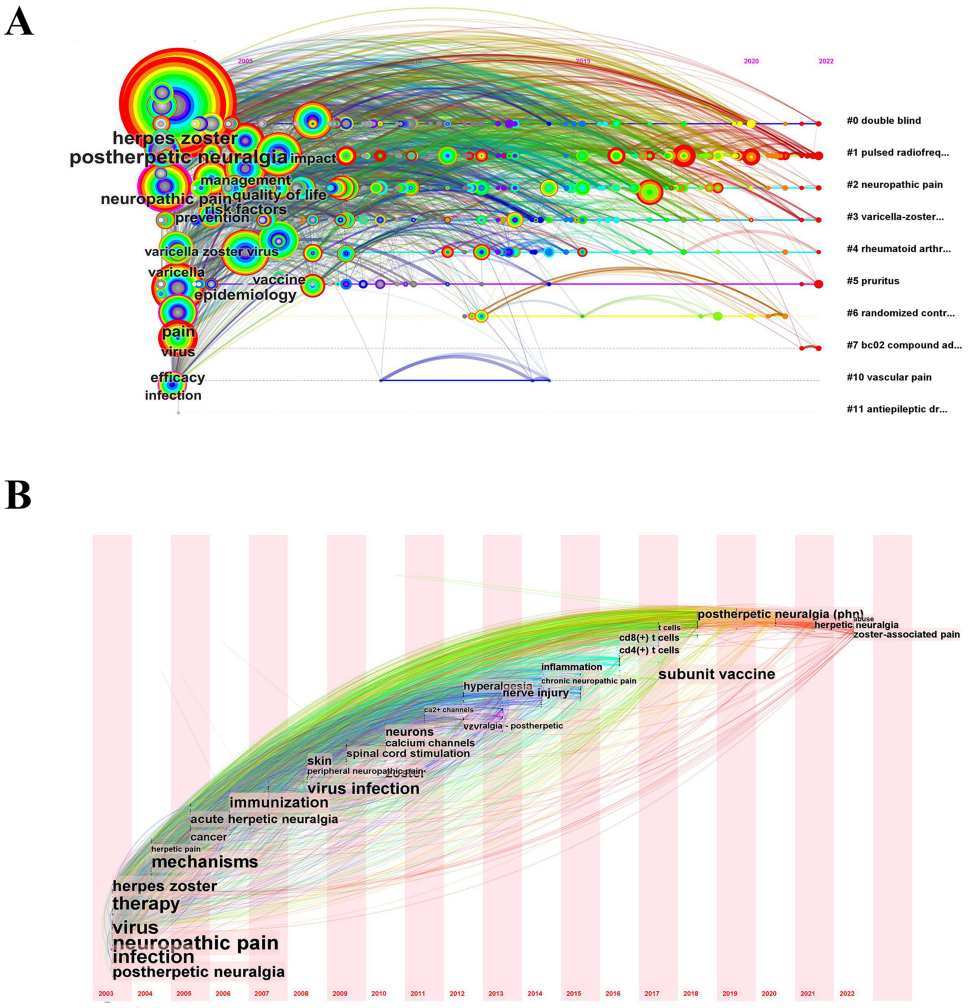

Figure 4 The software Citespace was employed to conduct timeline and time zone analysis of the key terms found in the literature related to PHN and VZV.
Notes: (**A**) The progression path and evolution of the 10 cluster names over time. (**B**) Time-zone map of the keywords.

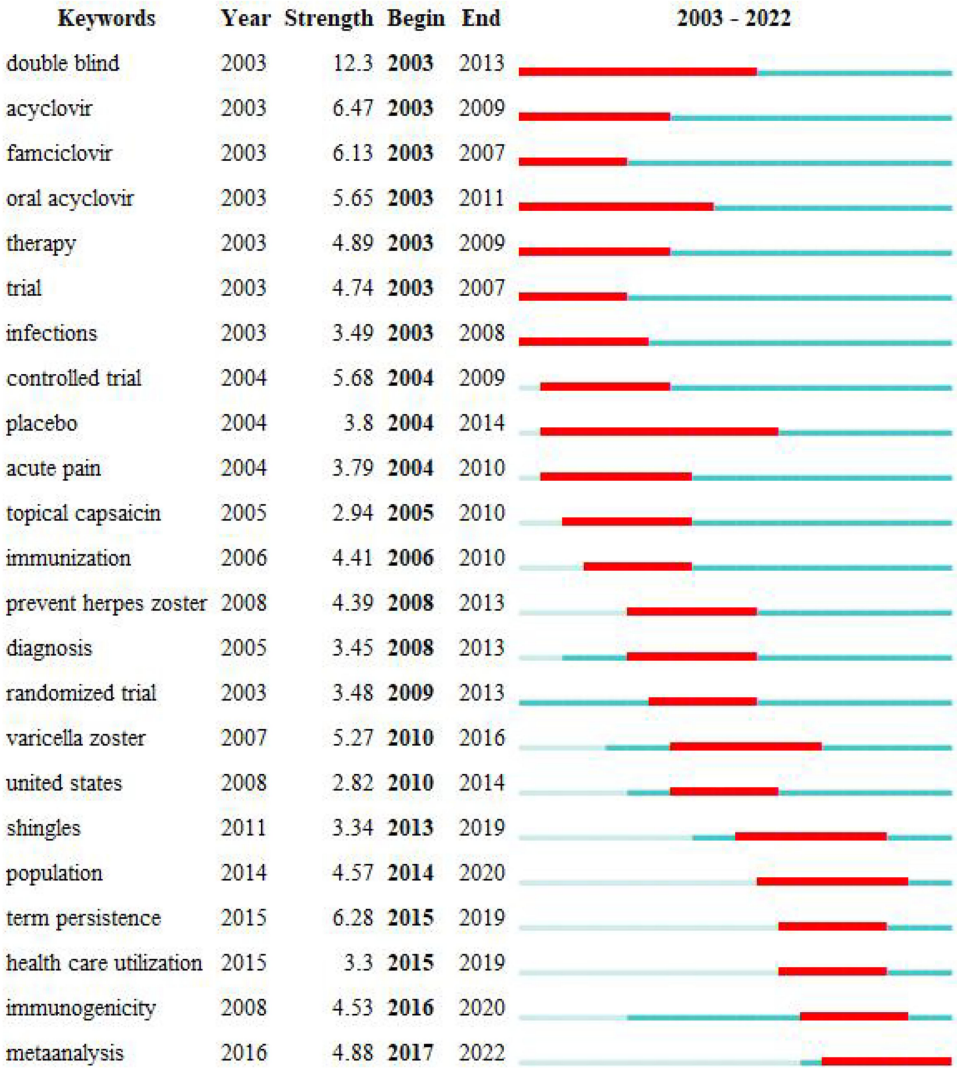

Figure 5 Top 23 keywords with citation bursts (by the beginning year).

documents, grouping them into clusters and conducting subject analysis of keywords (Figure 6). From the results, it becomes evident that the main disciplines represented in this literature revolve around the burden of PHN and effective strategies to prevent its occurrence. Notably, the focus also includes research on the use of vaccines as a potential preventive approach.

Table 8 Top 10 Cited References of Co-Citation on PHN and VZV

Rank	Cited Reference	Citations
1	Oxman MN, 2005, New Engl J Med, doi 10.1056/nejmoa051016	390
2	Gnann JW, 2002, New Engl J Med, doi 10.1056/nejmcp1302674	233
3	Yawn BP, 2007, Mayo Clin Proc, doi 10.4065/82.11.1341	185
4	Harpaz R, 2007, Morbidity and Mortality Weekly Report, v57, p1	151
5	Hope-Simpson RE, 1965, P Roy Soc Med, doi 10.1177/003591576505800106	150
6	Kawai K, 2014, BMJ Open, doi 10.1136/bmjopen-2014-004833	138
7	Kost RG, 1996, New Engl J Med, doi 10.1056/nejm199607043350107	128
8	Coplan PM, 2004, J Pain, doi 10.1016/j.jpain.2004.06.001	127
9	Dworkin RH, 2007, Clin Infect Dis, doi 10.1086/510,206	117
10	Donahue JG, 1995, Arch Intern Med, doi 10.1001/archinte.155.15.1605	116

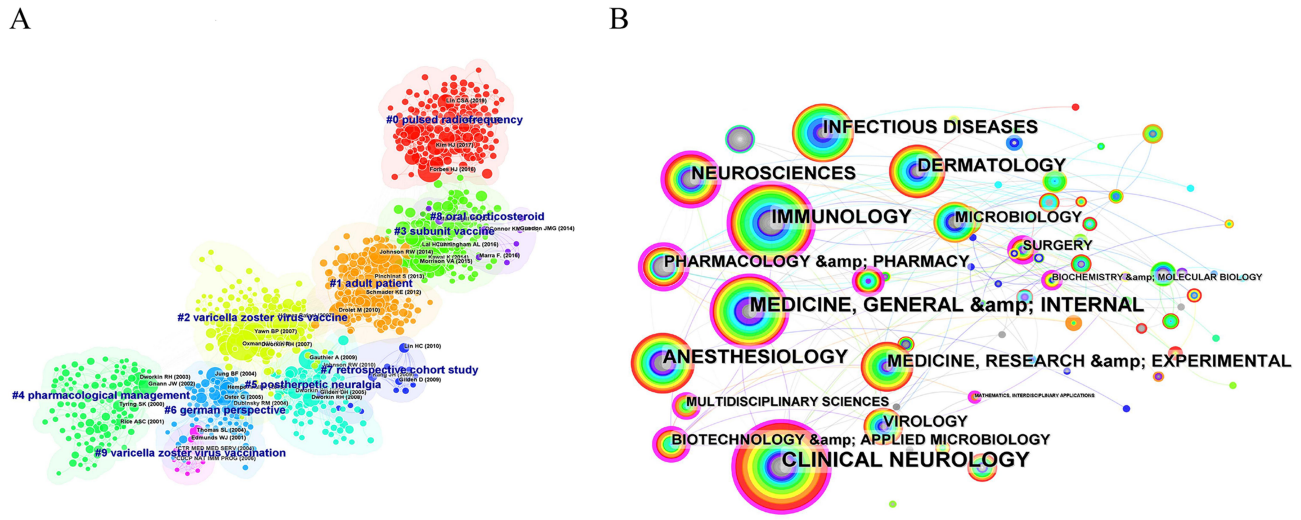

Figure 6 Cluster Analysis of Keywords and Disciplines in Co-Citation Articles of PHN and VZV Using Citespace Software.
Notes: (**A**) Cluster analysis was performed on all co-cited articles by keywords. (**B**) The subject analysis to which these keywords belong.

Discussion

In this study, a total of 1073 articles were included based on our search strategy and screening criteria. The findings revealed a consistent increase in research interest regarding VZV-related PHN over the past two decades. Initially, the focus was on clinical manifestations and risk factors associated with PHN pain. Subsequently, researchers shifted towards investigating the effectiveness of VZV vaccines in preventing PHN development. More recently, there has been growing attention towards immune-related mechanisms underlying the development of PHN. However, studies exploring the mechanisms of PHN occurrence still remain relatively limited. Our study provides valuable insights for future research, particularly in investigating the mechanisms of PHN occurrence and addressing the economic burden associated with its occurrence. Notably, we observed a significant number of authors and institutions contributing to research on vaccination.

Several related studies have proposed that vaccination can play a crucial role in significantly reducing the incidence and severity of PHN.[30–32] However, despite these advancements, the precise mechanisms behind the progression from HZ to PHN remain unclear.[33,34] Thus, further research is imperative to gain a deeper understanding of this disease's progression and pave the way for more effective prevention and treatment strategies for PHN.[35] Furthermore, our study highlighted a notable concentration of the top ten research institutions in PHN and VZV, primarily located in the United States. This observation indicates that the United States has been at the forefront of not only PHN and VZV research but also studies related to diabetic peripheral neuropathy.[36,37] The growing interest of authors and institutions in preventing the occurrence of PHN before its onset reflects a significant shift in research focus, aiming to alleviate the economic burden on society associated with this condition.

Currently, the treatment options for PHN include painkillers,[38] nerve blocks,[39] and electrical stimulation.[40] However, there is relatively limited research on nerve blocks and electrical stimulation at present. Vaccine research has undergone extensive investigation, with reports suggesting that it can effectively reduce the incidence of PHN in the elderly. However, for patients already experiencing PHN, how to achieve effective treatment remains a subject of significant concern and warrants our attention. In order to enhance the evidence of interventional treatments for PHN[41] and establish evidence-based medicine, it is necessary to design multicenter clinical controlled trials to validate the effectiveness of PHN-related interventions.

This study offers scientifically and clinically instructive insights. It highlights advancements in PHN and VZV research, emphasizing the efficacy of vaccines in reducing PHN incidence among the elderly. The identified research gap calls for more trials and an improved understanding of interventions and underlying mechanisms. Additionally, leveraging pathogenesis research findings can lead to the development of more effective pain relief medications. Overall, this

review guides future research and informs healthcare practices in preventing and managing PHN and VZV-related conditions.

Our study has several limitations that warrant acknowledgment. Firstly, we exclusively relied on the WoS database for retrieving publications, which could potentially impact the generalizability of our findings due to the database's inherent coverage limitations.

It is important to note some limitations of our study. Firstly, the WoS database primarily indexes journals from the science citation index expanded, which may result in a potential bias towards certain research fields. Additionally, our inclusion criteria were limited to English-language publications, potentially excluding valuable contributions in other languages and cultures. This language bias could have affected the overall comprehensiveness of our analysis. Moreover, our assessment of research topic importance and trends was based on the co-occurrence of terms within titles, abstracts, and keywords, limiting our ability to delve into the specific details of each publication. Lastly, we did not account for the varying contributions of authors or institutions in collaborative studies involving multiple institutions or authors from different countries, potentially introducing bias in the distribution of institutions and countries in our analysis. In conclusion, while acknowledging these limitations, we encourage future studies to address these challenges for more robust and comprehensive research in this field.

Conclusion

Using bibliometric analysis, we conducted a comprehensive investigation into the academic trajectory of research pertaining to PHN over the past two decades. Our findings revealed a consistent and growing interest among researchers in the domain of PHN and VZV. Nevertheless, we also proposed a future research direction aimed at advancing PHN-related studies. We underscored the significance of pain physicians in establishing strong academic evidence to support interventional treatments, thereby expanding their role within the field. This expansion can lead to improved patient outcomes for both PHN and VZV cases. We underscored the significance of pain physicians in establishing strong academic evidence to support interventional treatments, thereby expanding their role within the field. This expansion can lead to improved patient outcomes for both PHN and VZV cases.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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