

# Bibliometric Analysis of Human Metapneumovirus Studies

Işıl Deniz Alıracı<sup>1</sup> , Taylan Çelik<sup>2</sup> , Semiha Çelik-Ekinci<sup>3</sup> , Aziz Ahmad Hamidi<sup>3</sup> 

<sup>1</sup> Department of Infectious Diseases and Clinical Microbiology, Çanakkale 18 Mart University Hospital, Çanakkale, Türkiye

<sup>2</sup> Department of Pediatri, Çanakkale 18 Mart University Hospital, Çanakkale, Türkiye

<sup>3</sup> University of Health Sciences, Fatih Sultan Mehmet Training and Research Hospital, Istanbul, Türkiye

## ABSTRACT

**Objective:** This study aimed to estimate research productivity and general characteristics of research in different regions of the world in the field of human metapneumovirus (hMPV).

**Materials and Methods:** We used the Web of Science (WoS) electronic database to retrieve articles on “human metapneumovirus,” published up to March 31, 2023. Parameters such as research productivity, the total number of publications, average citation counts of all articles, research productivity by top publishing countries and affiliated organizations, links between countries/organizations, and top keywords were assessed.

**Results:** We found 826 articles in the WoS database. The first article on hMPV was published in 2002, and 2008 was the year that the most articles on hMPV were published, with 70 articles. The articles were cited 26,797 times (14,498 times without self-citations) and 32.25 times on average per article. Hirsch (H)-index was 80. The year 2008 also had the highest number of citations, with more than 1800. The United States was the most productive country, producing 295 documents (35.714%), one-third of all publications in this field worldwide. Canada (6.5%) and Japan (6.5%) followed the United States regarding total hMPV publications worldwide. The leading funding agencies for hMPV research were from the United States, Europe, China, and Japan.

**Conclusion:** Our findings imply that developed countries should assist developing countries in enhancing their research infrastructures.

**Keywords:** bibliometric analysis, publication, hMPV, human metapneumovirus

## Corresponding Author:

Işıl Deniz Alıracı

## E-mail:

isildeniz.aliravci@comu.edu.tr

**Received:** June 5, 2023

**Accepted:** September 6, 2023

**Published:** December 29, 2023

## Suggested citation:

Alıracı ID, Çelik T, Çelik-Ekinci S, Hamidi AA. Bibliometric analysis of human metapneumovirus studies. Infect Dis Clin Microbiol. 2023;4:311-22.

**DOI:** 10.36519/idcm.2023.250



## INTRODUCTION

**H**uman metapneumovirus (hMPV) is an enveloped, single-stranded ribonucleic acid (RNA) virus in the genus *Metapneumovirus* (1). In 2016, the *Pneumoviridae* family replaced *Paramyxoviridae* as a new classification for this virus (2).

It was first identified as a lower respiratory tract infection etiological agent in the Netherlands in 2001 (3, 4), and in recent years it has been detected all over the world (2). According to studies, hMPV has been present in human populations for more than 50 years (5). Transmission to humans occurs through direct or close contact with the infected person's secretions (4). Signs and symptoms of hMPV infection have been reported in primates other than humans, such as macaque monkeys (4). It has been reported that hMPV causes infection mostly in late winter and spring, but the seasonal distribution is not known for certain and can cause co-infection with other respiratory viruses (3). The signs and symptoms are frequently severe and resemble infections with respiratory syncytial viruses (5).

It is a common cause of respiratory tract infections, mainly in childhood, but immunocompromised patients and adults can also become infected with this virus (4). Seniors who have hMPV may acquire severe respiratory conditions (5). Previous studies conducted in different countries reported that the virus is especially active in pediatric patients and is detected in 5-20% of lower respiratory tract infections (2). Seroprevalence studies demonstrated that humans become infected for the first time before the age of five and continue to become infected for the rest of their lives (6). Human metapneumovirus is divided into two main, separate genetic groups, A and B, which exhibit antigenic differences but share the same clinical signs of infection (5) and also further divided into subclasses that include A1, A2, and B1, B2 with seasonal variation (2).

Direct antigen tests, cell cultures, molecular methods, and serologic methods are currently used in the diagnosis of hMPV infection (3). The current situation regarding the treatment of hMPV infections is supportive. Ribavirin, monoclonal antibodies, in-

hibitory peptides, and small interfering ribonucleic acids have been used in human/animal *in vivo* models, and several vaccine studies are being conducted to control hMPV infection in non-human primate models (7-10).

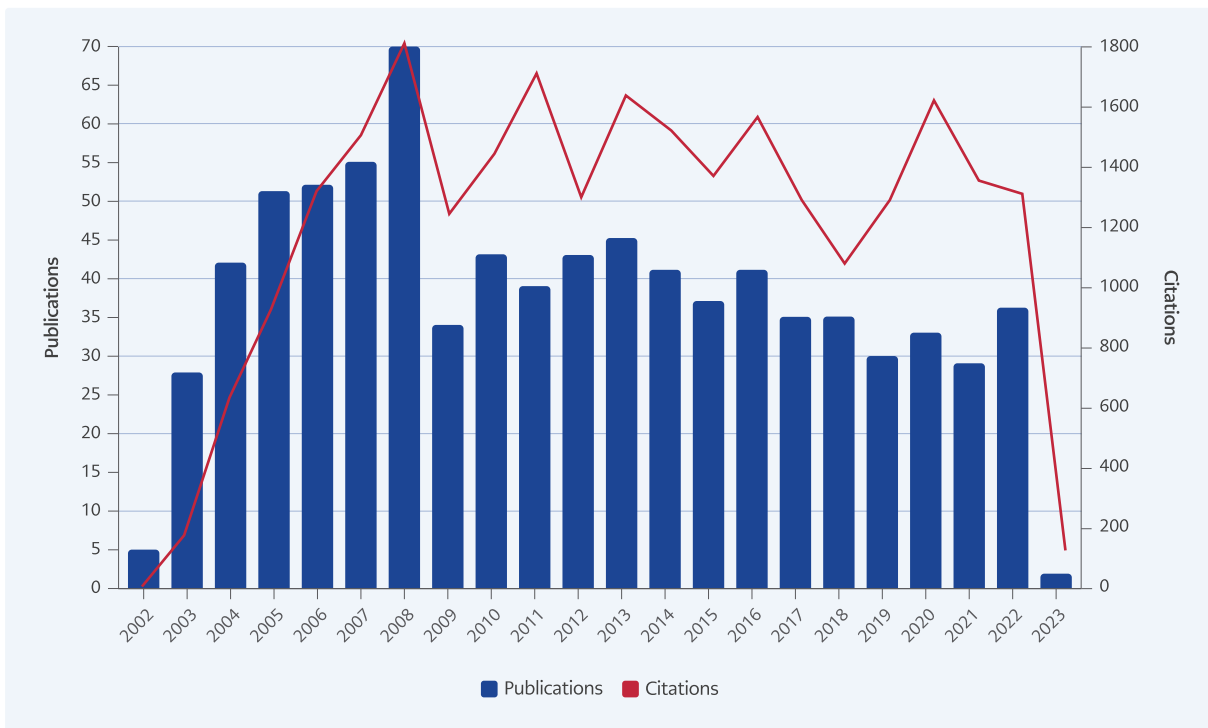
Numerous bibliometric analyses have been conducted on respiratory pathogenic viruses (11-14). "Bibliometric study" is a methodological technique from the library sciences based on reviewing scientific literature about specific topics by using statistical analysis to estimate the impact and productivity of authors, articles, papers, and other journals, including citing numbers. This study aimed to provide a detailed analysis of scientific research articles on hMPV. We explored annual trends of publications and core journals showing current status and future research trends by representing highly productive authors, institutions, countries, or regions and co-cited references. Our bibliometric study provides a systematic and comprehensive analysis of the scientific research on hMPV, which may inform future research directions and facilitate the development of effective prevention and treatment strategies for this virus.

## MATERIALS AND METHODS

We conducted a bibliometric study to analyze scientific research articles related to hMPV+. We retrieved scientific research articles on hMPV from the Web of Science (WoS) electronic bibliometric database. We selected this bibliographic database because it covers comprehensive and relevant scientific literature from various disciplines.

### HIGHLIGHTS

- The first article on hMPV was published in 2002.
- 2008 was the year that the most articles on hMPV were published, with 70 articles.
- Authors from 69 countries and 1083 organizations/institutions contributed to the literature on hMPV.
- The United States had the largest number of publications on hMPV, with one-third of all publications worldwide.



**Figure 1.** Citations and publications over time.

First, we typed human metapneumovirus OR hMPV OR HMPV in the title section of the search engine and retrieved all relevant literature published until March 31, 2023. We performed a literature search in one day (April 1, 2023), as the database was updated every day.

To accomplish this, we searched for all types of documents containing original research data, such as articles, letters, reviews, and conference proceedings. The data extracted in the bibliometric analysis were the title, author name, year of publication, journal name, publication type, country of origin for each article, number of articles published per country, and citation count.

The search was not restricted to a specific language, and we examined the number of article citations and the dominant countries according to the year period. The data are presented as percentages and decimals in the tables and graphs.

We used descriptive statistics to calculate the total number of articles, average citation count per article, and percentage of articles published per coun-

try. We also used a network analysis tool (VOSviewer software) to visualize the co-authorship and co-citation patterns among the institutions and countries involved in the research on hMPV and to broadcast network links between countries/institutions and the most preferred keywords.

## RESULTS

In our initial search using the selected keywords, we obtained 1120 results, of which 826 were articles. We focused our analysis on articles and excluded other document types. According to the WoS database, the first publication on hMPV was in 2002. 2008 was the year that the most articles on hMPV were published, with 70 articles (Figure 1), and the year 2008 also had the highest number of citations (>1800) (Figure 1). The majority of research on hMPV was published between 2002-2012. Figure 1 shows the number of publications on hMPV and their citations from 2002 to March 2023; the graph was obtained from the WoS database. Most hMPV-related articles (n=775; 93.826%) were published in journals indexed in the Science Citation Index Expanded of the WoS Core Collection and

**Table 1.** Top publishing countries on hMPV.

Countries/Regions	n (%) of 826
USA	295 (35.714)
Canada	72 (8.717)
Japan	66 (7.990)
China	66 (7.990)
Netherlands	48 (5.811)
France	44 (5.327)
England	37 (4.479)
Australia	32 (3.874)
Spain	29 (3.511)
Germany	26 (3.148)
Italy	24 (2.906)
South Korea	22 (2.663)
Turkey	17 (2.058)
Brazil	16 (1.937)
Chile	14 (1.695)
India	14 (1.695)
Israel	12 (1.453)
South Africa	11 (1.332)
Argentina	10 (1.211)
Iran	10 (1.211)
Norway	10 (1.211)
Taiwan	10 (1.211)
Thailand	10 (1.211)

English (n=800; 96.852%), Spanish (0.969%), Turkish (0.969%), French (0.726%), and Korean (0.484%) were the preferred publishing languages.

Authors from 69 countries and 1083 organizations/institutions have contributed to the literature on hMPV. The United States had the largest number of publications on hMPV (n=295, 35.714%). According to our findings, Canada (n=72), Japan (n=66), China (n=66), the Netherlands (n=48), France (n=44), England (n=37), Australia (n=32), Spain (n=29), and Germany (n=26) were also listed among the top publishing countries for hMPV (Table 1).

**Table 2.** The top publishing organizations/institutions on hMPV.

Publishing organizations/Institutions	n (%)
Vanderbilt University	53 (6.416)
Laval University	49 (5.932)
Erasmus University	39 (4.722)
Erasmus University Medical Center	38 (4.60)
The University of Texas System	35 (4.237)
The National Institutes of Health	31 (3.753)
The University of Texas Medical Branch	29 (3.511)
The National Institute of Allergy and Infectious Diseases	27 (3.269)
Centers for Disease Control and Prevention	24 (2.906)
AstraZeneca	19 (2.300)

Vanderbilt University (the United States), Laval University (Canada), Erasmus University Rotterdam (the Netherlands), and Erasmus University Medical Center (the Netherlands) were among the top publishing organizations/institutions on hMPV. In addition, AstraZeneca Pharmaceutical Company was among these organizations (Table 2).

The 826 articles included in our study were published in 235 journals. The Journal of Virology' published 61 publications on hMPV and ranked first among journals with the highest number of publications on hMPV (Table 3).

The top funding agency was the United States Department of Health and Human Services, which supported 158 articles, followed by the United States National Institutes of Health (153 articles) and the United States National Institute of Allergy Infectious Diseases (85 articles). The leading funding agencies for hMPV research were from the United States, Europe, China, and Japan (Table 4).

The total number of citations for articles was 26,797, with an average of 32.25 citations per article. According to the WoS database results, the highest number of citations for a single article was 316, and the Hirsch (H)-index of 826 articles was 80. A summary of the most cited 25 articles is shown

**Table 3.** The top publishing journals and citation numbers on hMPV.

	Number of articles	Total citations	Average citations
Journal of Virology	61	1189	19.49
Journal of Medical Virology	49	652	13.31
Journal of Clinical Virology	39	427	10.95
Journal of Infectious Diseases	37	2015	54.46
Journal of Clinical Microbiology	33	1097	33.24
Emerging Infectious Diseases	27	1437	53.22
Pediatric Infectious Disease Journal	26	638	24.54
Plos One	25	421	16.84
Journal of General Virology	24	638	26.5
Japanese Journal of Infectious Diseases	20	322	16.1

**Table 4.** The leading funding organizations of hMPV research.

Funding organizations	n	% of 826
United States Department of Health and Human Services (USA)	158	19.128
National Institutes of Health (USA)	153	18.523
National Institute of Allergy Infectious Diseases (USA)	85	10.291
European Commission (Europe)	24	2.906
National Natural Science Foundation of China (China)	23	2.785
Ministry of Education Culture Sports Science And Technology Japan (Japan)	19	2.300
Nih National Center For Research Resources (USA)	18	2.179
Canadian Institutes of Health Research (Canada)	17	2.058
Japan Society for the Promotion of Science (Japan)	14	1.695
AstraZeneca (England)	13	1.574

in Table 5. Williams, JV, was the most productive author with 47 articles.

We examined publication trends by dividing the publication years into two 10-year periods. When we compared the first period, 2002-2012, with the second period, 2013-2023, we observed that the number of publications decreased from 462 to 364 in the second period. The citation number was higher in the 2002-2012 period than in the 2013-2023 period (22,483 and 4192, respectively). The United States had the most publications in both periods. However, while Canada ranked second regarding the num-

ber of publications in the first period, it dropped to fifth place in the second period, and there was an increase in Chinese publications in the second period (Table 6).

We used the VOSviewer software to visualize the co-authorship and co-citation patterns among the institutions and countries involved in the research on hMPV and obtain network links between countries/institutions and the most preferred keywords. In Figure 2a, we created citation mapping of articles with a minimum of 10 citations. The larger circles indicate a higher total link strength. The top 28 ar-

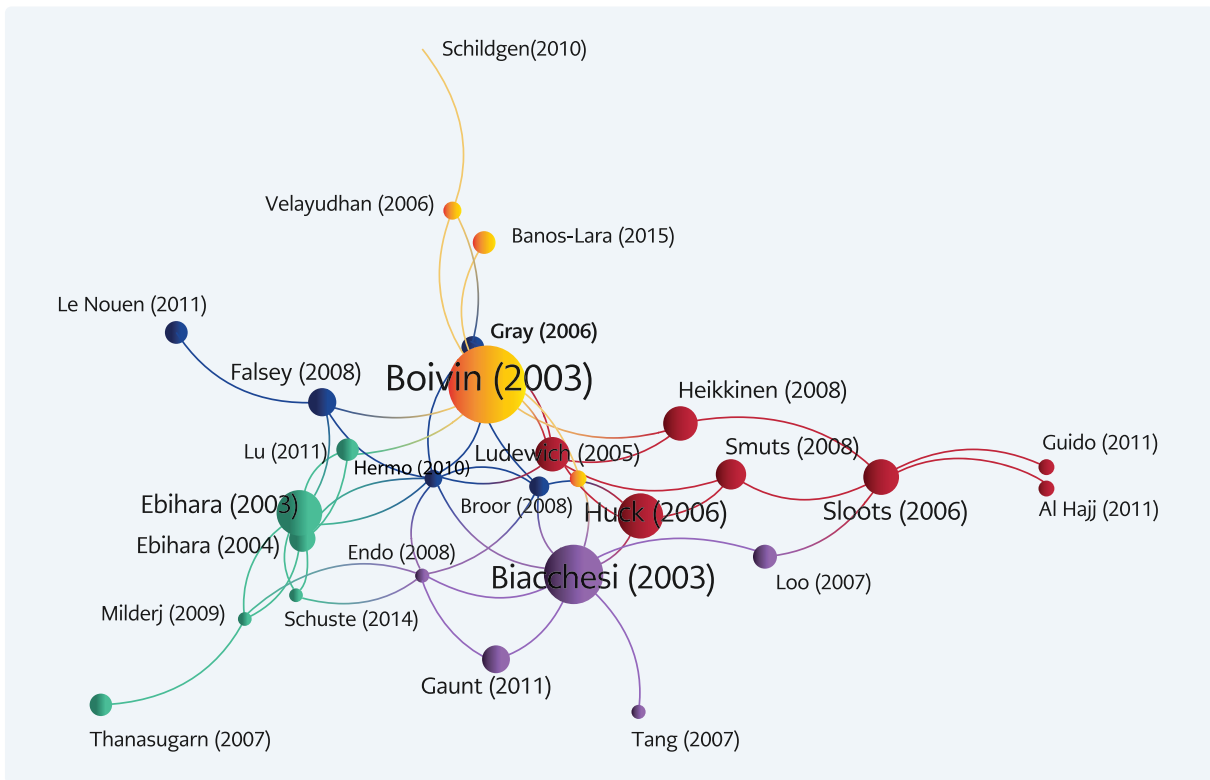


Figure 2a. Citation mapping of the articles with minimum 10 citations.

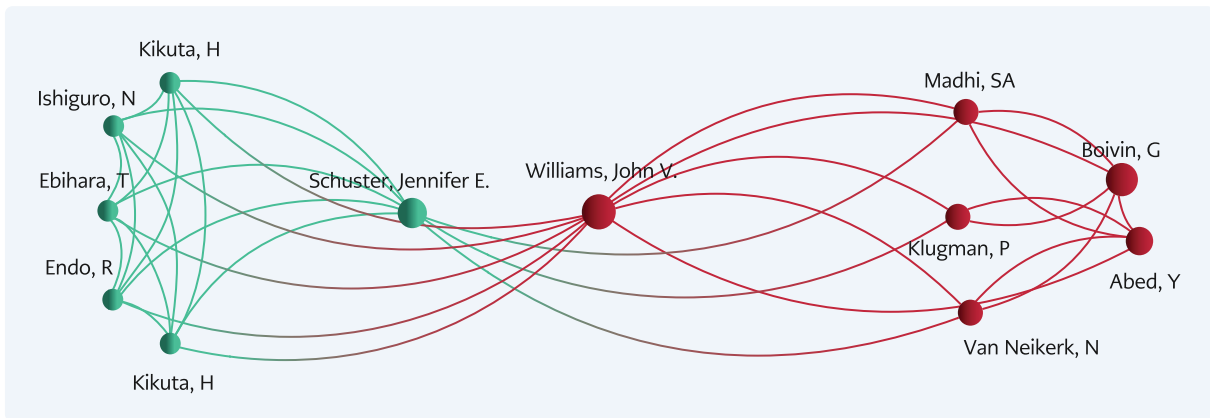


Figure 2b. Author citation mapping.

articles are shown in Figure 2. Figure 2b shows author citation mapping. In the figure, the larger the circle size, the greater the document and citation strength of the author. The lines represent citation relationships.

Figure 3 shows the citation relations by country. The bigger the circle, the more document and citation strength of the country.

Figures 4a and 4b show the co-authorship mapping using. Figure 4a shows authors with co-authorship relations out of 254, according to the total link strength. Thirty had a relationship, while others did not. The lines represent the relationship.

Figure 4b shows the co-authorship relations between institutions and publishing times. Clusters are filtered by document and citation number, and

**Table 5.** Summary of most cited 25 articles.

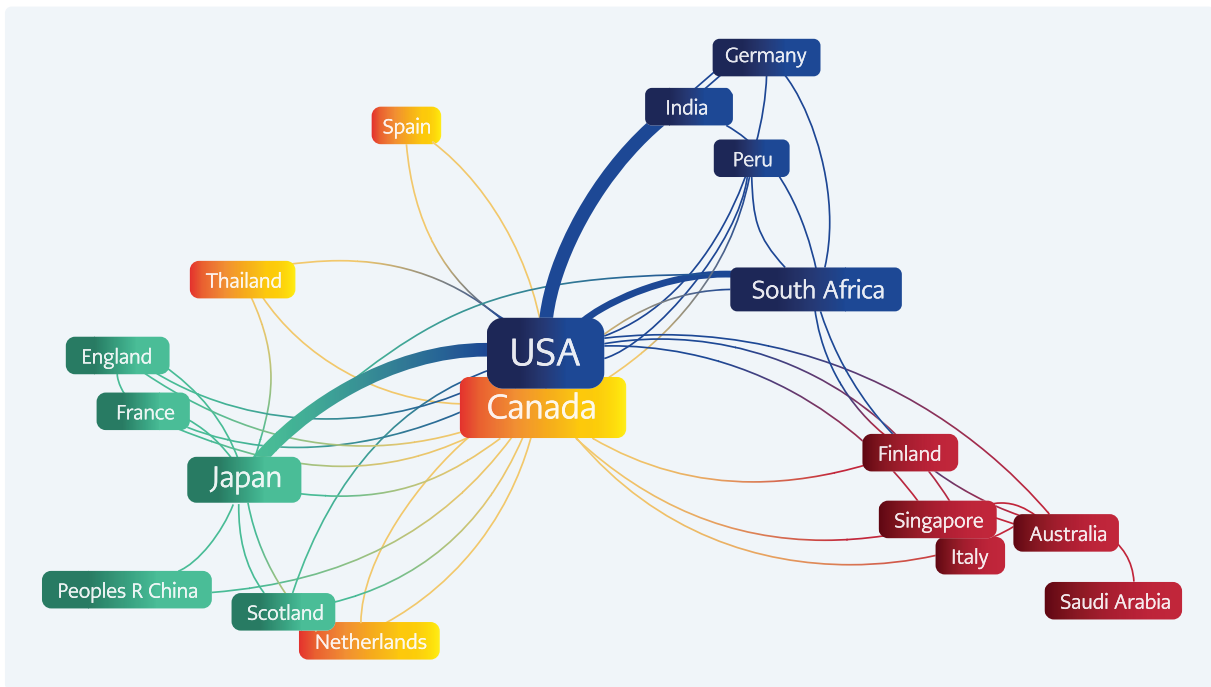
Journal	Title	First author	Author gender	Publication year	Total citations
New England Journal of Medicine	Human metapneumovirus and lower respiratory tract disease in otherwise healthy infants and children	Williams, JV.	Male	2004	646
Journal of Infectious Diseases	Virological features and clinical manifestations associated with human metapneumovirus: A new paramyxovirus responsible for acute respiratory-tract infections in all age groups	Boivin, G.	Male	2002	426
Journal of Infectious Diseases	Human metapneumovirus infections in young and elderly adults	Falsey, AR.	Female	2003	409
Virology	Analysis of the genomic sequence of a human metapneumovirus	van den Hoogen, BG.	Female	2002	328
Emerging Infectious Diseases	Human metapneumovirus infections in hospitalized children	Boivin, G.	Male	2003	317
Journal of Infectious Diseases	Prevalence and clinical symptoms of human metapneumovirus infection in hospitalized patients	van den Hoogen, BG.	Female	2003	313
Journal of Infectious Diseases	Characterization of human metapneumoviruses isolated from patients in North America	Peret, TCT.	Female	2002	300
Emerging Infectious Diseases	Antigenic and genetic variability of human metapneumoviruses	van den Hoogen, BG.	Female	2004	286
Journal of Infectious Diseases	Dual infection of infants by human metapneumovirus and human respiratory syncytial virus is strongly associated with severe bronchiolitis	Semple, MG.	Male	2005	279
Emerging Infectious Diseases	Human metapneumovirus in severe respiratory syncytial virus bronchiolitis	Greensill, J.	Female	2003	249
Journal of Clinical Microbiology	Real-time reverse transcriptase PCR assay for detection of human metapneumoviruses from all known genetic lineages	Maertzdorf, J.	Male	2004	243
Emerging Infectious Diseases	Human metapneumovirus as a cause of community-acquired respiratory illness	Stockton, J.	Female	2002	226
Pediatric Infectious Disease Journal	Clinical impact and diagnosis of human metapneumovirus infection	Van den Hoogen, BG.	Female	2004	209
New England Journal of Medicine	Burden of human metapneumovirus infection in young children	Edwards, Kathryn M.	Female	2013	202
Journal of Infectious Diseases	Rates of hospitalizations for respiratory syncytial virus, human metapneumovirus, and influenza virus in older adults	Widmer, K.	Female	2012	202
Pediatrics	Human metapneumovirus infection in the United States: Clinical manifestations associated with a newly emerging respiratory infection in children	Esper, F.	Male	2003	200
Emerging Infectious Diseases	Human metapneumovirus infection among children hospitalized with acute respiratory illness	Mullins, JA.	Male	2004	190
Virology	Genetic diversity between human metapneumovirus subgroups	Biacchesi, S.	Male	2003	190
Journal of Infectious Diseases	The role of human metapneumovirus in upper respiratory tract infections in children: A 20-year experience	Williams, JV.	Male	2006	183
Annals of Internal Medicine	Brief communication: Fatal human metapneumovirus infection in stem-cell transplant recipients	Englund, JA.	Female	2006	178
Pediatric Infectious Disease Journal	Presence of the new human metapneumovirus in French children with bronchiolitis	Freytmuth, F.	Male	2003	178
Emerging Infectious Diseases	Respiratory tract reinfections by the new human Metapneumovirus in an immunocompromised child	Pelletier, G.	Male	2002	178

**Continue to Table 5**

Journal of Clinical Microbiology	Human metapneumovirus associated with respiratory tract infections in a 3-year study of nasal swabs from infants in Italy	Maggi, F.	Male	2003	176
Journal of Infectious Diseases	A 1-year experience with human Metapneumovirus in children aged < 5 years	Esper, F.	Male	2004	171
Journal of Virology	Recombinant human metapneumovirus lacking the small hydrophobic SH and/or attachment G glycoprotein: Deletion of G yields a promising vaccine candidate	Biacchesi, S.	Male	2004	164

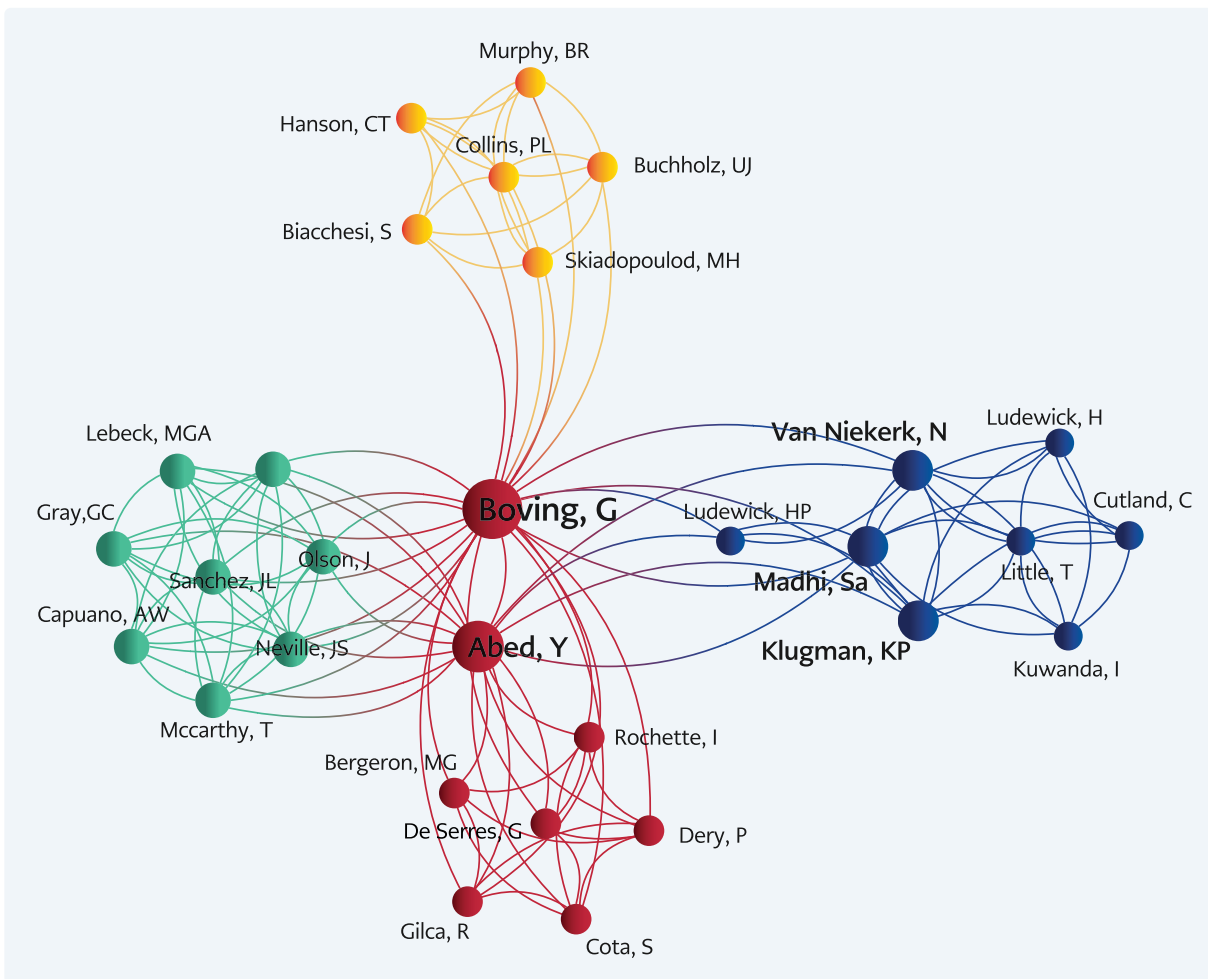
**Table 6.** The comparison of time periods.

Publication period	Number of articles	Times cited	H index	Top five publishing countries
2002-2012	462	22,483	80	USA (188) Canada (54) Japan (36) Netherlands (36) England (22)
2013-2023	364	4192	31	USA (127) China (44) Japan (30) France (23) Canada (18)



**Figure 3.** Citation relations by countries.





**Figure 4a.** The co-authorship mapping between authors.

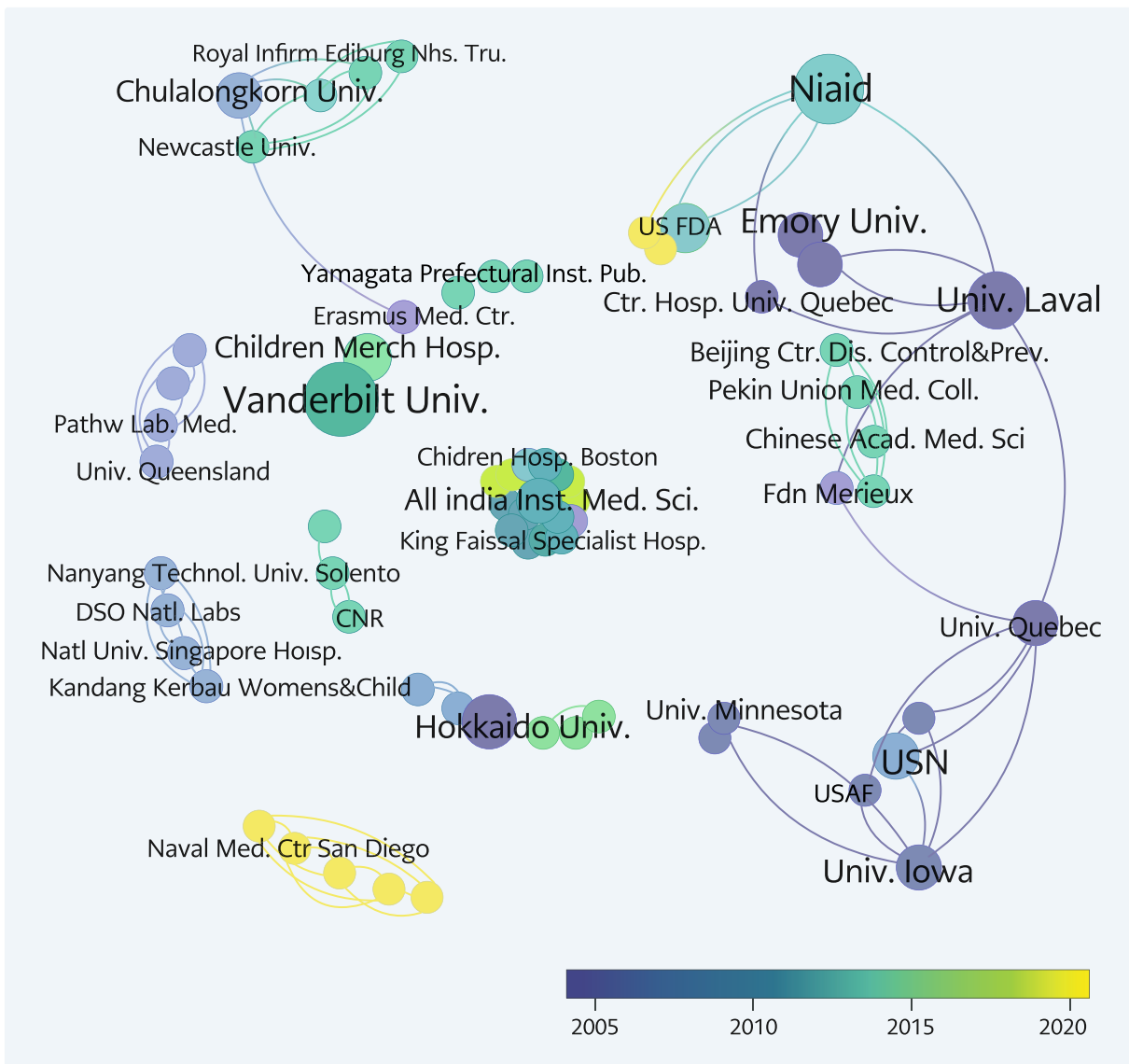
the most active ones in the clusters are shown. The legend shows the publication dates of the articles.

## DISCUSSION

Numerous new and re-emerging infections, some affecting both humans and animals, are caused by viruses, significantly threatening public health (15). This study focused on hMPV, which has been reported worldwide since its discovery by Dutch researchers in 2002. It causes an increasing number of cases, especially in children and immunosuppressants, owing to respiratory tract infections (3, 4). Although bibliometric studies, a popular method today, have been conducted for many popular or traditional infectious etiologic agents and viruses (14, 16-19), our study is the first to evaluate hMPV in the literature.

This study comprehensively analyzes the hMPV-related literature based on the WoS database, which presents global hMPV research regarding the number of reports and their distribution of countries, institutions, and journals. A comprehensive assessment of the state of hMPV research is necessary to guide future research goals, primarily through collaboration among numerous academic researchers in various fields. Our findings may have an impact on future theoretical research because a good indicator of production and advancement may be the number of publications over time (20).

We preferred the WoS database for bibliometric analysis of hMPV-related literature because the WoS database indexes quality publications and covers journal abstracts and citations (21, 22).



**Figure 4b.** The co-authorship mapping between authors.

This report provides a national-level overview of how hMPV research has progressed over the past 21 years in many countries. The results showed that American articles predominate over those from other countries in scientific journals. We identified countries that contributed to research on hMPV and found the United States to be the leading contributor, followed by Canada and Japan. English was the leading publishing language. The most productive institutions were from the United States, Canada, and the Netherlands. In addition, the leading funding agencies for hMPV research were from the United States, Europe, China, and

Japan. All the mentioned countries are economically developed. Similar to our findings, previous studies on scientific productivity have shown that economically developed countries are more productive regarding scientific studies (16-20).

The top three journals were the Journal of Virology (with 61 records), Journal of Medical Virology (with 49 records), and Journal of Clinical Virology (with 39 records). These journals have high impact factors and are indexed in the WoS Core Collection Science Citation Index Expanded. They mainly publish documents that explore the structure and basic func-

tions of viruses, how they interact with their hosts and environments, and how they change over time, as well as cutting-edge methodologies and therapeutic and diagnostic approaches.

Using VOS Viewer, we identified the most preferred keywords in research articles. We also analyzed the co-authorship and co-citation patterns among the institutions, authors, and countries involved in research on hMPV. Keywords were analyzed as we described before to understand better the researchers' current concerns and anticipated research trends. A paper's keywords can be considered the most crucial core details that reflect the main research objectives of the paper (21, 22). Therefore, we gathered and examined keywords issued by the

authors. Keywords related to topics such as the relationship between hMPV and other respiratory viruses (influenza, bocavirus, etc.), pathophysiology, clinical presentations, and risk groups (children and the elderly) were the most frequent keywords.

In conclusion, our bibliometric analysis provides a comprehensive overview of research on hMPV, highlighting the most active countries, institutions, and research topics. Our findings imply that developed countries should assist developing countries in enhancing their research infrastructures. These findings may inform future research and guide the development of effective prevention and treatment strategies for hMPV.

**Ethical Approval:** N.A.

**Informed Consent:** N.A.

**Peer-review:** Externally peer-reviewed

**Author Contributions:** Concept – I.D.A., T.Ç.; Design – I.D.A., S.Ç.E.; Supervision – I.D.A., A.A.H.; Funding – I.D.A.; Materials – S.Ç.E., I.D.A.; Data Collection and/or Processing – T.Ç., I.D.A.; Analysis

and/or Interpretation – T.Ç., S.Ç.E., I.D.A.; Literature Review – A.A.H.; Writer – I.D.A., S.Ç.E., A.A.H.; Critical Reviews – A.A.H.

**Conflict of Interest:** The authors declare no conflict of interest.

**Financial Disclosure:** The authors declared that this study has received no financial support.

## REFERENCES

- Wen SC, Schuster JE, Gilchuk P, Boyd KL, Joyce S, Williams JV. Lung CD8+ T cell impairment occurs during human metapneumovirus infection despite virus-like particle induction of functional CD8+ T cells. *J Virol*. 2015;89(17):8713-26. [[CrossRef](#)]
- Uddin S, Thomas M. Human metapneumovirus [Internet]. In: StatPearls. [updated July 17, 2023; cited May 1, 2023]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK560910/>
- Aksoy-Gökmen A, Çiçek C. [Newly discovered old respiratory virus: Human metapneumovirus]. *Ege Tıp Derg*. 2014;53(2):112-8. Turkish. [[CrossRef](#)]
- Vinci A, Lee PJ, Krilov LR. Human metapneumovirus infection. *Pediatr Rev*. 2018;39(12):623-4. [[CrossRef](#)]
- Takeda M, Shirogane Y. [Human metapneumovirus infection]. *Rinsho Byori*. 2016;64(9):1057-64. Japanese.
- Schuster JE, Williams JV. Human metapneumovirus. *Microbiol Spectr*. 2014;2(5). [[CrossRef](#)]
- Wyde PR, Chetty SN, Jewell AM, Boivin G, Piedra PA. Comparison of the inhibition of human metapneumovirus and respiratory syncytial virus by ribavirin and immune serum globulin *in vitro*. *Antiviral Res*. 2003;60(1):51-9. [[CrossRef](#)]
- Kitanovski L, Kopriva S, Pokorn M, Dolničar MB, Rajić V, Stefanović M, et al. Treatment of severe human metapneumovirus (hMPV) pneumonia in an immunocompromised child with oral ribavirin and IVIG. *J Pediatr Hematol Oncol*. 2013;35(7):e311-3. [[CrossRef](#)]
- Hamelin ME, Gagnon C, Prince GA, Kiener P, Suzich J, Ulbrandt N, et al. Prophylactic and therapeutic benefits of a monoclonal antibody against the fusion protein of human metapneumovirus in a mouse model. *Antiviral Res*. 2010;88(1):31-7. [[CrossRef](#)]
- Ulbrandt ND, Ji H, Patel NK, Riggs JM, Brewah YA, Ready S, et al. Isolation and characterization of monoclonal antibodies which neutralize human metapneumovirus *in vitro* and *in vivo*. *J Virol*. 2006;80(16):7799-806. [[CrossRef](#)]
- Ilyicheva TN, Netesov SV, Gureyev VN. COVID-19, influenza, and other acute respiratory viral infections: Etiology, immunopathogenesis, diagnosis, and treatment. Part 2. Other acute respiratory viral infections. *Mol Gen Microbiol Virol*. 2022;37(3):107-16. [[CrossRef](#)]
- Zhai F, Zhai Y, Cong C, Song T, Xiang R, Feng T, et al. Research progress of coronavirus based on bibliometric analysis. *Int J Environ Res Public Health*. 2020;17(11):3766. [[CrossRef](#)]



- 13 Brüggmann D, Köster C, Klingelhöfer D, Bauer J, Ohlendorf D, Bundschuh M, et al. Respiratory syncytial virus: a systematic scientometric analysis of the global publication output and the gender distribution of publishing authors. *BMJ Open*. 2017;7(7):e013615. [[CrossRef](#)]
- 14 Alkan-Çeviker S, Öntürk H, Alıracı ID, Siddıkođlu D. Trends of COVID-19 vaccines: International collaboration and visualized analysis. *Infect Dis Clin Microbiol* 2021;3:129-136. [[CrossRef](#)]
- 15 Howard CR, Fletcher NF. Emerging virus diseases: can we ever expect the unexpected? *Emerg Microbes Infect*. 2012;1(12):e46. [[CrossRef](#)]
- 16 Woolhouse ME, Gowtage-Sequeria S. Host range and emerging and reemerging pathogens. *Emerg Infect Dis*. 2005;11(12):1842-7. [[CrossRef](#)]
- 17 Zeeshan HM, Rubab A, Dhlakama H, Ogunsakin RE, Okpeku M. Global research trends on monkeypox virus: a bibliometric and visualized study. *Trop Med Infect Dis*. 2022;7(12):402. [[CrossRef](#)]
- 18 Zhang Q, Li J, Weng L. A bibliometric analysis of COVID-19 publications in neurology by using the visual mapping method. *Front Public Health*. 2022;10:937008. [[CrossRef](#)]
- 19 Ejaz H, Zeeshan HM, Iqbal A, Ahmad S, Ahmad F, Abdalla AE, et al. Rubella virus infections: a bibliometric analysis of the scientific literature from 2000 to 2021. *Healthcare (Basel)*. 2022;10(12):2562. [[CrossRef](#)]
- 20 Ahmad T. Global research trends in MERS-CoV: A comprehensive bibliometric analysis from 2012 to 2021. *Front Public Health*. 2022;10:933333. [[CrossRef](#)]
- 21 Falagas ME, Papastamataki PA, Bliziotis IA. A bibliometric analysis of research productivity in Parasitology by different world regions during a 9-year period (1995-2003). *BMC Infect Dis*. 2006;6:56. [[CrossRef](#)]
- 22 Prancutė R. Web of Science (WoS) and Scopus: The titans of bibliographic information in today's academic World. *Publications, MDPI*. 2021;9(1):1-59.