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Bibliometric Analysis of the Publications on Middle East Respiratory Syndrome Coronavirus Published Between 2012-2022

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ABSTRACT

Objective: This study aimed to conduct a bibliometric analysis of the global scientific output related to the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) between 2012 and 2022.

Materials and Methods: The Web of Science database was searched for articles on MERS-CoV published between 2012 and 2022 for bibliometric analysis. The parameters such as publication year, publication type, funding agencies, research institutions, journals, impact factors, language, and citation numbers of articles were analyzed.

Results: We included 1475 articles on MERS-CoV from 86 countries. The United States was the most published country on MERS-CoV, with 487 articles. The Saudi Ministry of Health (7.53%), King Saud bin Abdulaziz University for Health Sciences (6.92%), and The Egyptian Knowledge Bank (6.64%) were the most published institutions. The researchers who published the most on MERS-CoV were from Saudi Arabia. One thousand two hundred six funding agencies funded publications on MERS-CoV, most of which were funded by agencies from the United States.

Conclusion: MERS-CoV remains important because no treatment and no vaccine have been found since it was first detected, and accordingly, it continues to affect the world with new outbreaks and high mortality rates. In addition, experiences with MERS-CoV during the coronavirus disease 2019 (COVID-19) pandemic have guided new research on COVID-19, so scientific interest in MERS-CoV is still ongoing.

Keywords: bibliometric analysis, MERS-CoV, Middle East respiratory syndrome, publications

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INTRODUCTION

Middle East Respiratory Syndrome (MERS) is a viral respiratory infection caused by the MERS coronavirus (MERS-CoV) from the *Coronaviridae* family (1, 2). MERS coronavirus was first identified as the etiologic agent from a patient living in Saudi Arabia in 2012, and it is the sixth human coronavirus (1). After the first case, the infection was detected in Bahrain, Iran, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, the United Arab Emirates, and Yemen (3). So far, all MERS-CoV cases worldwide have been associated with a travel history to the Arabian Peninsula and surrounding countries. In 2015 the Republic of Korea experienced the largest reported MERS epidemic outside the Arabian Peninsula; a traveler returning from the Arabian Peninsula was linked to the outbreak (4).

Therefore, MERS-CoV infection is regarded as a public health problem on a global scale. This zoonotic virus transferred to humans from infected dromedary camels and with close contact with infected people (5). According to the World Health Organization (WHO), there have been 2519 confirmed cases of MERS-CoV and 866 deaths from 27 countries since January 2020; the fatality rate is 34.3% (6).

Severe acute respiratory syndrome (SARS), MERS, and coronavirus disease 2019 (COVID-19) are zoonotic diseases that have affected the respiratory system and caused deaths in the last 20 years. Global public health research centers focus on this disease group because they have a high potential to cause epidemics. The lack of effective treatments and vaccines makes the situation more serious. Although SARS was controlled within a year, the danger of MERS becoming a pandemic continues (7). It is crucial to evaluate studies as a whole in diseases that cause pandemics (8). The Centers for Disease Control and Prevention (CDC) has released recommendations for health departments and hospital infection-control programs to evaluate probable MERS infections and prevent spreading. CDC continues to collaborate closely with public health teams around the world to assess risk and inform the public on preventive interventions (9).

HIGHLIGHTS

- We included 1475 articles on MERS-CoV from 86 countries published between 2012-2022 from the Web of Science database.
- The United States was ranked first with 487 published articles on MERS-CoV.
- Researchers from Saudi Arabia published the largest number of MERS-CoV publications.
- The American funding agencies funded most of the research on MERS-CoV.

Bibliometric studies can play a guiding role for researchers in determining the current status of a scientific subject and shaping future research (10, 11). MERS-CoV research is critical in terms of guiding the COVID-19 pandemic process. Considering the importance of the topic, we aimed to make a detailed bibliometric analysis of the articles on MERS-CoV.

MATERIALS AND METHODS

The present study used a bibliometric design to analyze the development of MERS-CoV publications over the years. The Web of Science (WoS) bibliometric database was used for data retrieval. The parameters such as the publication year, publication type, funding agencies, research institutions, mostly published journals, the impact factor of journals, language, and citation numbers were analyzed.

The keywords of 'Middle East Respiratory Syndrome or MERSCOV or MERS-CoV or Middle East Respiratory Syndrome Virus' were used in the search. Document type was selected as 'article.' The time span was selected as 2012-2022 in the WoS Core Collection. The country rankings were calculated according to the first authors' countries.

All electronic searches were completed on April 15, 2023. The year 2023 was excluded because complete data for that year was unavailable. Keyword maps of the leading countries, authors, and institutions, and tables were created using the Vosviewer version 1.6.16 software (Leiden University Center for Science and Technology Studies, Leiden, Netherlands).

Table 1. List of top publishing countries on MERS-CoV

Countries/Regions	Record count	% of 1475
The United States	487	33.017
Saudi Arabia	399	27.051
China	270	18.305
South Korea	233	15.797
Egypt	103	6.983
England	86	5.831
Germany	86	5.831
Netherlands	65	4.407
Canada	62	4.203
Australia	48	3.254
France	48	3.254
India	47	3.186
Japan	40	2.712
United Arab Emirates	39	2.644
Switzerland	38	2.576
Spain	34	2.305
Iran	25	1.695
Qatar	23	1.559
Italy	22	1.492
Jordan	21	1.424
Taiwan	21	1.424
Pakistan	17	1.153
Bangladesh	15	1.017
Kenya	14	0.949
Scotland	14	0.949
Singapore	13	0.881
Sweden	12	0.814
Lebanon	11	0.746
Greece	10	0.678
Poland	9	0.61
Russia	9	0.61
Austria	8	0.542
Belgium	8	0.542
Malaysia	8	0.542
Oman	8	0.542

RESULTS

The findings revealed that between 2012 and 2022, 1891 entries in the field of MERS-CoV were indexed in the WoS database. The number of original articles was 1273 (67.32%), and review articles 202 (10.68%). Totally 1475 articles were included in the study and thoroughly examined.

It was determined that 91.19% of the articles were published as open access policy and 98.58% in English, and 88.81% were published in Science Citation Index-Expanded (SCI-E) journals. The first article was published as a case report in 2012 when the disease was first detected (2). Between 2014 and 2021, the number of published articles was 100 or more per year. The number of articles published in 2022 decreased to 95 (Figure 1). The articles were cited 74,468 times. Moreover, the average number of citations was 52.52 per article. The number of citations peaked in 2020 with 22,720 citations and decreased in 2021 (Figure 2). Most of the articles were from infectious diseases (29.09%), virology (16.68%), and immunology (14.31%) research areas.

In the list of countries publishing on MERS-CoV, the United States ranked first with 487 articles (33.02%). Saudi Arabia, China, South Korea, Egypt, Germany, Netherlands, Canada, Australia, and France were the other most productive countries. Table 1 shows articles on MERS-CoV published so far from 86 countries worldwide.

Most publications on MERS-CoV were published in the field of infectious diseases and virology, with 142 studies in 2020. Most of the articles were from the Saudi Ministry of Health (7.53%), King Saud bin Abdulaziz University for Health Sciences (6.92%), and The Egyptian Knowledge Bank (6.64%) (Table 2). Al-tawfiq JA from Saudi Arabia Indiana University School of Medicine (54 articles), Yaseen M Arabi from King Saud bin Abdulaziz University for Health Sciences (29 articles), Abdullah Assiri from Global Center for Mass Gatherings Medicine, Ministry of Health, Riyadh, Saudi Arabia (21 articles) were the top listed authors on the MERS-CoV publications.

There were 1206 funding agencies for MERS-CoV publications, and most of them were located in the

Continue to Table 1

Tunisia	7	0.475
Denmark	6	0.407
Ethiopia	6	0.407
Thailand	6	0.407
Brazil	5	0.339
Iraq	5	0.339
Israel	5	0.339
Morocco	5	0.339
Philippines	5	0.339
Portugal	5	0.339
South Africa	5	0.339
Sudan	5	0.339
Turkey	5	0.339
Vietnam	5	0.339
Indonesia	4	0.271

*Shows 50 out of 86 countries.

United States. The United States Department of Health and Human Services (15.05%) funded most of the research on MERS-CoV (Table 3).

The articles were published in 511 different journals. The top 10 journals that published the most articles on MERS-CoV and the number of publications is given in Table 4. The largest number of the articles (5.8%) on MERS-CoV were published in *The Journal of Virology* and *Emerging Infectious Diseases*.

DISCUSSION

We included 1475 articles related to MERS-CoV between 2012-2022 from the WoS database. When we examined the citations of articles, we found that they were cited mostly in 2020 and 2021 during the COVID-19 pandemic. This is because, during the COVID-19 pandemic caused by SARS coronavirus 2 (SARS-CoV-2), which has a similar structure to MERS-CoV, research on MERS-CoV guided most research around the world. SARS-CoV and MERS-CoV, the other members of the coronavirus family like SARS-CoV-2, have emerged sporadically in the last 20 years and have caused fatal cases of pneumonia. The COVID-19 outbreak was defined faster in light of the data obtained from MERS-CoV. COVID-19 vaccines were developed in a short time, and thus the pandemic was taken under control (12-14).

Table 2. List of the top affiliations on MERS-CoV.

Affiliations	Record Count	% of 1.475
Ministry Of Health Saudi Arabia	111	7.525
King Saud Bin Abdulaziz University For Health Sciences	102	6.915
Egyptian Knowledge Bank	98	6.644
King Saud University	91	6.169
National Institutes Of Health Nih Usa	83	5.627
University Of Hong Kong	81	5.492
Alfaisal University	68	4.610
Seoul National University Snu	66	4.475
Centers For Disease Control Prevention Usa	63	4.271
Nih National Institute Of Allergy Infectious Diseases	62	4.203

*Shows 10 out of 1.780 entries.

Table 3. List of the most common funding agencies.

Funding Agencies	Record Count	% of 1.475
United States Department of Health Human Services	222	15.051
National Institutes of Health USA	197	13.356
National Institute of Allergy Infectious Diseases	88	5.966
National Natural Science Foundation of China	80	5.424
European Commission	67	4.542
EuropeaCommission Joint Research Centre	34	2.305
National Research Foundation of Korea	34	2.305
German Research Foundation	29	1.966
United Kingdom Research Innovation	29	1.966
Ministry of Education Culture Sports Science And Technology Japan	27	1.831

*Showing 10 out of 1.206 entries

Table 4. List of the most common funding agencies.

Publication Journal Name	Record count	% of 1475	Journal Impact Factor 2021	Journal Citation Indicator 2021
Emerging Infectious Diseases	65	4.407	16.126	1.65
Journal of Virology	65	4.407	6.549	1.07
Viruses Basel	40	2.712	5.818	0.72
Journal of Infection and Public Health	37	2.508	7.537	1.3
Eurosurveillance	30	2.034	21.286	3.02
Plos One	29	1.966	3.752	0.88
Scientific Reports	29	1.966	4.997	1.05
Emerging Microbes Infections	24	1.627	19.568	2.77
International Journal of Infectious Diseases	24	1.627	12.073	1.48
Journal of Infectious Diseases	21	1.424	7.759	1.33

* The Journal Citation Indicator is a measure of the average category normalized citation impact of citable items (articles and reviews) published by a journal over a recent three-year period. It is used to help you evaluate journals based on other metrics besides the Journal impact factor.

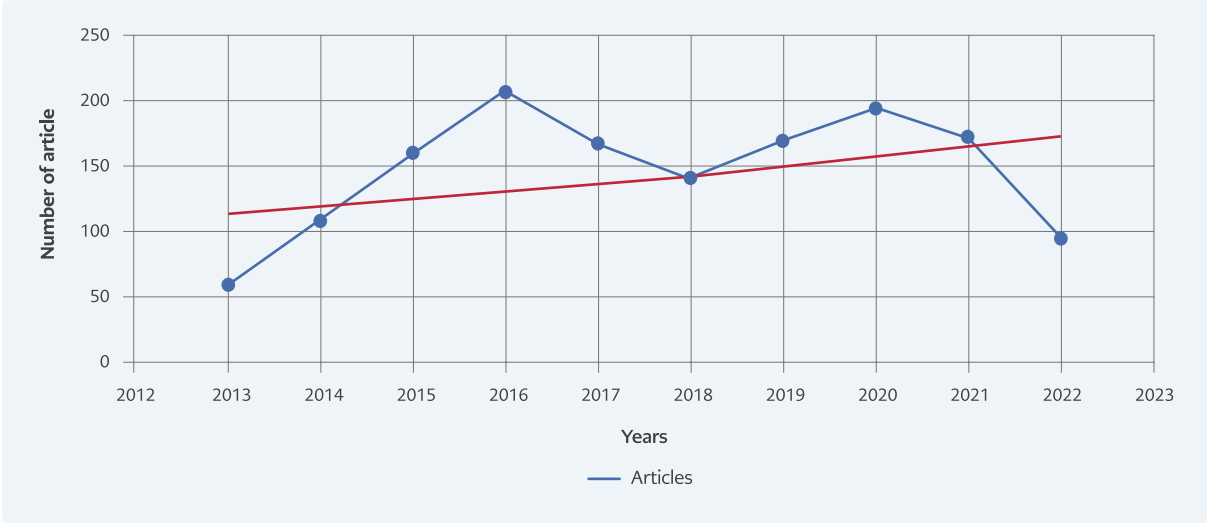

Figure 1. Articles by years.

Coronaviruses occupy a prominent position in virology. This family of viruses poses a significant threat to human health as it can easily change its structure and spread rapidly. As coronaviruses can cause ongoing epidemics, they will remain on the agenda due to the potential for these epidemics to occur in the future. This study also showed that the interest in the coronavirus family would continue to increase with new epidemics and that coronavirus studies have a distinguished place in the research field (15-17).

Our findings showed that the United States, Saudi Arabia, and China were the countries that mainly contributed to the research on MERS-CoV. There was international cooperation to control the disease, especially during the COVID-19 pandemic. In this context, the USA financed the majority of the articles. The United States and Saudi Arabia, which are economically strong countries, came to the forefront in financial support of research to prevent, control, diagnose, and treat coronaviruses that pose a global threat (18-22). Similarly, a bibliometric

analysis by Tauseef Ahmad showed that the United States and Saudi Arabia were the most active and funding countries. Their study also revealed that the Ministry of Health of Saudi Arabia was the most active institution, and Saudi Arabia was the country with the strongest cooperation (18). According to data from the Scopus database, another bibliometric analysis by Sa'ed H. Zyoud revealed a global increase in research on MERS-CoV from 2012 to 2015. In that study, it was determined that the publications in the field of MERS-CoV were published by high-income countries such as the USA, and the h-index value of the USA, the United Kingdom and the Kingdom of Saudi Arabia was higher (19).

Our study revealed that research collaboration between countries and continents was carried out comprehensively. Although the top three rankings of the countries included in the MERS-CoV research were the same as in previous studies, our study showed that South Korea, Egypt, and England, where new outbreaks occurred, were among the top ten countries after 2016 with a significant increase (12, 19, 21).

English, which is used as one of the most common languages in the world, was also the most used language in the MERS-CoV research. The reason for this may be that the majority of the journals indexed in the WoS Core Collection, which were viewed, were published in English (19).

The Journal of Virology and Emerging Infectious Diseases were among the leading journals with many publications on MERS-CoV. The impact factors of the journals that contributed the most to this process were quite high. In addition, following the emergence of Coronaviruses, most of the articles were published in the most respected journals worldwide (19, 22, 23).

This study has some limitations. First, the keywords were only in English, so it is possible that articles written in other languages were left out. Sec-

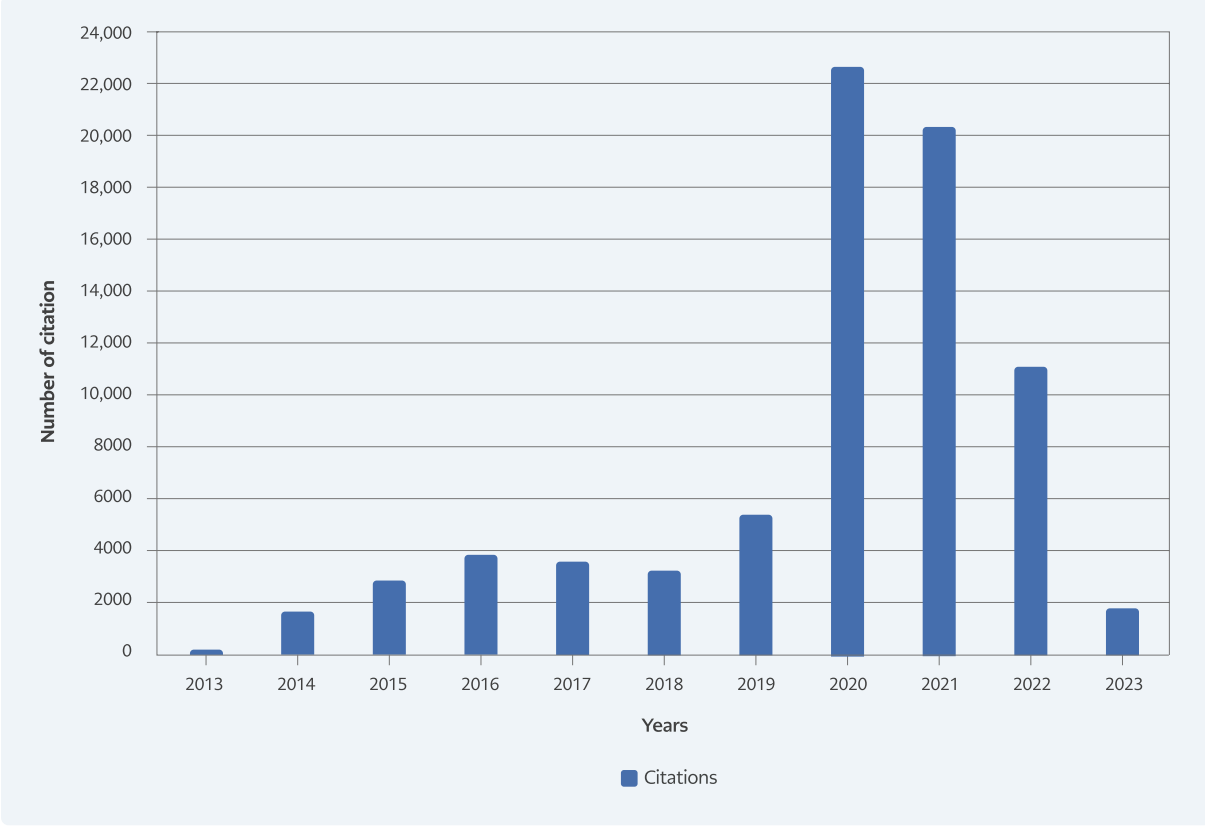

Figure 2. Articles by years.

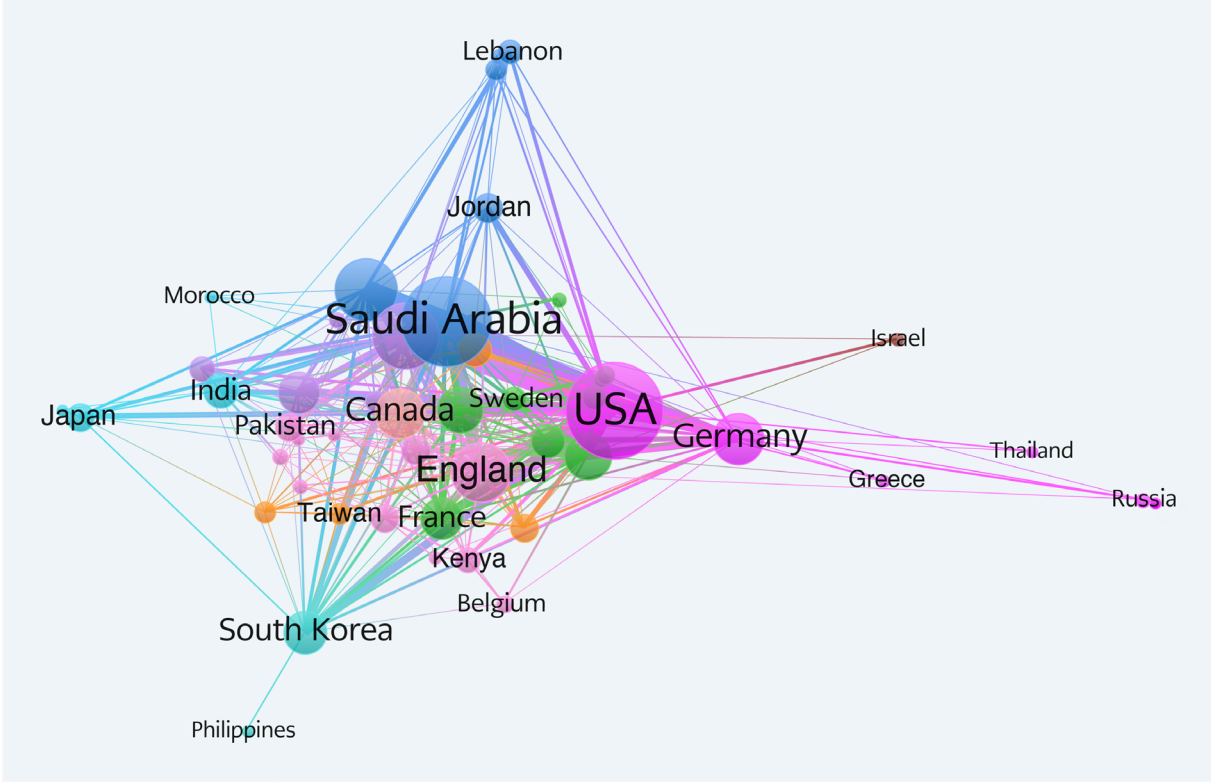

Figure 3. International collaboration network map.

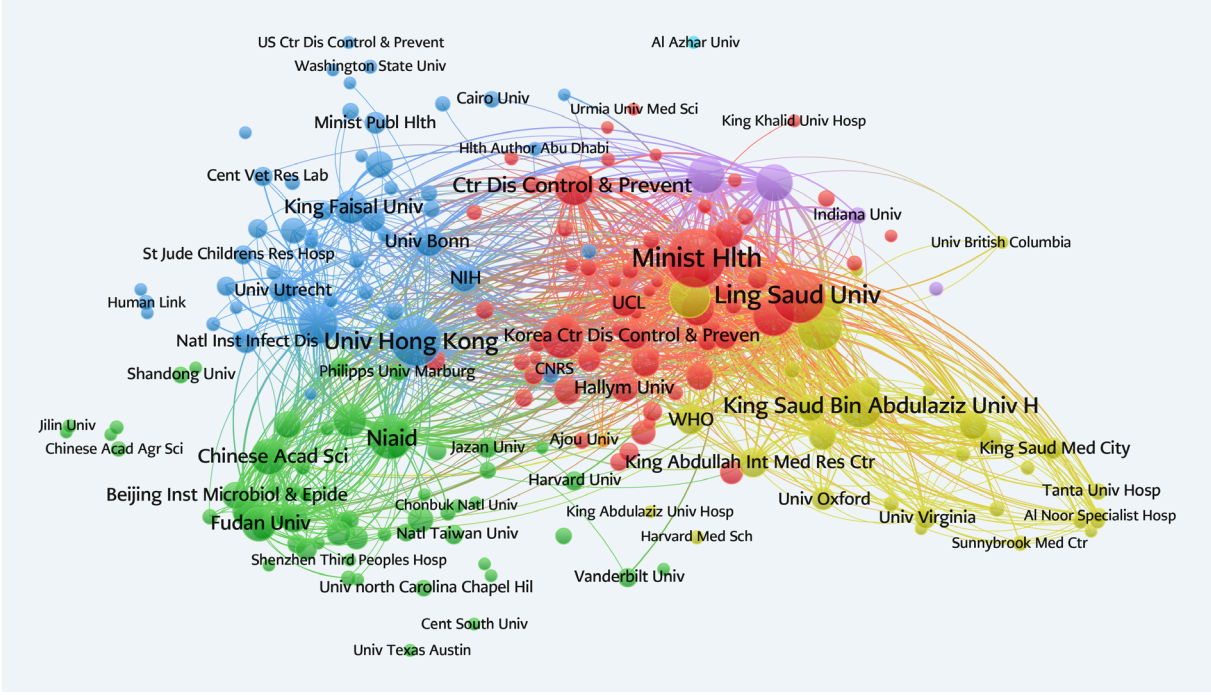

Figure 4. Citation network visualization map among affiliations with at least five publications.

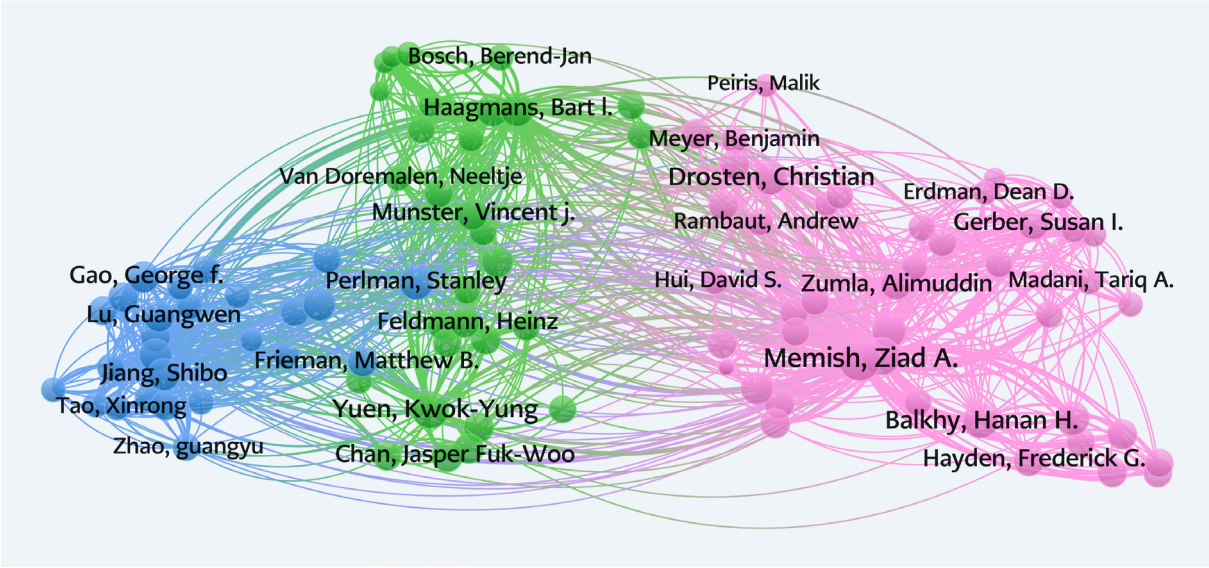

Figure 5. The authors with at least five publications and 100 citations.

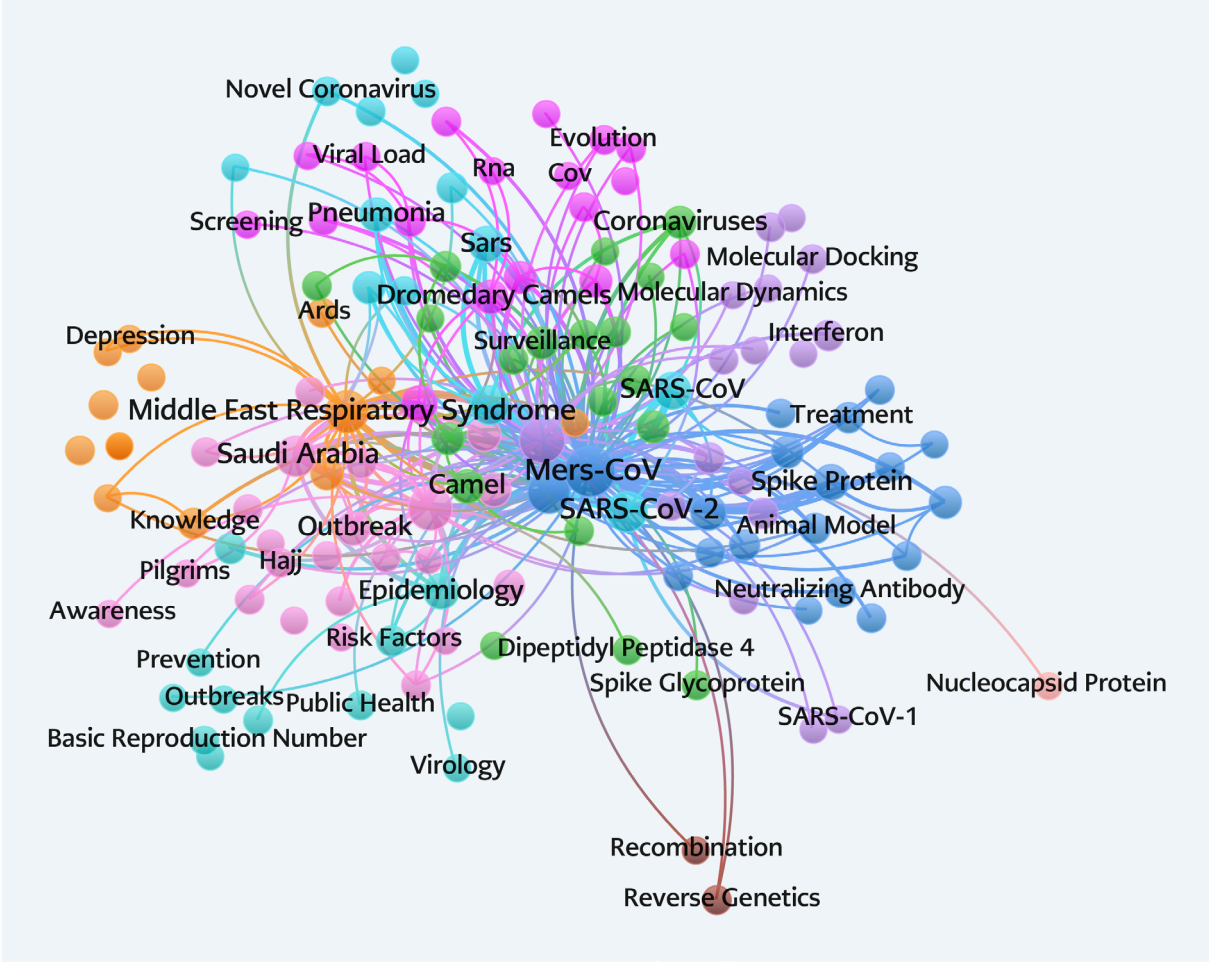

Figure 6. Keyword visualization map of articles with at least five occurrences.

ond, the publications from other databases (such as Scopus and PubMed) were not included. Third, the analyses were done only using the Vosviewer application. Lastly, there was no content analysis carried out.

In conclusion, MERS-CoV remains important because it has no treatment or vaccine so far; hence, it continues to affect the world with new epidemics and its mortality is high. In addition, experiences with MERS-CoV during the coronavirus disease 2019 (COVID-19) pandemic have guided new research on COVID-19, so scientific interest in MERS-CoV is still ongoing. We believe this bibliometric analysis will contribute to active data sharing and the fight against future epidemic and pandemic crises.

Ethical Approval: N.A.

Informed Consent: N.A.

Peer-review: Externally peer-reviewed

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

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