A 50-Year Overview of the Coronavirus Family with Science Mapping Techniques: A Review

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Abstract

Background: The COVID-19 pandemic from the coronavirus family is the most important agenda of today's world, also called the "New World". In this outbreak period, declared a pandemic by WHO and affected the whole world and humanity on a global scale, all kinds of scientific information and evidence-based sharing on the subject gained great importance.

Methods: Overall, 12,301 articles from the web of Science (WOS) Core Collection database were analyzed using SciMAT software, conducted to examine the development of coronavirus publications in the process and to reveal the scientific mapping related to the subject. To analyze the development in the process based on periods, the articles covering the 50 years were compared as five periods of 10 years.

Results: The most publications with the Coronavirus theme were made between 2010 and 2020 (n=1020), the total number of citations of these articles was 15,966 and the h-index value was 54. The theme "Coronavirus" was associated with the themes "infection" (w=0.04), "SARS" (w=0.03), "virus" (w=0.04), "identification" (w=0.05) and "swine" (w=0.03). Due to the recent emergence of the COVID-19 theme, it was found to be directly related to the "outbreak" theme (w=0.01). In terms of the distribution of the articles on coronavirus by country, most articles were published by the USA. This country is followed by China, Germany, England and the Netherlands.

Conclusion: This research on the coronavirus family can offer a holistic view of the virus family in the scientific world and can make a scientific contribution to the fight against the virus by creating awareness on this issue.

Keywords: Coronavirus; Pandemic; COVID-19; Science mapping; Scimat

Introduction

The Latin name of coronavirus is Orthocoronavirinae. This type constitutes one of two families of the coronaviridae family of viruses. Birds and mammals are known as hosts where coronaviruses settle and cause disease. Diseases with respiratory complaints caused by these viruses in humans follow a clinical course similar to the common cold and do not cause serious health problems. Starting with MERS-CoV, continuing with SARS-CoV and spreading all over the world

with the latest COVID-19, some types of coronavirus, which threaten human health, may show signs of serious respiratory disease and even cause death (1, 2).

Coronaviruses are sphere-like in structure. They are viruses with protrusions on their surfaces and can have different morphological forms. The diameter of the virus particles is around 100-120 nm. Coronaviruses are enveloped viruses. The viral envelope in question is in the lipid structure and is double-folded. These viruses have structural proteins like S (spike glycoprotein), E (Envelope), M (Membrane), and N (Nucleocapsid). The crown shape, which is the source of the name coronavirus, is formed by spike proteins. Apart from these structures located outside the viral envelope, there is also a nucleocapsid inside. Nucleocapsid contains the nucleic acid genome (RNA or DNA) and a protein-structured protective sheath called the capsid. Since coronaviruses are RNA-structured, they have a large number of nucleocapsid proteins attached to single-stranded RNA (2,3).

The existence of the coronavirus family, including MERS-CoV, SARS-CoV and COVID-19, has been known since the 60s. The first found coronaviruses are viruses that cause bronchitis in poultry and are isolated from the nasal cavities of humans. Coronavirus types were identified in subsequent years as SARS-CoV in 2003, HCoV NL63 in 2004, HKU1 in 2005, MERS-CoV in 2012 and COVID-19 in 2019. All of these are known to be causes of respiratory disease (4).

The cause of "Severe Acute Respiratory Syndrome", also known as SARS-CoV, is the coronavirus family. SARS started as a respiratory disease in humans. This disease started in Hong Kong and spread around the world in 2003-2004. The SARS outbreak resulted in nearly 10,000 cases and around 1,500 deaths worldwide. The mortality rate of SARS is around 11% (5).

MERS, which is a disease similar to SARS and COVID-19, is known as "Middle East Respiratory Syndrome". MERS is a coronavirus infection first detected in Saudi Arabia in 2012. The mortality rate in MERS is high compared to other samples and is about 36%. Like other family members, respiratory tract disease symptoms are observed in MERS. Since its detection, there have been around 2,500 MERS cases worldwide, and the number of deaths is around 800 (6).

The new type of coronavirus disease, called COVID-19, was defined in Jan 2020 as a result of examinations made on patients who showed symptoms of respiratory diseases in Wuhan Province, China in Dec 2019. The COVID-19 outbreak was caused by the markets where seafood and/or live animal products in Wuhan were sold, and early COVID-19 cases were linked to these markets. In these markets, the virus, first transmitted from animal to human, then started to spread from person to person and spread to other provinces and regions of China and, from there, to many countries of the world. Person-to-person spread occurs especially through contact with large respiratory droplets or virus-containing secretions. However, it can also occur as a result of contact with contaminated surfaces by droplets emitted from infected individuals. Viruses can be transmitted from the patients who show or do not show symptoms of the disease. The contagiousness of COVID-19 is higher than SARS (7).

One of the conditions where COVID-19 carries a high risk of transmission is where people have to live collectively and in congestion. These include sports facilities, entertainment venues such as cinema and theater, restaurants and cafes, nursing homes, care facilities or homes and prisons (8).

Quarantine and isolation measures are used to limit the local and/or global spread of the COVID-19 outbreak. Being sensitive in the implementation of these measures contributed to the limitation of the infection (8).

Bibliometry is the analysis of the works produced by the designated person/institutions and the relations between these works in the designated area. Scientific publications have been increasing significantly in quantity. With this increase, it has become difficult to follow and analyze scientific developments. Changes in different disciplines or their dynamics need to be monitored by scholars. Academic staff demand to stay up to date and

access the data they need at any time. These demands and needs triggered the use of bibliometric methods (9,10).

Bibliometry is based on various analyzes of the data provided from databases. As a result of these analyzes, a panoramic view of the subject or discipline being studied can be reached. Thus, information can be obtained about scholars, works and articles related to the subject or discipline, and information about publication performances can be reached easily. The bibliometric analysis allows us to examine the literature in detail and to see the subject at one point. Besides, it provides information about the citation performance of the works. This information is important in evaluating the scientific competence of the works. The aging rate of the literature can be calculated with the citation analysis studies with bibliometric methods, and accordingly, the attitudes of the libraries towards the relevant literature are decided (11,12).

One of the main areas of use of bibliometry is scientific mapping (Science Mapping). Scientific mapping is the analysis of the relationships between different elements that make up scientific disciplines, such as universities, various works and authors. Science Mapping can also be defined as the visualization of a science discipline (13).

There is much software used for scientific mapping. Gephi, UCINET, Pajek, CoPalRed, Cytoscape, CiteSpace II, VOSviewer are some of the software in question.

Methods

We aimed to examine the development of publications on coronavirus in the process and to reveal the scientific mapping related to the subject, were obtained from the Web of Science (WoS) Core Collection database. Overall, 17,782 publications were found in the search performed with the terms "corona virus" OR "coronavirus" OR "SARS-CoV" OR "MERS-CoV" OR "COVID-19" in the "Topic" tab of the WoS database. Overall, 12,322 articles were found in the search

with the publications only in the "Article" category, and the data of these articles were exported in plain text format and loaded into the SciMAT program. In the SciMAT program, 21 articles without year data were excluded from the analysis and the analysis continued over 12,301 articles. In the analysis, there were 105 articles in the first period, 384 articles in the second period, 1,270 articles in the third period, 3,921 articles in the fourth period and 6,621 articles in the last period. Words were used as research units in analyzes. Before the analysis, the keywords in the articles were grouped by considering their singular-plural uses. After editing the data to be used in the analyses, data reduction was made to interpret their findings;

- "Co-occurrence" in matrix type,
- "Equivalence index" in normalization measurement,
- "Simple centers algorithm" in cluster algorithm,
- "Core mapper" in mapping,
- H-index and the total number of citations and thematic development map in quality measurement,
- "Inclusion index" options are used in the overlap map (14-18).

Strategic diagrams, thematic networks, overlap maps and thematic development maps were used in the interpretation of the research findings. The themes emerging as a result of the analysis in the strategic diagram are placed according to the levels of centrality and density. Centrality is related to the outer relations of the theme, and themes shift to the right side in the diagram as the level of relationship with other themes increases. Density is related to the inner relations of the theme, and themes with increasing levels of relationship in themselves move upward in the diagram. Themes can be placed in four different areas according to their level of centrality and density. According to this;

- Themes with high centrality and density in the upper right area where motor themes are located,

- Themes with high centrality but low density in the lower right area where basic and transformational themes are located
- Themes with low centrality but high density in the upper left area where developed and isolated themes are located,
- Themes with low centrality and density in the lower left area where emerging or disappearing themes are located

In thematic networks, relationships between themes in the relevant theme cluster are seen, and the size of the themes varies according to the number of publications, and the thickness of the lines depends on the degree of the relationship. Keywords in the articles are examined in the overlap map. Accordingly, keywords transferred from the previous period, newly used and used in the previous period but not used in the relevant period can be seen. In the thematic development map, the relationships between themes and periods are examined. Straight lines in the map show

that the same keywords are shared among themes with theme names, dashed lines show that common words are shared except for theme names, and the thickness of the lines varies according to the degree of relationships (14-18).

Of the strategic diagrams in our study, only the 1990-1999 period and later were shared. Tables containing the findings related to the obtained themes and the figures and tables regarding the thematic network and relationship weights were not shared because it would increase the volume of the article too much. But the important data among these unshared data were included in the relevant sections.

Results

The distribution of the articles analyzed with the SciMAT program by years is given in Fig. 1. Accordingly, the increase in the number of articles in 2004, 2016, 2017 and 2020 is noteworthy.
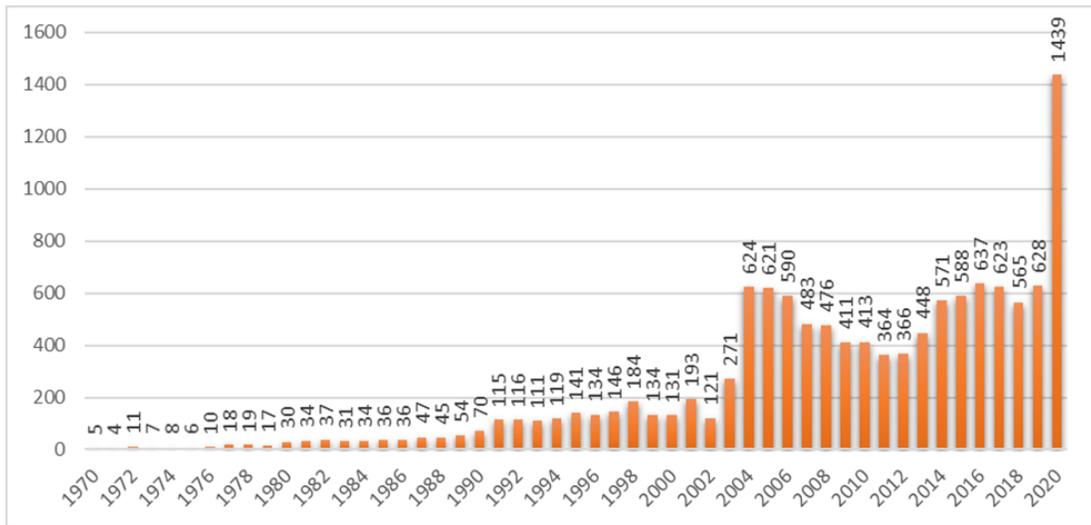

Fig. 1: Number of articles by years

The distribution of the articles analyzed in the research by countries is shown in Fig. 2. Most articles were published by the United States and

this country is followed by China, Germany, the United Kingdom and the Netherlands.
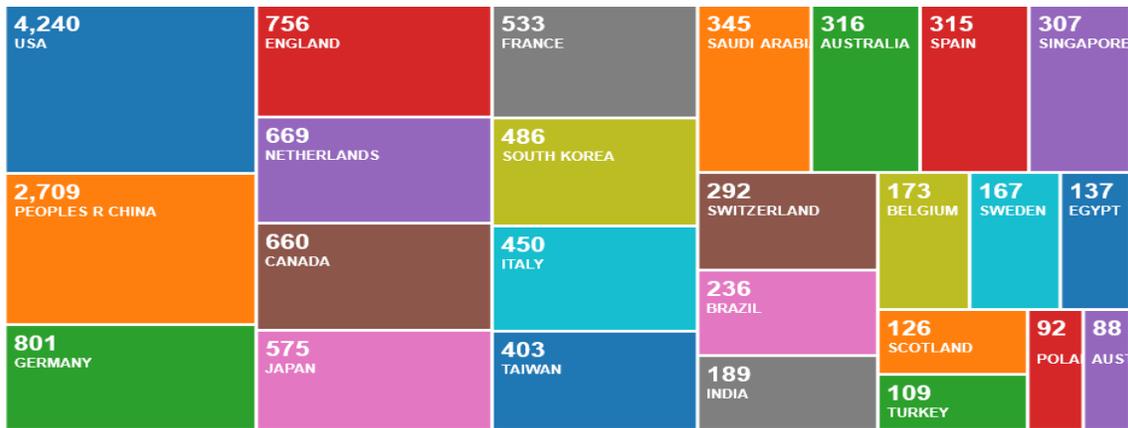
Fig. 2: Number of articles by country (top 25 countries)

The most used words after grouping the key-words in the articles included in the analysis in the research were determined. Accordingly, the most used word is "coronavirus" and the words "infection", "virus", "identification" and "acute respiratory syndrome" and "SARS" follow it.

Six themes emerged in the strategic diagram for the 1970-1979 period as a result of the analysis. According to their centrality and intensity, one motor theme ("antigen"), two isolated and advanced themes ("adults", "purification"), two basic and transformational themes ("virus", "particles"), one emerging or disappearing theme ("human coronavirus") were found. An article was published about the motor theme of this period, the "antigen" theme, and it was determined that this article was cited 57 in total (Fig. 3).
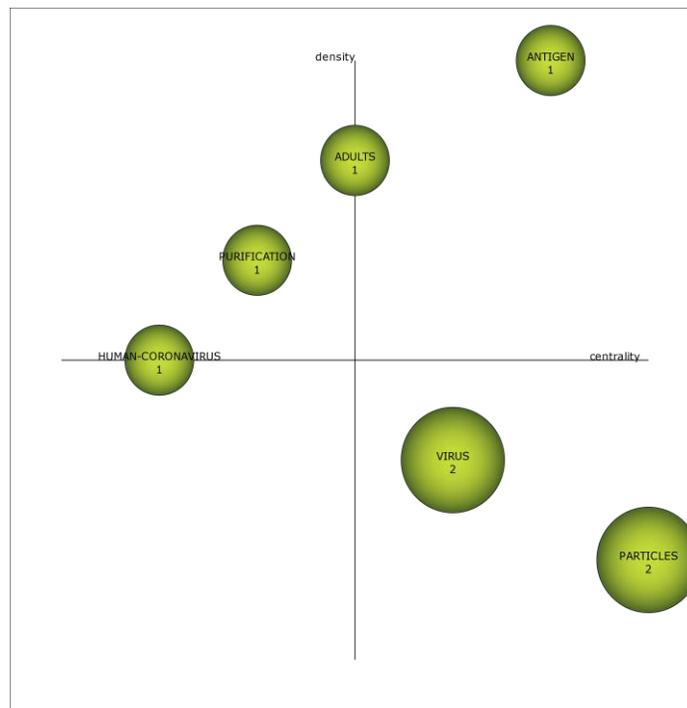

Fig.3: Strategic diagram (1970-1979 Period)

Three themes emerged in the 1980-1989 period. According to their centrality and density, one motor theme from the themes localized ("bovine coronavirus"), one isolated and developed theme ("antibodies"), one basic and transformational theme ("intracellular RNA") were found. An article was published concerning the theme of "bovine coronavirus", the motor theme of this period, and this article was cited 85 in total (Fig. 4).
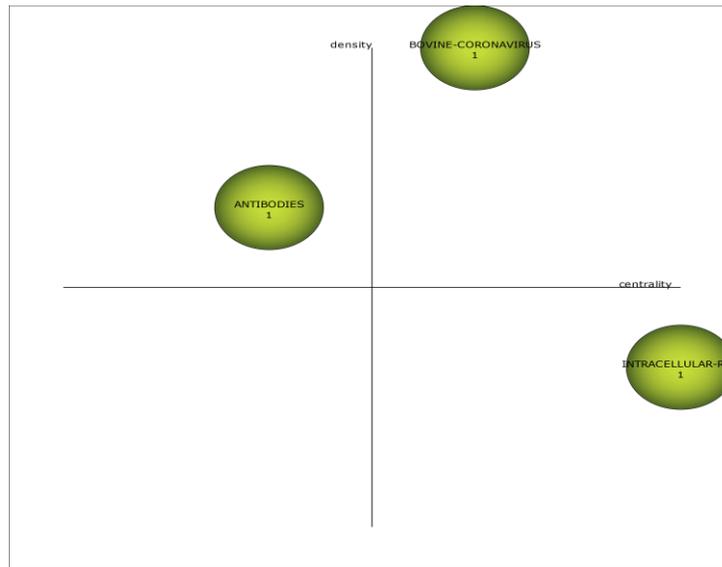

Fig. 4: Strategic diagram (1980-1989 Period)

According to the strategic diagram of the 1990-1999 period in our study, 16 themes emerged in this period. According to their centrality and density, there are six motor themes, three isolated and developed themes, three basic and transformational themes and four emerging or disappearing themes (Fig. 5).
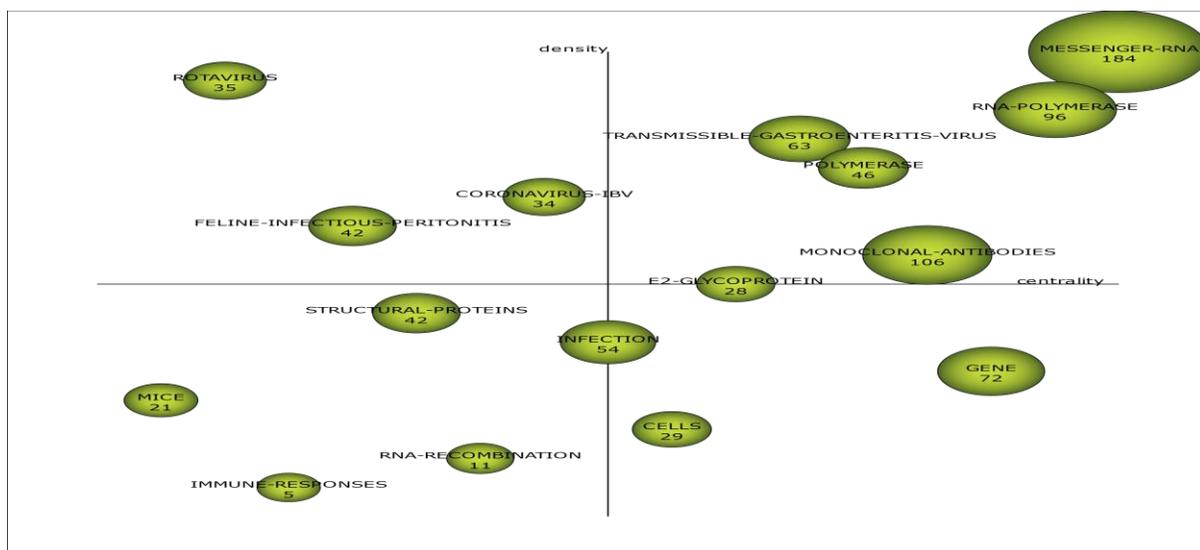

Fig. 5: Strategic diagram (1990-1999 Period)

Overall, 184 articles related to "messenger RNA", one of the engine themes of this period, were published and the total number of citations of these articles was 8,481 and the h-index value was 56. Furthermore, "messenger RNA" was associated with "murine coronavirus" (w=0.09), "replication" (w=0.07), "mouse hepatitis virus"

(w=0.10), "defective interfering RNA" (w=0.10) and "genomic RNA" (w=0.08) themes.

According to the strategic diagram of the 2000-2009 period in our research, 19 themes emerged in this period. Six motor themes, four isolated and advanced themes, four fundamental and transformational themes, and five emerging or disappearing themes were identified (Fig. 6).
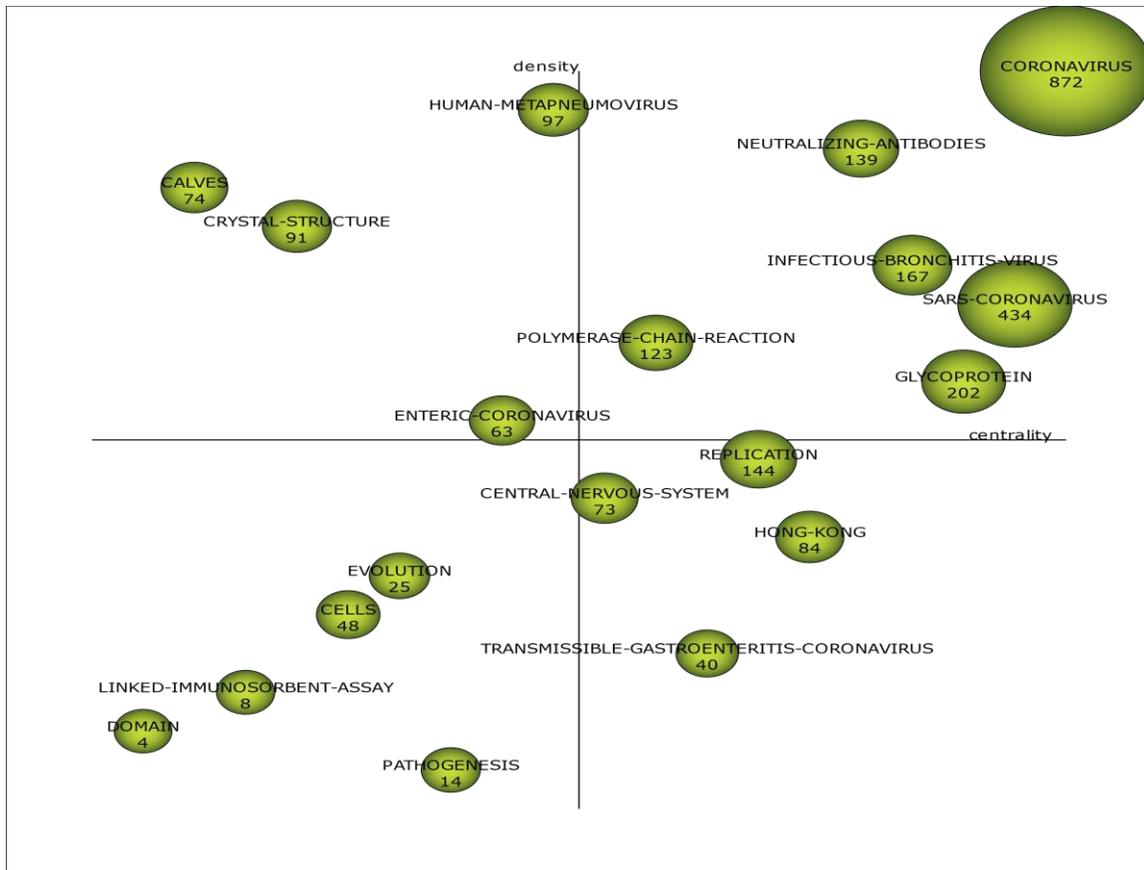

Fig. 6: Strategic diagram (2000-2009 Period)

Overall, 872 articles with "Coronavirus" content, one of the motor themes of this period, were published and it was found that the total number of citations for these articles was 33,150 and the h-index value was 86. The "coronavirus" theme was associated with the themes "outbreak" (w=0.07), "SARS" (w=0.11), "severe acute respiratory syndrome" (w=0.09), "acute respiratory syndrome" (w=0.09) and "identification" (w=0.08). Overall, 434 articles were published related to the "SARS coronavirus" theme, which

was another motor theme and the total number of citations of these articles was 21,594 and the h-index value was 76.

According to the strategic diagram for the 2010-2020 period, which was the last period analyzed in our research, 21 themes emerged in this period. These are seven motor themes, four isolated and advanced themes, four basic and transformational themes, six emerging or disappearing themes (Fig. 7).
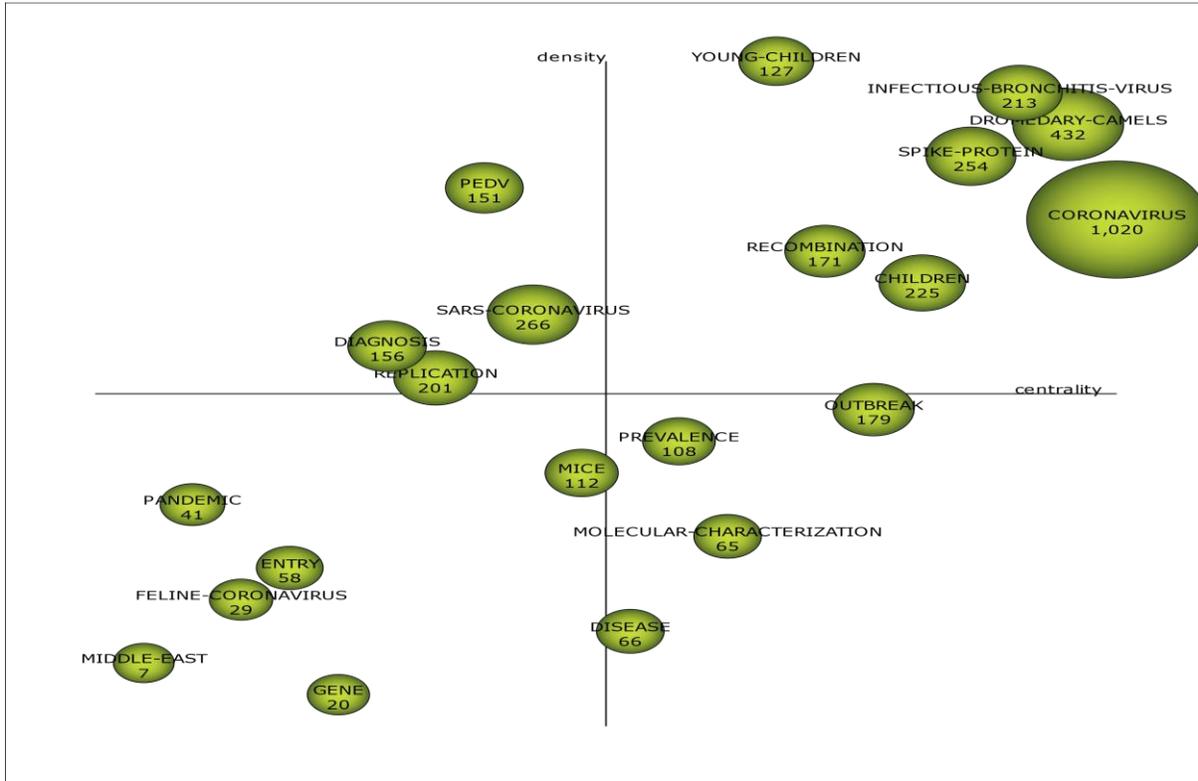
Fig. 7: Strategic diagram (2010-2020 Period)

Overall, 1,020 articles were published related to the "coronavirus" theme, one of the motor themes, and the total number of citations of these articles was 15,966 and the h-index value was 54. When the thematic network was examined, the theme "coronavirus" was related to the themes "infection" (w=0.04),"SARS" (w=0.03), "virus" (w=0.04), "identification" (w=0.05) and "swine" (w=0.03).

Overall, 432 articles were published concerning the theme "dromedary camels". The total number of citations of these articles was 10,531 and the h-index value was 53. When the thematic network was examined, the "dromedary camels" theme was associated with the themes "antibodies" (w=0.06), "respiratory syndrome corona-

virus" (w=0.01), "MERS cov" (w=0.04), "Saudi Arabia" (w=0.13) and "MERS coronavirus" (w=0.05).

Overall, 179 articles were published related to the "outbreak" theme, which was one of the basic and transformational themes of the period, as it was directly related to the COVID-19 theme. The total number of citations of these articles was 1,913 and the h-index value was 21. When the thematic network was examined, "outbreak" was associated with the themes "COVID 19" (W=0.01), "MERS" (w=0.01), "transmission" (w=0.02), "Middle East respiratory syndrome" (w=0.01) and "Middle East respiratory syndrome coronavirus" (w=0.01) (Fig. 8).
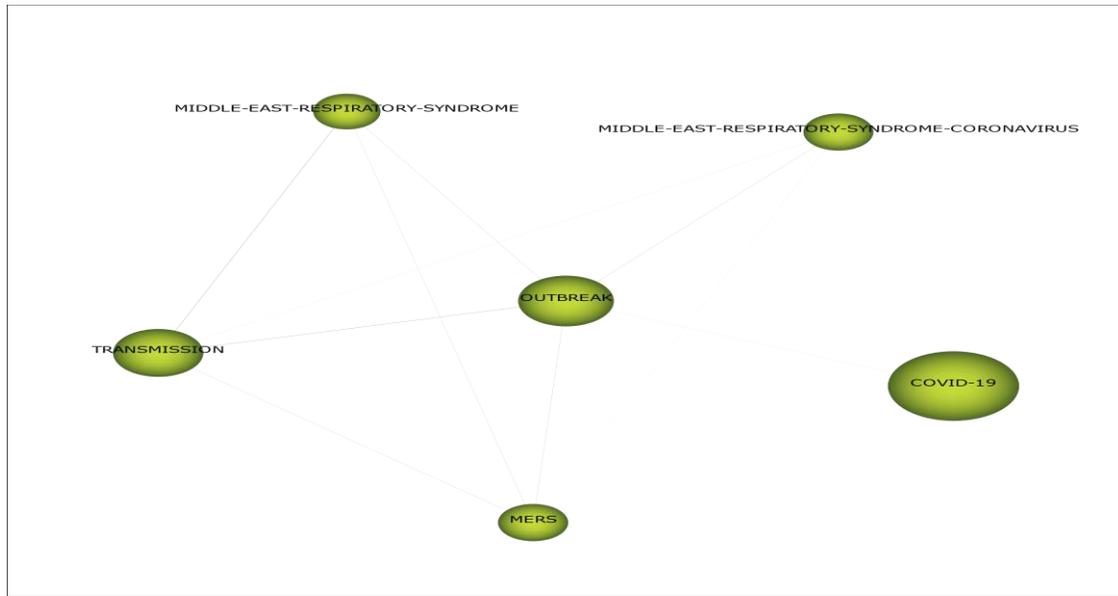
Fig. 8: Thematic Network (Outbreak)

The numerical development of the keywords in the articles included in the research by periods is presented in the overlap map in Fig. 9. According to these findings, 3 (18%) of 31 keywords in the first term were transferred to the second term and 17 words were used in the second term with the newly added words. In the last period, 3,772 (46%) of the keywords were transferred to this period, and 14,595 words were used in this period with the newly added words.
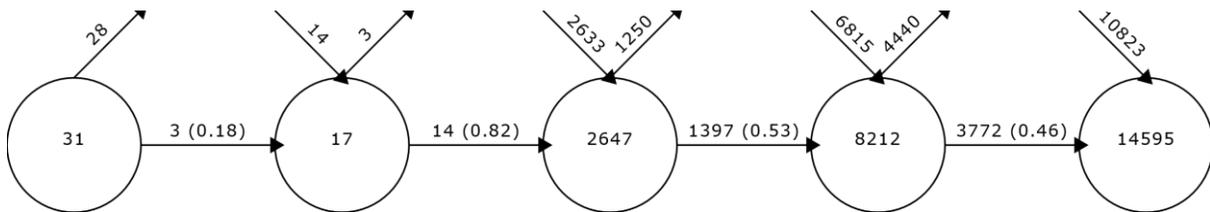

Fig. 9: Overlap map

The relationships between the themes that emerged in the periods evaluated in our research were examined. According to the findings (Fig.10);

- The "coronavirus" theme that emerged in the fourth period was related to the themes of "gene" and "RNA polymerase" from the previous period. The "coronavirus" theme, found in the fourth and fifth periods, was the most published theme in both periods. The "coronavirus" themes in both periods were mutually re-lated to the "SARS coronavirus" themes found in both periods.

- The "neutralizing antibodies" theme, associated with the "coronavirus ibv" theme from the third period, had a strong relationship with the "spike protein" theme from the last period.

- The theme of "human metapneumovirus", which emerged in the fourth period, intensely shared basic keywords with the theme of "young children" from the last period.
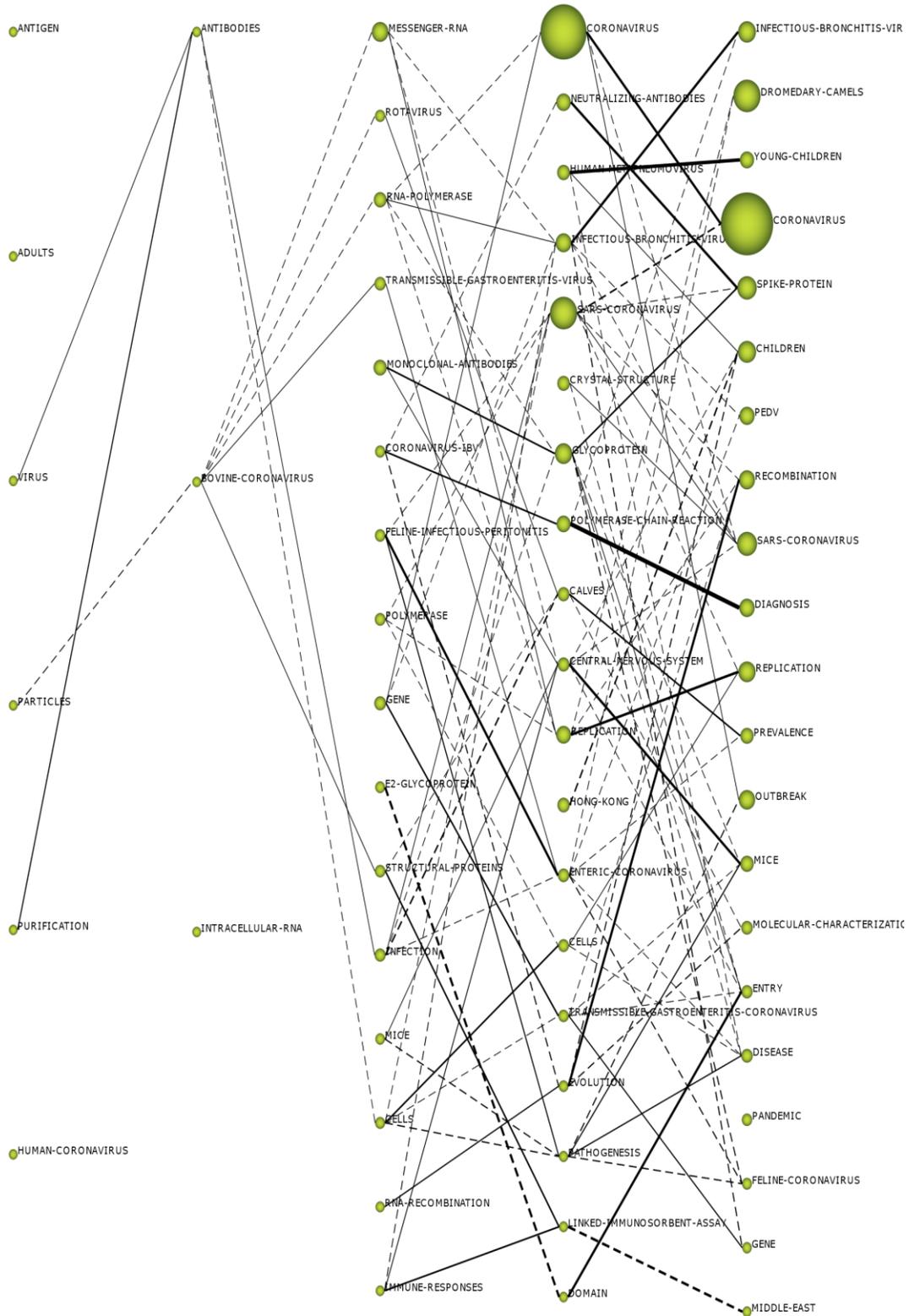
Fig. 10: Strategic Development Map

- The theme of "SARS coronavirus", which emerged in the fourth period and was also found in the last period, was related to the themes of "peline infectious peritonitis", "polymerase", "infection" "cells" from the third period. This theme shared keywords with the themes of "coronavirus", "spike protein", "recombination", "replication", "infectious bronchitis virus", "crystal structure" and "central nervous system".
- The theme of "replication" in the last two periods was related to the theme of "polymerase" from the third period and the theme of "Hong Kong" in the fourth period was related to the theme of "children" from the last period.
- The theme of "enteric coronavirus", associated with the themes of "transmissible gastroenteritis virus" "feline infectious peritonitis" and "infection" from the third period, was related to "dromery camel" "pedv", "prevalence", "disease" and "feline coronavirus" themes from the last period.

Discussion

In this research, Coronavirus, which is the causative agent of COVID-19 disease, recently affected our country as well as the world, was examined. This pandemic can change our lives irreversibly and create a "new normal". With the analysis, the interest of science to the virus and how it has changed in terms of quality and quantity over the years has been revealed. Scientific mapping methods used for this purpose are still the most frequently used methods in the world of science.

Since the 50-year period examined in the study constitutes a very large volume, 10-year periods were determined in order to understand the changes and transformations over time, and analyzes were made based on these intervals. Since the discovery of coronaviruses was already made in the 1960s, it is pointless to go further back. In this respect, our study is a very comprehensive study examining the issue of Coronavirus since the day it entered the agenda of the scientific world.

Considering the findings regarding the distribution of the articles analyzed within the scope of our research by years, the number of articles increased in 2004, 2016, 2017 and 2020. This situation is thought to be related to outbreaks or pandemics of SARS, MERS and COVID-19. Considering the historical course of the coronavirus, SARS started in Hong Kong and spread to the world in 2002-2003, MERS known as "Middle East Respiratory Syndrome" was first detected in Saudi Arabia in 2012 and subsequently affected wide geography and lastly, COVID-19 was defined in Jan 2020. According to this course, with the outbreaks affecting almost the entire population of the world, research on the virus that is the cause of these outbreaks has increased significantly. This is considered to be an expected situation. (5-7).

Besides, Coronavirus types were identified as HCoV NL63 in 2004 and HKU1 in 2005. However, it is not possible to say that there was an increase in the number of articles in the years they were identified compared to other periods. In fact, the increase in the number of articles starting with SARS tended to fall until MERS came into play. Coronavirus research follows a stable course in terms of quantity unless there are significant developments.

Our research showed that leading countries in the field of scientific studies, such as the United States, China, Germany and the United Kingdom, are also prominent in research on coronavirus and its publication in articles. Considering all the articles published in the field of medicine; the USA, China, UK and Germany are in the first place. Our country ranks 16th in this field. However, when looking at the number of citations of the publications from the countries, the ranking changes (19).

In the distribution of the articles on coronavirus by country, most articles were published by the USA. This country was followed by China, Germany, England and the Netherlands. In more

detail, Taiwan and Saudi Arabia, which were not among the top 12 countries that published the largest number of articles in the field of Medicine, were among the top 12 countries relating the articles on Coronavirus. Singapore, not included in the list of countries publishing medical articles in the "Data on the World, Countries and Groups in the Disciplines" published by TÜBİTAK, ranked 15th in articles about Coronavirus. Besides, Egypt, which ranked 37th in the ranking of all articles in the field of medicine, was the 20th country that published the highest number of articles on Coronavirus (19).

In the review regarding the change in the number of articles, the high number of articles on the Coronavirus in Taiwan and Singapore was due to the SARS epidemic. Taiwan and Singapore were the leading countries where SARS was seen most, and the death rate from SARS in these countries was higher compared to other countries (20).

The high number of articles on Coronavirus originating from Saudi Arabia and Egypt was caused by the MERS disease. When the data on MERS were examined, it was seen that Saudi Arabia was far ahead of other countries in terms of the number of cases confirmed by the laboratory, and Egypt is among the countries where MERS disease was detected. Besides, Jordan and the United Arab Emirates, where MERS was detected much more frequently than other countries, were not ranked among the countries that published articles with Coronavirus content. This can be explained by the low performance of the listed countries in publishing medical articles. Because both countries were not ranked as the countries that published the most medical articles (21).

Among the keywords used in the articles analyzed in the research, the most used words were listed as "coronavirus", "infection", "virus", "identification", "acute respiratory syndrome" and "SARS". This was an expected situation; however, MERS and COVID were not among the most widely used words. MERS affected a more limited region compared to SARS and COVID, and the new entry of COVID-containing publications into the literature since

COVID was defined in Jan 2020 could explain this situation.

The prominent themes or scientific studies in the period examined are located in the upper right and lower right sections of the strategic diagram. In this case, Coronavirus studies containing "antigen", "virus" and "particles" are at the forefront in the period of 1970-1979. Research has shown that studies of newly discovered Coronaviruses in the 60s continued into the 70s, the studies and antigenic researches on the diseases caused by Coronavirus OC43 and 229E intensified in these years, the structure and epidemiological features of the virus were frequently examined during this period. This is the reason why the Coronavirus studies containing "antigen", "virus" and "particles" came to the fore in these years. The first Coronaviruses were detected in poultry. In the following years, many studies were carried out on the types of Coronavirus that caused diseases in humans and their characteristics. The detection of "human coronavirus" as a newly emerging theme is an expected result.

Three themes were determined in the later period, 1980-1989. These are "bovine coronavirus", "antibodies" and "intracellular RNA" themes. The prominent engine theme among these is the "bovine coronavirus" theme. Bovine Coronavirus is a type of Coronavirus that is found in cattle and shows common antigenic properties with the Human Coronavirus OC43 virus. Bovine Coronavirus entered the literature in the late '70s. Thus, with the '80s, the studies on Bovine Coronavirus intensified and the studies on Coronavirus came to prominence as the engine theme of the 80s. Bovine Coronavirus has a development process that lasts longer and progresses more slowly than other Coronavirus types. Therefore, research on the transcription, replication and protein synthesis processes of the coronavirus family was conducted with the study of the process in bovine Coronavirus. This situation made "intracellular RNA" one of the important issues of Coronavirus research in the '80s (22,23).

According to the analyzes conducted, "Messenger RNA", "transmissible gastroenteritis virus", "coronavirus IBV", "feline infectious peritonitis",

which were among the themes in the strategic diagram for the period of 1990-1999, appeared to be important themes. In the period examined in the mid-'80s, 22 of 26 Coronavirus types showing antigenic homology were associated with Transmissible Gastroenteritis Virus, and Feline Infectious Peritonitis Virus was among the related viruses. In the literature, numerous articles are belonging to this period. Coronavirus IBV is a species seen in poultry throughout the world. Articles about this species have started to appear in literature since the early 80s. Many articles were published in the 90s on Coronavirus IBV, which threatened the economies of the country by causing serious deaths in poultry due to its high contagious properties and killing rate (24,25).

According to the strategic diagram, "Coronavirus", "SARS-coronavirus", "human metapneumovirus", "Hong Kong", "transmissible gastroenteritis coronavirus" themes related to the period 2000-2009 were considered to be important. Among these themes, the themes of "Coronavirus", "SARS-coronavirus" originated from the SARS epidemic that shook the world during the 2003-2004 period and the articles produced from numerous research and studies on this subject. The Hong Kong theme is thought to come to the fore because Hong Kong was the first place where SARS started. "Human Metapneumovirus" is a worldwide known species discovered in 2001. It is a common respiratory pathogen that can cause both upper and lower respiratory tract infections, especially in infants and young children. Articles produced and published from studies on this newly defined species made Human Metapneumovirus stand out among other issues related to Coronavirus (26,27).

In the light of the analyzes, the themes included in the strategic diagram for the 2010-2020 period and primarily examined are "coronavirus", "dromedary camels", "spike protein", "Middle East" themes. The reason why the Coronavirus and the Middle East headlines came to the fore is the MERS pandemic detected and spread in Saudi Arabia in 2012. Since this disease was frequently seen in Middle Eastern countries such as

Jordan, United Arab Emirates, Oman and Kuwait, the Middle East was examined more frequently in articles than in other subjects. Dromedary camel means "single-humped camel" in Turkish. One of the animal reservoirs infected with MERS disease was dromedary camels. For this reason, a significant number of articles have been published on this subject. The Spike protein theme has been studied more frequently than other themes due to its association with the Dromedary Camel theme. The presence of MERS coronavirus in single hump camels (Dromedary Camels) was proven by the demonstration of the presence of spike protein-binding antibodies (28,29).

Our study also examined the relationships between the themes that emerged during the ten-year period. In this context, the themes "Gene" and "RNA polymerase" seemed to be related to Coronavirus. This was an expected result because RNA polymerase is the enzyme that copies the data in DNA or RNA in a gene as RNA. Coronavirus family is also the RNA virus family, and many studies investigating their molecular structures have actually been conducted in the form of gene and RNA polymerase analysis.

Neutralizing or protective antibodies are Ig A and/or M antibodies and are formed to protect the organism after virus contamination. Coronavirus IBV is a species seen in poultry worldwide and has a high rate of transmission and killing. Numerous articles have been published about this species that threatens the economies of the country. In the articles, possible vaccines and treatment approaches used against this species were examined. These approaches are generally in the form of examining the neutralizing or protective antibodies that develop through the spike protein structure of the virus. As a result, a strong relationship has been found between the theme of "neutralizing antibodies" and "coronavirus ibv" and "spike protein" themes from the recent period (30,31).

Intensive basic keyword sharing with the "young children" theme of the "Human metapneumovirus" theme was an expected result. Because Human Metapneumovirus is a common respira-

tory pathogen seen in infants and young children (26).

The relationship between the "replication" theme and the "polymerase" theme stems from the fact that polymerase enzymes are necessary for RNA replication. The relationship of the "Hong Kong" theme with the "children" theme stems from articles from Hong Kong examining the effects of various Coronavirus species, especially Human Metapneumovirus, on children (32,33).

Conclusion

Not only has the Coronavirus outbreak eroded traditional systems, but it also improves our ability to find new and innovative solutions to problems. The concept of "new normal" has entered our lives. "New normal" concepts with different dynamics are defined for each country.

The impact of the outbreak is not the same for all countries. New life models will be introduced for each country, different from previous years. Some behaviors and routines, especially related to health systems, business life, trade, education and travel, will change indefinitely.

In this period when the COVID-19 pandemic started to affect the whole world as a second wave, this research on the coronavirus family can offer a holistic view of the virus family in the scientific world. Besides, it can make a scientific contribution to the fight against the virus by creating an awareness on this issue.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Conflict of interest

The authors declare that there is no conflict of interest.

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