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A Bibliometric Analysis of The Impact of COVID-19 on Maritime Logistics and Ports

COVID-19'un Deniz Lojistiği ve Limanlar Üzerindeki Etkisinin Bibliyometrik Analizi

Abstract

Starting from the city of Wuhan in China in March 2020, the Covid-19 virus, which spread all over the world in a short time, affected many areas globally. With the declaration of the epidemic worldwide, a red alert was issued in the national and international community. The significant impact of the restrictions applied to slow the spread of the Covid-19 epidemic, as in many other sectors, has also manifested itself in the economy sector. The maritime industry, which constitutes the most important part of international trade, was caught unprepared for this unexpected epidemic. The purpose of this study is to bibliometrically analyze the articles written on the impact of the Covid-19 pandemic on maritime logistics and ports. Web of Science database was used to conduct the study and 29 articles were reached. The articles were examined in detail in terms of number of publications, keyword analysis, author and journal information, and citation analysis. It is aimed that the results of the bibliometric study will guide future studies in this field.

Öz

Mart 2020'de Çin'in Wuhan kentinden başlayarak kısa sürede tüm dünyaya yayılan Covid-19 virüsü, dünya genelinde birçok alanı etkisi altına aldı. Salgının dünya çapında ilan edilmesiyle birlikte ulusal ve uluslararası toplumda kırmızı alarm verildi. Covid-19 salgınının yayılmasını yavaşlatmak için uygulanan kısıtlamaların etkisi birçok alanda olduğu gibi ekonomi alanında da kendini gösterdi. Uluslararası ticaretin en önemli bölümünü oluşturan denizcilik sektörü bu beklenmedik salgına hazırlıksız yakalandı. Bu çalışmanın amacı, Covid-19 pandemisinin deniz lojistiği ve limanlar üzerindeki etkisi üzerine yazılan makaleleri bibliyometrik olarak incelemektir. Çalışmanın yürütülmesinde Web of Science veri tabanı kullanılmış ve 29 makaleye ulaşılmıştır. Makaleler, yayın sayısı, anahtar kelime analizi, yazar ve dergi bilgileri ve atıf analizi açısından detaylı olarak incelenmiştir. Bibliyometrik çalışmanın sonuçlarının gelecekte bu alanda yapılacak çalışmalara yön vermesi hedeflenmektedir.

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Introduction

With the World Health Organization (WHO)'s declaration of the Covid-19 pandemic in March 2020, global changes have begun in the world. The coronavirus has spread rapidly all over the world, increased its impact day by day. According to the WHO current report, as of 3 February 2022, the number of people who lost their lives from the Covid-19 virus in the world was 5.693.824 in total. February 2022 WHO report data shows that the number of global cases has reached a total of 383.509.779 (WHO, 2021). The fight against the Covid-19, which emerged unexpectedly, has become the agenda of the world. The states were caught unprepared for the pandemic. States took important decisions to fight the virus with national and international organizations. The measures taken in this context became more stringent with the increasing number of deaths. Countries have closed borders; travel bans were imposed inside and outside the countries. Schools and workplaces were closed, and lockdowns were imposed. While all of this was going on, the economy has also severely damaged.

Especially in the first wave of the pandemic, the supply chain experienced significant difficulties around the world. The disruption of trade had a negative impact on both imports and exports. The spread of the disease and the increase in the number of deaths led to a decrease in the workforce. There were delays in shipments due to the lack of labor, especially at the ports, which are the main points of international trade. The decline in world gross domestic product can be shown as the most important evidence of the negative impact of the Covid-19 pandemic on the finance and trade sector. Major world economies such as America, China, Germany, and U.K. have been the countries most affected by the coronavirus. This situation brought international trade to a standstill. Covid-19 has caused supply disruptions and demand shocks in the world supply chain. The effects of the pandemic have also manifested themselves in maritime companies and businesses in the maritime sector (UNCTAD, 2021).

A noticeable decrease in investments compared to previous years, temporary closures implemented to prevent the spread of the pandemic, and the decrease in logistics services adversely affected maritime companies. Measures and closures taken around the world have rendered the purchasing functions of companies dysfunctional. Generally, materials imported from abroad could not be obtained to a large extent. The existing export potentials of the companies also decreased due to the same reasons. With these decreases, the traffic in maritime transport decreased considerably (Cengiz and Turan, 2021: 54). Within the scope of Covid-19 measures, ports, which are one of the places where mobility is experienced the most, were also subjected to strict measures. The temporary closure of the shipping lines, and the decrease in the current workforce due to illness caused disruptions in operations inside and outside the ports. Therefore, import and export volumes were adversely affected by the pandemic conditions. (Xu et al., 2021: 2).

This study consists of 6 sections. In the next part, the theoretical framework, the general concepts related to the subject are briefly explained to better understand the research. In the third section, the literature review is outlined to summarize the articles regarding the impacts of Covid-19 on maritime logistics and seaports. In the following section, the research methodology is described in terms of the techniques used in the design and preparation of the study. The findings and results that reached as a result of the bibliometric analysis is examined in the fifth section. In the conclusion section, the main implications are summarized.

1. Theoretical Framework

1.1. Covid-19 Pandemic

The Covid-19 (SARS-CoV-2) virus, which first appeared in Wuhan, China in December 2019, is an international disease that unexpectedly affected the whole world. The coronavirus, which spread very quickly around the world, was declared a pandemic by the World Health Organization in as little as 3 months. The world was caught unprepared for this pandemic. The health systems and laboratories of many countries did not have the infrastructure to develop treatment against the virus.

The rapidly increased infection rate has caused a rising in the death rate and strengthen the effect of the virus day by day. In order to reduce the effects of this virus, limitation decisions have been put into effect around the world. Especially in the first quarter of the pandemic, measures such as travel bans between cities and countries, curfews, which brought the routine functioning of life to a standstill, have been implemented. This situation negatively affected the economic and commercial activities in the world. Countries have been announced the number of cases and deaths day by day and informed their citizens about the spread rate and effect of the virus. The World Health Organization has been shared the worldwide coronavirus data with the whole world and supported the fight of countries against the virus and followed it closely (Harapan et al., 2020: 668). Uncertainty about the nature and effects of the disease at first started clinical studies on this subject. Afterwards, studies to develop drugs and vaccines against the coronavirus disease started rapidly around the world. As of May 2021, it is known that there are 442 coronavirus vaccines in clinical trials worldwide. Some of these vaccines are supported by industries, others by the government or academics (Huang et al., 2021: 3276). Pfizer-BioNTech COVID-19 Vaccine, which is the first Covid-19 vaccine approved for use by the World Health Organization, is the vaccine with the highest

effectiveness against the virus to date. However, the virus mutates day by day, making the different world open to different threats. For this reason, vaccine development studies continue against new mutations (Britton et al, 2021: 400).

1.2. Maritime Transportation and Ports

There are many academic studies on maritime transport and ports, which has a long history. Ports are the center points of maritime transport. Maritime transport is not just about operations inside the ship. The performance, efficiency and capacity of ports are functions that need to be well managed for maritime transport to be successful. For this reason, ship and port operations cannot be seen separately from each other. Global maritime transport networks have been created over the years through the strategically important channels and straits of the world. The most efficient realization of the intercontinental trade flow by sea is provided along the routes formed by strategic locations such as the Panama Canal, Suez Canal, Hormuz, and Malacca Straits. These routes were created by connecting the continents by the shortest route. The development of international trade relations with the increase in global supply has increased the role of maritime transport. The level of regional and global economic development increases in direct proportion to the acceleration of trade in fossil fuels, raw materials, grains, parts, and finished products provided by sea transportation. In addition to developed countries, the inclusion of developing countries in the industrialization process in a short time and the evolution of supply chains from a regional to a global structure paved the way for maritime transport. This situation has led to an increase in the share of trade of many products in maritime transport. The development of world maritime transport throughout the historical process has grown in parallel with the increase in the current capacity. With the development of container and bulk cargo transportation, which are the two most important segments of maritime transportation, the capacities of ship and terminal facilities have been enlarged. In this way, the unit costs of products transported by sea are reduced and the advantage of transporting more products with less cost is provided (Rodrigue, 2017: 1-7).

Maritime transport, which is one of the most important elements of international trade, has a critical place in the economies of the countries. The fact that it has an international character compared to other transportation modes is because more than %80 of international trade is carried out by sea (UNCTAD, 2021: 111). Maritime transportation, which offers various cargo transportation alternatives such as bulk cargo, general cargo, and line transportation, also constitutes an important part of passenger transportation and tourism industry. Maritime transport in the world economy has a global structure. The involvement of countries in global maritime transport offers them many opportunities. In this way, countries have gained the chance to have more commercial opportunities by increasing their accessibility to global markets (Xu et al., 2020: 10). There is an important link between the position of countries in international trade and their level in maritime transport. Maritime transport has a positive effect on the development and economy of the country. Maritime transport, which stands out with its economic advantage, is an alternative to environmentally friendly practices, which are becoming more important today (Fratila et al., 2021: 19). In other words, the global economic growth is paralleled by international trade and maritime transport. Improvements in international trade contribute to regional and global economic development. Therefore, economic growth is directly affected by the increasing of international trade volume. The development of intercontinental trade boosts the demand for logistics services as it reveals the need for the transportation of products. Compared to other transportation modes, the demand for maritime transportation, which provides intercontinental transport with critical transit routes around the world, also increases (Yercan & Yıldız, 2021: 59).

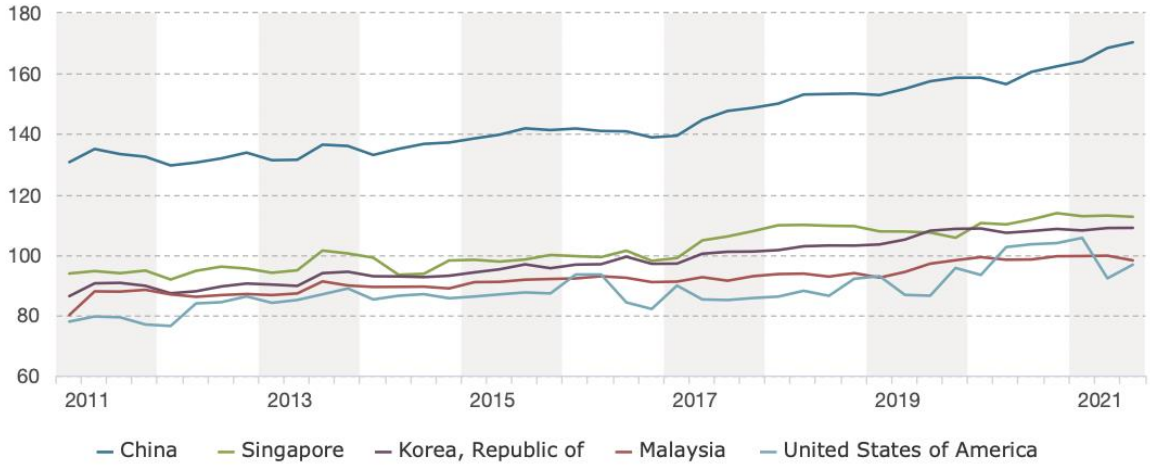

Figure 1: Linear Shipping Connectivity Index, Top 5 Economies
Reproduced from United Nations Conference on Trade and Development (UNCTAD 2021), *The UNCTAD Handbook of Statistics 2021* (p.80)

The UNCTAD maritime transport connectivity index (LSCI) measures the level of participation of countries in maritime transport around the world. This index is created by evaluating the basic components of maritime transport together. The number of port calls, container carrying capacity, the number of maritime transport services and companies, the capacity of the largest ship and the number of countries directly connected to the transport services are the criteria used in the calculation of LSCI. In certain periods, the position of each country in the global maritime transport network is determined by this index. Looking at the LSCI index's data for the third quarter of 2021 in Figure.1, it is seen that China is the country that is most integrated into the maritime transport network around the world. Other countries with the strongest connection in the global maritime transport network, taking place in the top five of the index, are Singapore, the Republic of Korea, Malaysia and the USA, respectively (UNCTAD, 2021: 80).

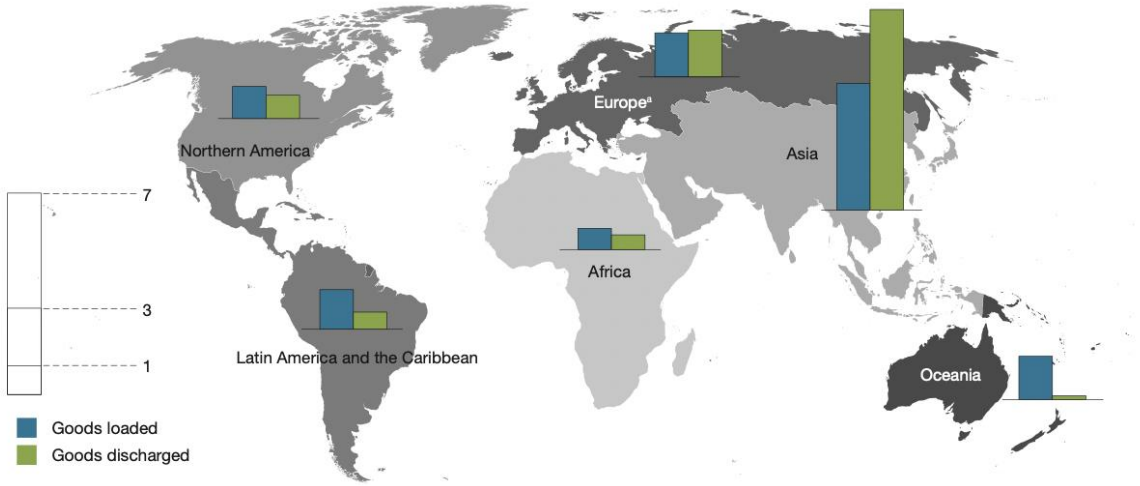

Figure 2: Tonnage loaded and discharged, 2020
Reproduced from United Nations Conference on Trade and Development (UNCTAD 2021), *The UNCTAD Handbook of Statistics 2021* (p.72)

The number of products transported internationally in ports, which are the center of global trade, gives information about the import and export volumes of countries by sea. According to Figure.2, which shows the tonnage of goods loaded and unloaded at world-wide ports in 2020, it is seen that ports in the Asian region are in a leading position in maritime transport compared to other world ports. While global seaborne trade volume was recorded as 10.6 billion tons in 2020,

Considering the loading and unloading rates at ports, which are indicators of imports and exports, more than 41.3 percent of the total goods loaded in world ports were loaded into Asian ports. Developing countries maintain their position at the top with 59.5% loading and 69.5% unloading rates in 2020. Developing countries, especially in the Asia and Oceania regions, take part in this large share (UNCTAD, 2021: 72-73). Since the global economic advancement is directly linked to maritime transport and trade, the worldwide problems and crises affect negatively. While the global maritime trade has improved from year to year for both developed and developing countries in the last decade, global crises such as the economic recession in 2008 and the Covid-19 outbreak in 2020 have led to declines. This situation shows us the interconnected relationship between the global economy and seaborne trade (Yercan & Yıldız, 2021: 38).

2. Literature Review

The literature review study was carried out by analyzing the existing studies between 2020-2021 via the Web of Science (WoS) database. The literature review was conducted by considering the criteria of (1) date range: 2019-2020 (2) language: English (3) source type: article, research article, review, book chapter. In the literature review, "COVID-19, pandemic, maritime logistics, seaports, port resilience and disruptions, maritime supply chain, response strategies" keywords were used. The articles reached as a result of the analysis were divided into three groups according to their contents.

2.1. Disruption and Resilience in Maritime Logistics

According to Yazır et al. (2020), with the bans put in place at the beginning of the pandemic, industrial production and energy consumption fell drastically, and many sectors were harmed by this situation. Intermediate goods provided by China, which is the starting point of the Covid-19 virus, could not be delivered to the countries due to the health crisis. This situation negatively affected the production in many companies. Travel bans and quarantine processes implemented around the world damaged the industry, transportation, and tourism sectors, especially in the first months of the pandemic. Known for its international character, maritime transport is the mode of transport in which a large proportion of imports and exports are carried out. The problems experienced at the ports during the pandemic process therefore directly affect international trade negatively. This has become a bigger crisis, especially for import-dependent countries that must procure certain products from abroad. Ports with constant entrances and exits have become risky in terms of health and safety during the pandemic. The cessation of operations, along with the decreasing workforce due to the health threat, brings along many different costs. Quarantine processes in ports and ships have led to longer delivery times and increased transportation costs. The prolongation of delivery times and the accumulation of cargo at the port have been a major problem, especially for perishable products. For all these reasons, it draws attention to the complete implementation of the measures taken at port entrances and exits.

Akyürek and Bolat (2020) discussed the impact of the pandemic process on maritime transport by evaluating the port state control process. The Paris Memorandum of Understanding on Port State Control (MOU) statistics explained that the number of ship inspections decreased in the first months of Covid-19. Contrary to this reduction, they have drawn attention to the increase in documents related to ship detention. They stated that the reason for this is that the required inspections could not be carried out under the necessary conditions due to the risk of Covid-19. It is pointed out that inspectors who cannot meet the necessary conditions have a reduced chance of conducting an accurate and fair audit. Remote control with the use of technology was suggested as a solution.

Shi and Weng (2021), examined the impact of the pandemic on maritime trade, depending on the commercial ship activities in the Shanghai port. As a result of the comparison of the 2019 and 2020 February Automatic Identification Systems (AIS) data, the connection between the emission rate of ships and the frequency of ship use was analyzed. A parallel relationship has been established between these two different data. In this comparison, according to the emission density of different commercial ship types, it has been revealed that the difference in the emission rate of cargo ships is particularly high. This comparison had showed that the emission density of ships while cruising in

February 2020 was significantly below the 2019 data. In other words, pandemic conditions were shown as the reason for the reduction in the frequency of use of the commercial ship type with decreasing emission intensity. On the contrary, the prolongation of the ship berthing and departure times due to the slowdown in port operations during the pandemic period caused the emission intensities of the ships to increase in this process.

Comparing the effects of the 2009 financial crisis and the 2020 pandemic crisis in the maritime sector, Notteboom et al. (2021) evaluated each crisis as periods that allow the measurement of adaptation and resilience for the maritime sector. One of the important effects of Covid-19 on maritime transport was the decrease in port calls. Especially in the first 6 months of the pandemic, there was a noticeable decrease in port calls compared to 2019. Parallel to the decrease in calls, the decrease in port level and demand has led to an increase in the number of empty voyages, especially on long lines. Although the ports, which tried to renew themselves with a series of measures taken, managed to struggle with the effects of covid-19 for a while, the high levels of cases with the second wave destabilized the balance. The restrictions applied to reduce the spread of Covid-19 have adversely affected not only ship and port operations, but also inland transportation. The answers given by the maritime sector to the restrictions such as the decrease in the number of carriers due to the decrease in the workforce and the closure of border crossings for a certain period have been related to the effective management of the existing capacity. In addition to the general effects of the pandemic, when analyzed on a port basis, it has been observed that different degrees of vulnerability varied according to features such as call selection, shipping network and hinterland location.

Menhat et al. (2021), on the other hand, had drawn attention to the negative impact of disruptions in ports, which are the main connection points of the global maritime supply chain, on international trade. The problem experienced at one point affected other regions connected to the same network in the domino effect. The spread of the disease and the absence of labor due to restrictions made it difficult for the cargo to enter and exit the ports. This situation, which hindered the cargo movement capacity, caused cargo accumulation in the ports. Although the supply of essential food and medical supplies was provided with a compulsory intervention, the movement of materials in other categories was limited to the agglomeration they created in the ports.

2.2. Technical and Organizational Problems in Ports

According to Tai et al. (2021) analyzed the impact of Covid-19 on port operations using the system dynamic model. The pandemic data of the Shanghai port was analyzed within the framework of the concepts of port production and organization. In this study, the system dynamic model has been constructed within the framework of concepts such as cargo carrying capacity, domestic and foreign trade volume, GDP, and environmental pollution. As a result of the data analyzed in three different scenarios, it is stated that the effect of the pandemic on passenger transportation is greater. Tai et al. emphasized the port modernization by drawing attention to the impact of the pandemic on the ports. It also revealed that the information flow between domestic and international ports should be ensured effectively. Another conclusion reached as a result of this study is the necessity of developing coordination and control structures against pandemic conditions in ports. Another negative impact of the pandemic in ports is high detention fees. The delay in deliveries due to the loss of workforce and the slowdown in the operations at the ports caused a heavy load of cargo in the ports. This resulted in a high-cost burden due to the long stay of many containers in ports.

According to Doumbia-Henry (2020), crew change in seaway shipping is one of the main functions that ensures the continuous and efficient operation of the global supply chain. Especially during the pandemic period, many seafarers had to stay at sea for a very long time due to prohibitions. This situation posed a serious risk by rendering maritime trade operations inefficient. He stated that the efforts of the seafarers to continue their operations under difficult conditions during the pandemic process and the crises they have experienced in this process should not be ignored.

Xu et al. (2021) had evaluated the impact of the pandemic on the maritime industry focusing on 14 ports of China. It was stated that there were significant differences in terms of the import and

export volume compared to the previous year. The pandemic conditions caused a significant decrease in the volume of import as an import barrier. In the study the impact of Covid-19 on the transportation sector found to be great and emphasized that measures and inspections should be carried out effectively to reduce this negative effect. Government policies are considered important as a preventive and mitigating factor for the effects of the pandemic. Supportive government policies such as tax reductions and interest-free loans can be an important factor, especially to reduce the devastating effect of the pandemic in the maritime sector.

On the other hand, Van den Oord et al. (2020) explained that the effective strategies implemented by the port authorities in the pandemic crisis helped to overcome this crisis with the least damage. The Antwerp Port Authority (APA), the second largest port in Europe after Rotterdam, has implemented important strategies in managing the Covid-19 crisis. Accurate and fast information sharing to act jointly with its networks emerged as an important management strategy in this sense. When the constraints were put into effect, APA displayed a leadership characteristic by predetermining its strategy regarding the management of key operational processes. APA also negotiated with other ports in the network and shared its policy with them. The port managed to minimize the negative impact of the pandemic by providing effective communication and coordination with each link in the chain. In addition, APA has not been limited to these, but also prioritized studies on port management after the pandemic.

2.3. The Post Covid-19 Effects on Maritime Supply Chain: Digital Transformation and Response Strategies

According to Charłampowicz (2021), the negative effects of Covid-19 on maritime logistics may be possible by renewing the ports. Improving the service quality of the ports was suggested to provide an advantage in this sense. Improving the service quality of the terminals is possible by establishing a control mechanism and checking it regularly. These checks are made by operators, carriers, and freight forwarders to help identifying and improving service quality deficiencies. Charlampowicz (2021) has established a directly proportional relationship between the service quality of the terminals and their competitiveness. He drew attention to the use of digital technologies as an important factor in increasing service quality such as cloud computing, blockchain technology, Artificial Intelligence (AI) etc.

Bocayuva (2020) defended the necessity of digital transformation, the importance of which has increased especially with the pandemic, while on the other hand, he explained that the risks that arise with digital should not be ignored. In order to be competitive, it is necessary not only to have the technological infrastructure, but also to take precautions by being aware of the serious threats of cyber-attacks against ports. In this context, Bocayuva (2020) drew attention to the concept of cyber security.

From Notteboom et al. (2021)'s different perspective, each crisis was evaluated as an opportunity to measure resilience and renew itself according to emerging needs. In addition, the integration of new technologies and the implementation of automation systems to increase the resilience of the maritime supply chain against crises and strengthen its adaptation capabilities have increased its importance with the Covid-19 crisis.

Menhat et al. (2021) evaluated the impact of Covid-19 on maritime transport by considering Malaysia. While evaluating the impact of Covid-19 in the maritime sector in Malaysia, the importance of state support policies in the fight against the pandemic crisis is emphasized, but it is not considered sufficient alone for this struggle to be successful. In addition, it has been mentioned that infrastructural changes that will increase efficiency should also be implemented.

According to Russell et al. (2020) today's supply chain is becoming more and more open to uncertainties. The Covid-19 crisis is one of the most important indicators of this. Thus, management strategies developed against uncertainty in order not to interrupt the supply chain processes has gained importance. In particular, the issue of "flexibility" is an element that should be considered to avoid this uncertainty in port transportation. Flexible capacity management will bring efficiency to port operations in crisis situations where uncertainty prevails, such as a pandemic.

Detailed information of the studies (year, author(s), research method, results) reached as a result of bibliometric analysis are shown in Table-1. According to Table-1, both qualitative and quantitative methods were preferred as research methods in the analyzed academic articles. The effects of Covid-19 were evaluated not only from a single perspective, but also from different perspectives such as seafarers, ports, and supply chain. In addition, the results show that the level of the effect of the pandemic varies in different periods (first, second and third quarter). It is examined that the Covid-19 period has significantly affected both ports and maritime logistics, although the impact was not the same in every period.

Table 1: Literature Review

YEAR	AUTHOR(S)	RESEARCH METHODOLOGY	RESULTS
2021	Shi, K.; Weng, J. X.	Bottom-up Method	As a result of the data analysis in the study, the number and frequency of use of commercial ships decreased during the Covid-19 period, more operation times for berthing and anchoring activities, and longer ship turnaround times were reached.
2021	Millefiori, L. M.; Braca, P.; Zissis, D.; Spiliopoulos, G; Marano, S.; Willett, P. K.; Carniel, S.	The Spatio-Temporal Analysis	As a results of the study, there is a significant decrease in all commercial shipping stages and seaway activities in the first months of Covid-19, when a high degree of precaution was applied.
2021	Tai, Z. L.; Guo, J; Guan, Y. L.; Shi, Q.Q.	Systems Dynamic Model	In the study, attention was drawn to the impact of COVID-19 on the production and operation of ports. It was concluded that the port's collection and distribution capabilities should be strengthened, port production efficiency should be increased, and port modernization should be further strengthened.
2021	Menhat, M.; Zaideen, I. M. M.; Yusuf, Y.; Salleh, N. H. M.; Zamri, M. A.; Jeevan, J.	Literature Review	In this study, it was predicted that the negative effects of the pandemic in all business sectors could be reduced with the support of incentive packages.
2021	Xu, L.; Yang, S. M.; Chen, J. H.; Shi, J.	Panel Regression Model	Emphasizing the negative effects of the pandemic on imports and exports, it was concluded that government prevention would be effective in improving the maritime sector.
2021	Mankowska, M.; Plucinski, M.; Kotowska, I.; Filina-Dawidowicz, L.	Multiple Case Study Method	This study found that some maritime supply chains have disappeared because of the COVID-19 pandemic, while others continue to operate with declining cargo volumes.
2021	Wang, C. N.; Nguyen, N. A.; Fu, H. P.; Hsu, H. P.; Dang, T. T.	The Malmquist Model & The Epsilon-based Measure (EBM) Model	Emphasizing that seaports have an important place in the fight against the pandemic, the study concluded that long-term strategies should be developed to actively contribute to a wider systemic resilience.
2021	Mannan, S.; Shaheen, M. M. A.; Saha, R.	Qualitative Analysis: Semi-structured Questionnaires, In-depth Interviews, Secondary Data Analysis	As a result of the study, it was revealed that during the pandemic period, the berthing times of the ships were prolonged as the cargo discharge of the container slowed down. It was also revealed that the ship waiting time and turn time increased simultaneously.

2021	Bocayuva, M.	Compilation Method	It has been revealed that digital addiction has increased with the COVID-19 pandemic and cyber-attacks in the global shipping industry have quadrupled. It was emphasized that cyber risks should be considered to ensure the security of the European port sector.
2021	Verschuur, J.; Koks, E. E.; Hall, J. W.	Regression Model	Results show widespread port-level trade losses, with the largest absolute losses found for ports in China, the Middle East, and Western Europe, associated with the collapse of specific supply-chains. It is found a clear negative impact of COVID-19 related school and public transport closures on country-wide exports.
2021	Oyenuga, A.	Compilation Method	This article analyzes Africa's MTS performance in the post Covid-19 pandemic period. It has been concluded that sustainable development and multi-stakeholder maritime governance should be given priority in order to achieve the desired development after the pandemic.
2021	Sackey, A. D.; Tchouangeup, B.; Lamptey, B. L.; van der Merwe, B.; Lee, R. O. D.; Mensah, R.; Fuseini, M. C.; Sackey, A. D.	Quantitative Analysis: Interviews and Field Observations	This study concluded that MWS businesses, like all other businesses in the maritime industry, should be proactive and innovative, considering the policies of the countries in which they operate, against the ongoing pandemic risks.
2021	Gao, T. M.; Erokhin, V.; Arskiy, A.; Khudzhatov, M.	the Augmented Dickey-Fuller (ADF), the Phillips-Perron (PP), The Autoregressive Distributed Lag (ARDL) Method, the Fully Modified Ordinary Least Squares (FMOLS) and the Dynamic Ordinary Least Squares (DOLS) Methods	In 2020, pre-existing tight trade relations at all locations along the China-PSR transport corridor appeared to be weakening. The bidirectional effects between the number of COVID-19 cases and connectivity parameters have made the safety regulations of the maritime industry important.
2021	Battineni, G.; Sagaro, G. G.; Chintalapudi, N.; Di Canio, M.; Amenta, F.	Survey Method	Highlighting good knowledge and behavior about COVID-19 among seafarers, this study demonstrates that shipping companies need to develop good practices and appropriate guidelines to keep marine workers cooperative at all times to reduce the spread of COVID-19.
2021	Zheng, H. L.; Hu, Q. Y.; Yang, C.; Chen, J. H.; Mei, Q.	Hierarchy Classification Model	In this study, the relationship between port call probability and ship deadweight was considered. The analysis was made by regarding the geographical distribution of the ports, the types of ship and cargo. As the result of the study, this analysis will enable to monitor the spread of the virus by sea and take measures.
2021	Notteboom, T.; Pallis, T.; Rodrigue, J. P.	Primary and Secondary Data Analysis	This study determined that the container traffic dynamics observed during the financial crisis cannot be used as a predictive tool for the potential impacts of COVID-19 on ports. At the same time, it has been revealed that the impact of COVID-19 varies according to both the region and the port.
2021	Charlampowicz, J.	Compilation Method	In this study, the importance of improving service quality in reducing the negative effects of crises such as pandemics was emphasized. It was demonstrated that this improvement can be achieved by applying methods such as measuring, evaluating, and continuously controlling the service quality of the terminals.

2021	Choquet, A.; Sam-Lefebvre, A.	Compilation Method	This study has shown that the lack of cooperation makes it more difficult to act on major threats such as the pandemic. It was stated that cooperation between flag states and port states should be ensured to carry out operations safely at sea and in ports.
2021	Fanoy, E.; Ummels, A. E.; Schokkenbroek, V.; van Dijk, B.; Wiegmans, S.; Veenstra, T.; van der Eijk, A. A.; Sikkema, R. S.; de Raad, A.	Survey Method	In this study, it was emphasized that in order to control the epidemic on ships, it was necessary to develop epidemic guides adapted to the ships and local conditions. In order to achieve this, it was stated that a network should be established in advance.
2021	Gutsuliak, V. N.	Compilation Method	This study revealed that the main problem caused by the COVID-19 pandemic is the lack of coordination between port authorities and shipowners.
2021	Pallis, A. A.; Papachristou, A. A.	Survey Method	This study emphasized that for the policies to be developed against the solution of the problems to be beneficial, they should not be based on a single format, but should be implemented in a way that covers both port management and regional market dimensions.
2020	Akyurek, E.; Bolat, P.	Comparative Analysis & Entropy-based Grey Relevance Analysis	This study, which included a comparison of data on inspection numbers, found that after the pandemic outbreak caused by COVID-19, the number of ship inspections under the Paris MOU dropped significantly, but the inspection and detention rate remained the same. For the control system to work efficiently, it was suggested to develop new technologies to adapt.
2020	Duran-Grados, V.; Amado-Sanchez, Y.; Calderay-Cayetano, F.; Rodriguez-Moreno, R.; Pajaro-Velazquez, E.; Ramirez-Sanchez, A.; Sousa, S. I. V.; Nunes, R. A. O.; Alvim-Ferraz, M. C. M.; Moreno-Gutierrez, J.	SENEM Model	Based on the results obtained for ships navigating in the waters around the Strait of Gibraltar, the study revealed a positive relationship between the decrease in ship traffic and the decrease in emission rates.
2020	Olapoju, O. M.	Literature Review	The study concluded that the increased preference for transportation in each era was important for the spread of the epidemic prevailing in the era.
2020	Russell, D.; Ruamsook, K.; Roso, V.	Systematic Literature Review Methodology	In this study, it was stated that the importance of capacity flexibility increased in an environment of uncertainty that emerged with the pandemic. The importance of providing flexibility in the operations of ports struggling with the uncertainty environment was emphasized.
2020	Doumbia-Henry, C.	Compilation Method	The study, which showed that the pandemic had a devastating effect on the maritime industry, revealed that seafarers were ignored. In this sense, it was emphasized that improvements should be made.
2020	Van den Oord, S.; Vanlaer, N.; Marynissen, H.; Brugghemans, B.; Van Roey, J.; Albers, S.; Cambre, B.; Kenis, P.	The Network and Data Analysis	This study identified an interdependence between the port community and APA as a leading network within the community.

2020	Wang, Z. H.; Yao, M. Y.; Meng, C. G.; Claramunt, C.	Case Study and Data-driven and Machine Learning Approach	This study introduced data-driven and machine learning, such as Automatic Identification Systems (AIS), to predict the risk of COVID-19 automatically and dynamically in international shipping globally to mitigate the impact of the pandemic.
2020	Yazır, D.; Şahin, B.; Yip, T. L.; Tseng, P. H.	Literature Review	It was stated that reducing the devastating effects of the pandemic can be achieved with effective Port State Controls based on IMO conventions and big data applications. It was emphasized that in the post-COVID-19 period, it would be possible to minimize potential operational risks and evaluate them as successful return opportunities.

3. Research Methodology

Bibliometric analysis is a research method that offers the opportunity to analyze a large amount of data in a certain field. It is known that large volumes of data needed in bibliometric analysis can be accessed accurately and reliably from important scientific databases such as Scopus and Web of Science. With the bibliometric analysis method, large volumes and objective data can be analyzed, and it can be interpreted with objective evaluations such as performance analysis and subjective evaluations such as thematic analysis. It gives detailed information about academic studies and trends in the field of analysis. Bibliometric analysis requires a controlled examination because it contains too many parameters. Recently developed softwires such as Gephi, Leximancer, VOSviewer allow easy bibliometric analysis on the system (Donthu et al., 2021: 285-286). The research design is given in Figure 3.

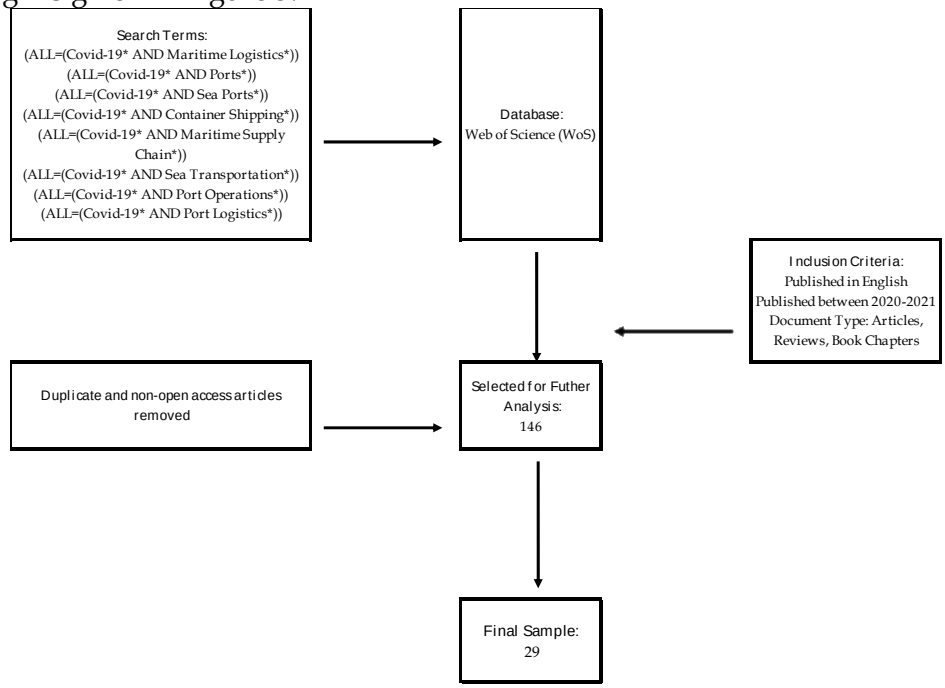

Figure 3: Research Design

This method carried out by following certain steps leads the researcher to more accurate results. Determining the scope and purpose of the study is the first step in starting the analysis. Afterwards, the bibliometric analysis technique is decided, and the data collection phase begins. The last and most important stage is the bibliometric analysis of the found data and the expression of the results (Donthu et al., 2021: 291-293).

As it is seen in the Figure 1 the studies related to "Covid-19 and its impacts on maritime logistics and ports" in the Web of Science (WoS) database between the years 2020-2021 were analyzed using the bibliometric technique, which is one of the qualitative research methods. Since the determined

title is a new topic, it has been observed that the number of studies in this field is low. Thus, to expand the scope as much as possible, different types of publications were included in the study besides the article. The WoS database was preferred because it allows a wider range of studies. The keyword search in the WoS was set to include titles, abstracts, and keywords. In the literature review, "COVID-19, pandemic, maritime logistics, seaports, port resilience and disruptions, maritime supply chain, response strategies" keywords were used.

The first step of study is literature review that was conducted by using the WoS. In order not to go beyond the scope of the main object of the research, the titles, keywords, and abstracts of the reached studies were carefully examined. In the second stage, the publications whose publication language is not English, and which have not yet been fully published have been removed. In addition, publications that do not have open access to their full texts were eliminated.

Finally, as a result, the obtained 29 studies were analyzed. By examining these studies, it is aimed to present a resource in terms of revealing the status of the studies on this subject and guiding future studies. The limitation of this study is that the publications was obtained only using the WoS database. The findings that obtained by bibliometric analysis method in this study are important in terms of identifying research gaps and encouraging high-impact research on the Covid-19 and its impact on maritime logistics and ports.

4. Findings and Results

29 studies were analyzed according to the following categories: (1) publication year, (2) research areas, (3) document type, (4) countries/regions, (5) publication/source titles, (6) times cited, (7) keywords (word cloud). Analysis charts were created via Web of Science database.

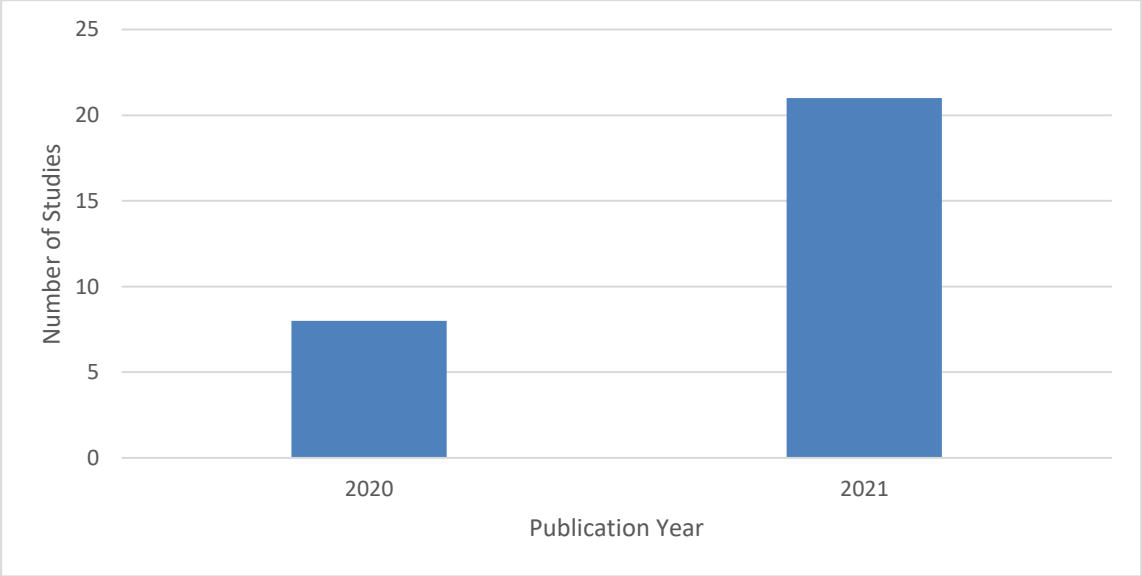

Figure 4: Number of Publications per Year

The distribution of publications by years is shown in Figure 4. Since the SARS-CoV-2 virus has declared a pandemic in March 2020, the concept of Covid-19 has entered the literature as a new concept. For this reason, the beginning of academic studies on this subject was in 2020. In the 2020-2021 period, 8 of the 29 publications in the WoS database were published in 2020. Most of the contributions belong to 2021 (21 publications).

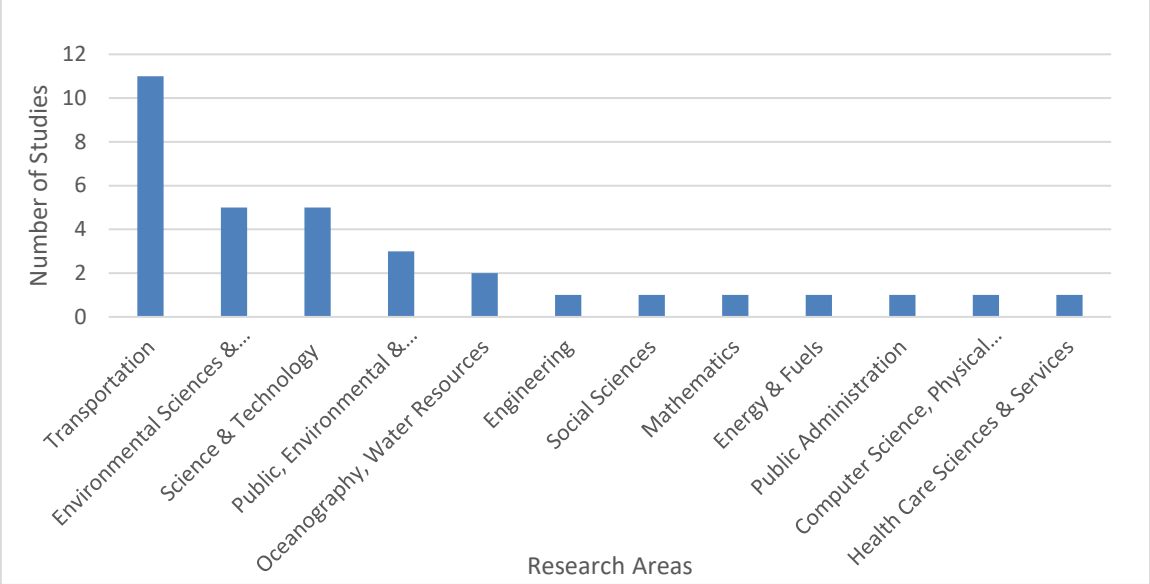

Figure 5: Distribution of Reviewed Papers by Research Areas

Figure 5 shows the distribution of publications by research areas. Most publications are from the field of Transportation. Others have been published in the research areas of environmental science and ecology, science and technology, and public, environmental, and occupational health, respectively. Due to the use of transportation-related keywords such as "maritime logistics" and "ports", more publications related to transportation have been reached. The studies obtained as a result of the research include various research areas. It has been seen that the Covid-19 pandemic has also been discussed in different research areas, as it has effects and consequences that concern many disciplines.

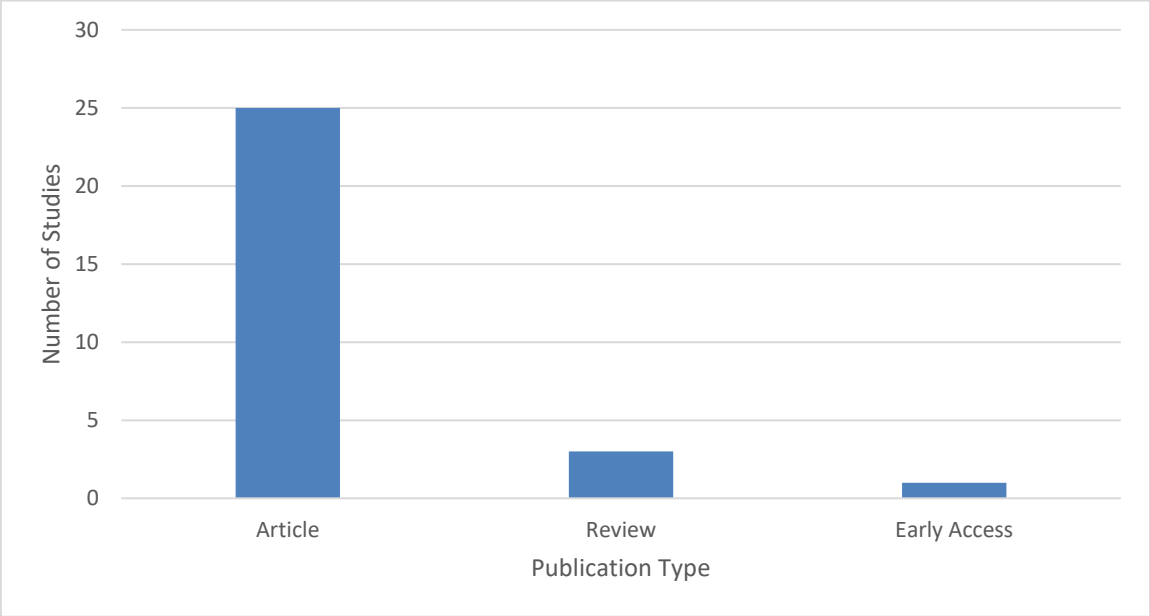

Figure 6: Distribution of Reviewed Studies by Publication Type

The distribution of the publications according to the document type is shown in Figure 6. Articles were found to be the most preferred publication type. Among the publications, there are also few review articles and conference proceedings.

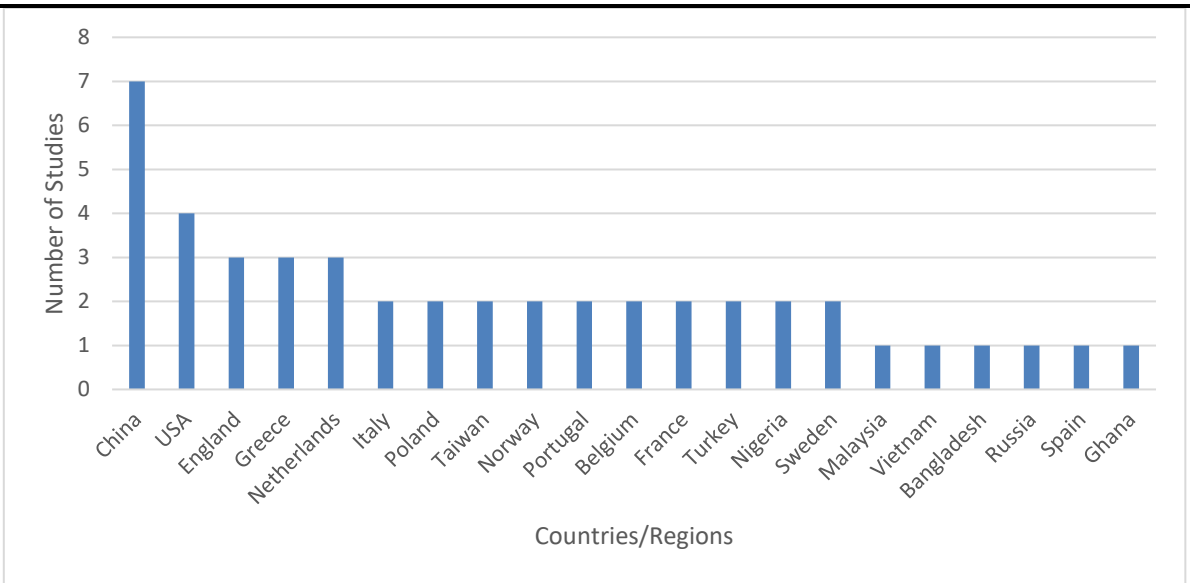

Figure 7: Distribution of Publications by Countries/Regions

Figure 7 indicates the distribution of articles by country. Most of the publications are originated from China. This is followed by USA, England, Greece, the Netherlands, and Italy. In addition, Poland, Taiwan, Portugal, and Belgium are countries which have publications in this topic. It is noteworthy that these countries have an important place in the maritime sector and are among the countries most affected by the pandemic.

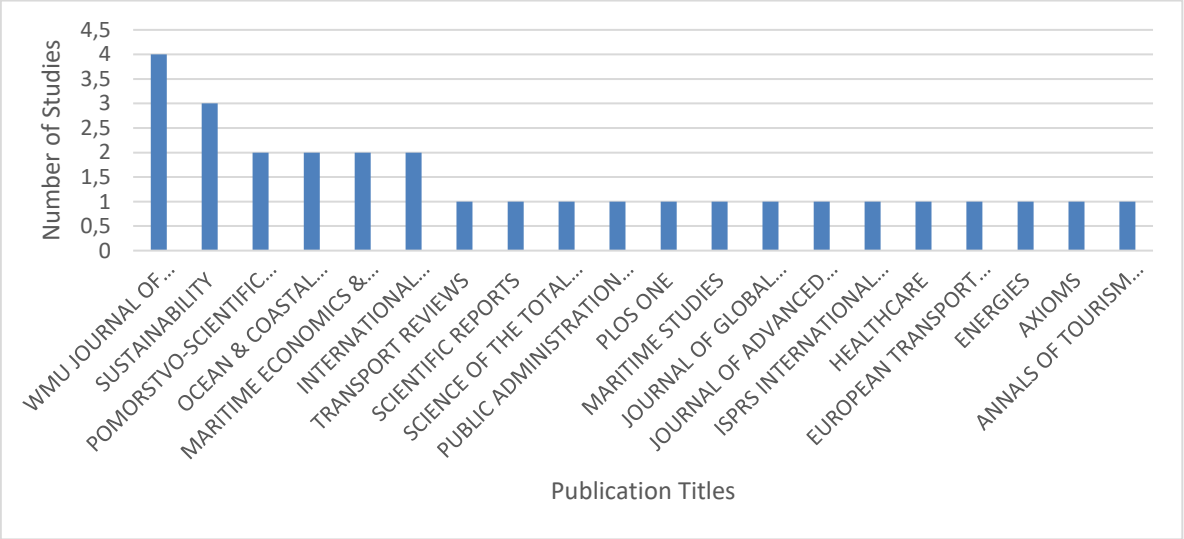

Figure 8: Distribution of Publications Titles

Figure 8 shows the distribution of studies by the publication titles. The World Maritime University Journal of Maritime Affairs (WMU JoMA) ranks first in this distribution. "Sustainability", "Pomorstvo-Scientific Journal of Maritime Research", "Ocean and Coastal Management", "Maritime Economics and Logistics", "International Maritime Health" contribute to the field as scientific journals in which publications are concentrated.

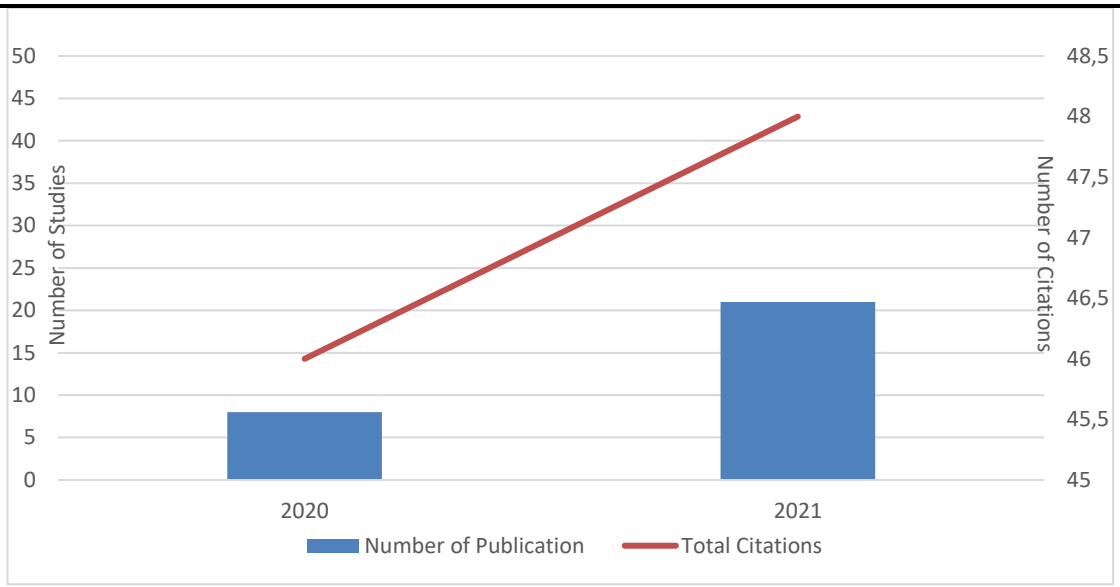

Figure 9: Total Citations Over Time

Figure 9 gives information about the total number of citations of the collected academic studies. While the total number of citing articles is 77, this number is 72 when self-citations are excluded. The total number of citations of the academic studies analyzed in this study is 94. The total number of citations were made without self-quotes is 79. The average number of citing studies and H-index calculations are taken from the analysis of the WoS database. The average number of citing articles is 3.38. The H-index shows the citation levels of the articles reached. A high index record indicates that the articles analyzed in the study have good citation levels. According to WoS analysis, there are 6 academic studies cited at least 6 times according to the H-index ratio.

Figure 10: Word Cloud of Keywords

The word cloud contributes to forming an idea about frequently used keyword. For this purpose, the word cloud figure was created via the website (https://wordart.com). According to Figure 10, it has been determined that the most frequently used keywords in publications are COVID-19, ship, maritime, port, pandemic, cruise, container. Other keywords that are frequently used in academic studies are: *China, maritime/shipping industry, shipping, maritime law, outbreak, cruise ships, maritime supply chain, seafarers, ship emissions, port performance.*

Conclusion

This study bibliometrically analyzed the publications conducted in this field in 2020 and 2021 to reveal the effect of Covid-19 on maritime logistics and ports. The analysis was carried out through the Web of Science database, and a total of 29 studies were reached. In the literature review, the criteria of publication year, language (English), accessibility (open access), publication type (article, proceeding, book chapter) were considered. This study can be the first bibliometric literature review in this field, as no other study has been found in this area.

The result of this study gives information about the direction of the studies in this field. Some of these academic studies used Automatic Identification Systems (AIS) data as an important source in explaining the impact of Covid-19 on the maritime shipping. Based on these data, it was revealed that port calls, cargo volume and vessel traffic were adversely affected by the pandemic compared to previous years. (Shi et al., 2021: 9; Wang et al., 2020: 15) When research methods of the studies were observed in general, it has been seen that the descriptive analysis method was widely used. An important common point among some of these studies was the emphasis that the negative impact of Covid-19 on maritime logistics was seen more in the first quarter of the pandemic. It was also emphasized that this effect may vary according to passenger ships, cargo ships and the regions where the ports are located. (Millefiori et al., 2021: 5-8; Tai et al., 2021: 11) Otherwise, the spread of the disease and the increase in the loss of workforce caused the slowdown in port operations. It was observed that the articles discussing the impact of the coronavirus on the ports specifically addressed the technical and operational problems of the ports. (Doumbia-Henry, 2020: 288-289; Mannan et al., 2021: 260; Tai et al., 2021: 11) As another effect of the pandemic, it has been discussed in some studies that the need for digitalization and new technology use in port and ship operations has become more prominent. (Bocayuva, 2020: 188-189; Charłampowicz, 2021: 97; Menhat et al., 2021: 7; Russell et al., 2020: 16-17) Another important issue addressed in these studies was the role of port states and authorities in the fight against the pandemic. Some studies have also included topics such as which institutions should assume and which roles in terms of controlling the effect of the coronavirus and reducing its spread and how effective are government incentives. (Pallis et al., 2020: 372; Van der Oord et al., 2020: 894) There are also some articles that explain the impact of the pandemic on these concepts by making a connection between port calls, container traffic and emission rates. (Durán-Grados et al., 2020: 12; Notteboom et al., 2021: 206-208; Zheng et al., 2021: 18)

This study has also some limitations. The research was based on a single database (WoS). Academic studies on the Covid-19 pandemic, which officially entered our agenda in March 2020, started that year and continues today. The fact that it has a history of only two years causes resource limitations in the research. This study reveals the scarcity of studies on Covid-19 in the field of maritime logistics, as it is a new subject. The use of a single database in the study made the number of sources even more limited. It is recommended to include other databases such as Scopus, Google Scholar, and Ebscohost for future studies.

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