

## ORIGINAL

# Analysis of studies on disaster management in health with science mapping technique

*Análisis de estudios sobre gestión de desastres en Salud con técnica de mapeo científico*

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## Abstract

**Background:** Resilience of disaster management is expressed as the ability to meet the needs of the population and to reduce the potential impact of disasters. Particularly, the recent Covid-19 pandemic process all over the world has spoiled all plans and forecasts, once again revealing the necessity and importance of disaster management.

**Methods:** This research was carried in order to analyze scientific publications on disaster management in the field of health by using science mapping technique. The search engine of the Web of Science database was searched by selecting all publications scanned in the Web of Science Core Collection and database by typing the keywords "disaster management" and "health" with the "topic" option. As a result of the search, 1290 publications indexed between 1977 and April 2023 were reached and analyzed.

**Results:** According to the results of the analysis, the highest production was made in 2022 with 163 publications; the publication with the highest number of citations with 895 citations was "Telehealth for global emergencies: Implications for coronavirus disease 2019 (Covid-19)".

**Conclusion:** In addition, it is seen that studies focusing on disaster management in health are increasing day by day, especially with the recent Covid-19 pandemic that has affected the whole world. Especially in this process, it is expected that scientific studies in this field will guide decision makers.

**Key words:** Health Disaster Management, Health Management, Science Mapping Analysis.

## Resumen

**Antecedentes:** La resiliencia de la gestión de desastres se expresa como la capacidad de satisfacer las necesidades de la población y reducir el impacto potencial de los desastres. En particular, el reciente proceso de pandemia de Covid-19 en todo el mundo ha echado a perder todos los planes y pronósticos, revelando una vez más la necesidad e importancia de la gestión de desastres.

**Métodos:** Esta investigación se llevó a cabo con el fin de analizar las publicaciones científicas sobre la gestión de desastres en el campo de la salud mediante el uso de la técnica de mapeo científico. Se buscó en el motor de búsqueda de la base de datos de Web of Science seleccionando todas las publicaciones escaneadas en la colección principal y la base de datos de Web of Science escribiendo las palabras clave "gestión de desastres" y "salud" con la opción "tema". Como resultado de la búsqueda se alcanzaron y analizaron 1290 publicaciones indexadas entre 1977 y abril de 2023.

**Resultados:** Según los resultados del análisis, la mayor producción se realizó en 2022 con 163 publicaciones; la publicación con mayor número de citas con 895 citas fue "Tele salud para emergencias globales: implicaciones para la enfermedad por coronavirus 2019 (Covid-19)".

**Conclusión:** Además, se ve que los estudios enfocados en la gestión de desastres en salud se incrementan día a día, especialmente con la reciente pandemia del Covid-19 que ha afectado a todo el mundo. Especialmente en este proceso, se espera que los estudios científicos en este campo guíen a los tomadores de decisiones.

**Palabras clave:** Gestión de Desastres en Salud, Gestión en Salud, Análisis de Mapeo Científico.

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## Introduction

Disasters are human events that can cause great damage to living and non-living beings in the environment<sup>1</sup>. Disasters usually result in death or damage. The word disaster is of Arabic origin and means great destruction, catastrophe and calamity<sup>2</sup>. There is always a risk of disaster<sup>3</sup> and disasters create anxiety on people. Natural disasters, weather events, epidemics (especially the recent coronavirus pandemic), many dangerous events that people are exposed to are within the scope of disasters<sup>4</sup>.

Disasters can be man-made or natural disasters. The damage caused by disasters to the natural, economic and social environment is a fact known by everyone. Against this risk, everyone should be prepared for disasters. This can only be achieved through good disaster management. The concept of disaster management emerges with a holistic and systematic management approach<sup>5,3</sup>. Disaster management is the activity of preparing for and responding to a disaster before it occurs. Disaster management is a form of management that will minimize the consequences.

Disaster management consists of four phases. These stages consist of mitigation, preparedness, response and recovery<sup>6,7</sup>. The mitigation stage consists of actions and strategies created to limit or mitigate the effects of a disaster that may occur. The second stage in the disaster management process is the preparation stage. At this stage, it is the part that includes special capacity and information required for the hazard that will occur by experts or governments. The response phase covers the emergency needs and assistance required during or after the disaster and includes the rescue of the victims. The final phase is recovery, which involves providing the necessary professional support to improve living conditions<sup>6</sup>. Considering the four implementation phases of disaster management, it is considered that the most important component is the risk reduction phase. Because with risk reduction, loss of life and property is minimized and the risks that may be caused by the disaster are identified and reduced before the disaster occurs<sup>8</sup>. Well-planned disaster management plans in a society contribute to raising the awareness of individuals and play an important role in warning societies about how to cope with the consequences of major disasters. Especially in recent times, disasters can be responded to quickly and this has led to a significant decrease in the number of lives lost by reducing the destructive consequences of disasters<sup>9</sup>.

One of the prominent sectors in the fight against disasters is the health service sector. As the destructiveness of disasters increases, the demand for health services may increase and the problems that may be experienced accordingly increase. In this context, health institutions are among the critical organizations in terms of disasters.

Because these institutions are considered as medical service centers during the disaster process. Therefore, in order to reduce the effects of disasters in an emergency, it is necessary to establish an applicable disaster management process especially for these institutions.

In disaster situations, health systems sometimes fail to perform adequately and therefore systems may be interrupted. Since there will be some problems arising from the demand for medical services in disaster situations, it becomes very important to manage the disaster in these situations<sup>10</sup>. Many disasters, especially the Covid-19 pandemic in recent years, have caused some disruptions, shortages and changes in health services<sup>11</sup>. Therefore, disaster management is very important especially in health services.

Disaster management process starts with the identification of possible risks that may affect individuals, communities and hospitals and its effects can be reduced by people taking precautions. Inappropriate execution of disaster management processes creates an ineffective and complex chaos environment. Especially hospital disaster management should have a holistic approach that includes not only response processes but also policies and plans that will cover all processes of the disaster<sup>12</sup>. Crowe et al. (2014) stated that disaster management should be sufficiently resilient<sup>13</sup>. This resilience covers the objectives set during the disaster preparedness phase. Resilience of disaster management is expressed as the ability to meet the needs of the population and reduce the potential impact of disasters. Especially the Covid-19 Pandemic process experienced all over the world in the recent period has disrupted all plans and forecasts and once again revealed the need and importance of disaster management.

With Covid 19, great increases have occurred in disaster management studies. To examine these studies, bibliometric analysis has been essential. The science mapping method, which is one of the bibliometric analysis methods, is generally a visual representation of the knowledge and understanding available in a science branch. These maps provide a visual arrangement of the knowledge, concepts, theories, relationships, and methods found in that field. Science maps are used to gain a better understanding of a subject, to discover new relationships and patterns, or to make complex knowledge structures more understandable.

## Methodology

### Aim

The aim of this research is to examine scientific studies in the field of disaster management in health by using science mapping technique. By using the science mapping technique in the research, it is aimed to better communicate the basic findings of bibliometric

visualization and to better reflect the studies in the literature by providing rich information to the readers.

### Data Analysis

The WoS database was used in the research because it contains many scientific studies and is supported by various indexes. In the research, all studies in the field of disaster management in health were included in the research, regardless of the index (SSCI, SCI, AHCI) in the WoS database. The data obtained in the research were analyzed in terms of various parameters such as citations, authors, countries of publication, keywords, and year of publication. Co-citation analysis was also conducted in this research. In the research, the keywords “disaster management” and “health” were searched in the WoS database by selecting the Web of Science Core Collection and all scanned publications with the “topic” option. Since the analyzes were made on 05.04.2023, works published between 1977-2023 (April) were included in the research. The research is a descriptive survey model. Ethics committee permission was not obtained since the research was not experimental and was not conducted on humans. R-Bibliomterix program was used for scientific mapping in the research. This package program is a bibliometrix package developed using R Studio software. From this perspective, bibliometrix has a powerful function in terms of creating co-citation networks, bibliographic link networks, co-authorship and co-creation networks. Bibliometrix meets the needs of bibliometric analysis with scientific visualization and data analysis<sup>14</sup>.

Figure 1: Screening strategy of the research.

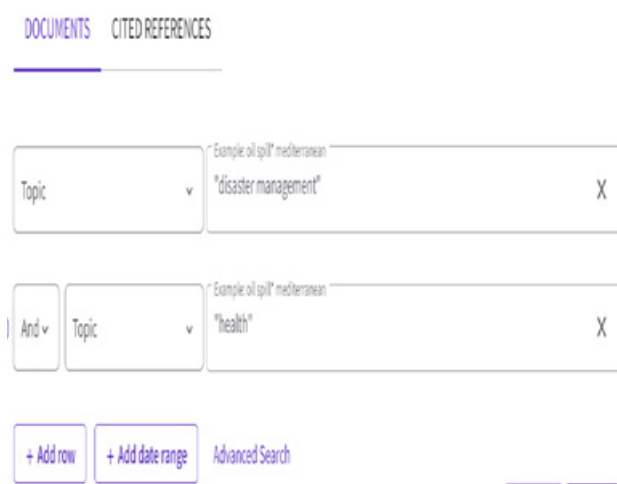


Table I: Information on the most cited publications on disaster management in health.

Research	Author(s)	Journal	Cite
Telehealth for global emergencies: Implications for coronavirus disease 2019 (Covid-19)	Smith et al., 2020	Journal Of Telemedicine and Telecare	895
A Social Vulnerability Index for Disaster Management	Flanagan ve diğerleri, 2011	Journal Of Homeland Security and Emergency Management	596
Pandemics, transformations and tourism: be careful what you wish for	Hall ve diğerleri, 2020	Tourism Geographies	512

## Results

In this research, Web of Science (WoS) database was used for bibliometric analysis. In the research, firstly, publications related to the relevant topic were tried to be identified and a search strategy was created. Search strategy for the subject is presented in **figure 1**.

The search strategy of the research is shown in **figure 1**. On 05.04.2023, “disaster management” and “health” keywords were searched from the WOS database by selecting all publications in the Web of Science Core Collection (SSCI, SCI, AHCI, SCI-E, etc.) with the “topic” option. As a result of the search, 1290 publications were reached and these publications were analyzed.

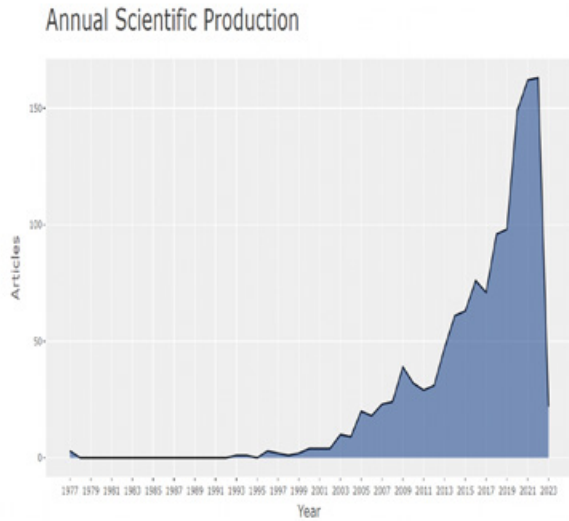
The top 3 most cited studies among the publications obtained by searching the WoS database of publications on disaster management in health are shown in **table I**. When the most cited studies are analyzed, the research by Smith et al. (2020) titled “Telehealth for global emergencies: Implications for coronavirus disease 2019 (Covid-19)” by Smith et al. In this research, the importance of using telehealth to provide care in the Covid-19 pandemic, especially as a way to reduce the risk of cross-contamination caused by close contact, was emphasized. For telehealth to be effective as part of emergency response, it must first become a routine part of the health system. The research also provides basic solutions for the widespread use of telehealth. The second most cited research is “A Social Vulnerability Index for Disaster Management” by Flanagan et al. In the research, it is emphasized that socially vulnerable people are more likely to be negatively affected, less likely to recover and more likely to die in disaster events<sup>12,15,16</sup>.

**Figure 2** shows the publication years of the scientific studies published on the subject.

The publication years of related studies on disaster management in health according to years are given in **figure 3**. Accordingly, the highest number of publications was realized in 2022 with 163 publications. This was followed by 2021 with 162 publications. Especially the studies published in 2019 showed an increase of 52%, reaching 149 publications from 98 publications.

The co-occurrence map of plus keywords are presented in **figure 3**.

Figure 2: Publication Years of Scientific Studies on Disaster Management in Health.



When interpreting visual networks, the colors of the clusters indicate how many different themes they are divided into, and the fonts and sizes of the clusters indicate the size of the number of occurrences. When interpreting the relationship between clusters, the distance between two circles is taken as the basis<sup>17</sup>. Keywords are divided into 4 clusters. The red cluster represents the theme “health” and is the most frequently used theme. The purple cluster is “management and emergency”, the blue cluster is “disaster management” and the green cluster is “post-disaster trauma”.

Figure 4 shows the co-occurrence map of the words in the titles of the publications.

Looking at the co-occurrence map of the words in the titles of the publications, the words are divided into 5 clusters. The red cluster represents “disaster management” and is the most frequently used theme. Blue cluster represents “health”, green cluster represents “pandemic”, purple cluster represents “earthquake” and orange cluster represents “risk and assessment”.

Figure 4: Co-occurrence map of words in publication titles.

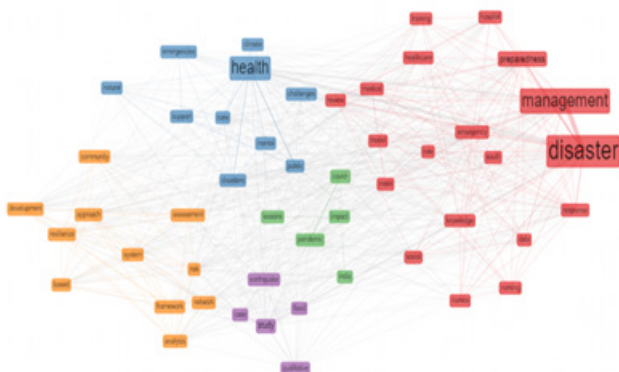


Figure 3: Co-occurrence map of plus keywords.



Figure 5 shows the co-occurrence map of the words in the abstracts of the studies.

According to **figure 5**, the words are divided into 3 clusters. The blue cluster represents “disaster management” and is the most frequently used theme. The red cluster represents “pre-disaster preparations” and the green cluster represents “pandemic”.

Figure 6 shows the co-occurrence map of the words in the author keywords of the publications. According to this, the words are divided into 3 clusters. The blue cluster represents “Covid-19 and disaster management” and is the most frequently used theme. The red cluster represents “pre-disaster preparations”, the green cluster represents “disaster nursing” and the purple cluster represents “disaster education”.

Co-citation analysis was conducted in the research and the findings related to the analysis are given below. While creating network visuals in co-citation data, relationships between influential publications are taken as a basis and potentially indicate disciplinary contributions in an interdisciplinary field<sup>18</sup>.

Figure 5: Co-occurrence map of words in publication abstract.



The co-citation map of the publications are presented in **figure 7**.

As a result of the relevant analysis, publications were grouped around 9 clusters. The pink cluster is represented by “world health” and is the most frequently used theme. The purple cluster is represented by “al kalaileh, 2012”, the aqua green cluster by “subbarao I, 2008” and the orange cluster by “Norris Fh, 2008”. While the brown and green clusters are clustered by two publications in a different theme, one publication is clustered in the red, blue and gray clusters.

The co-citation map of the journals are presented in **fig. 8**.

According to the co-citation analysis, the publications are grouped around 3 clusters. The most frequently used red cluster is represented by prehossp disaster med, disaster med public and lancet journals, while the main themes of the cluster are disaster management and public health. The blue cluster is represented by international disaster risk re, disasters and natural hazards journals and the main themes of the cluster are disaster management and governance. The green cluster consists of the least preferred journals and its main themes are disaster management and nursing.

**Figure 6:** Co-occurrence map of author keywords.



**Figure 8:** Co-Citation Analysis of Journals.

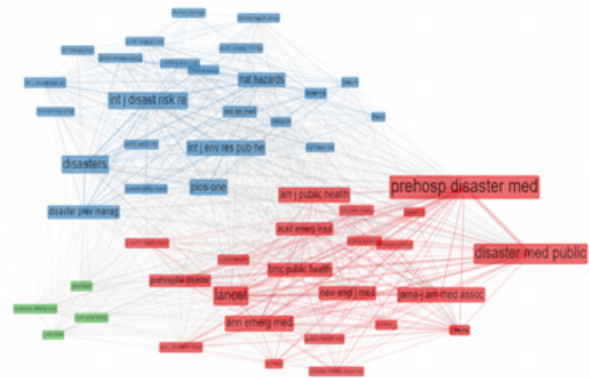


**Figure 9** shows the network map of researchers in their own countries and in collaboration network with other countries.

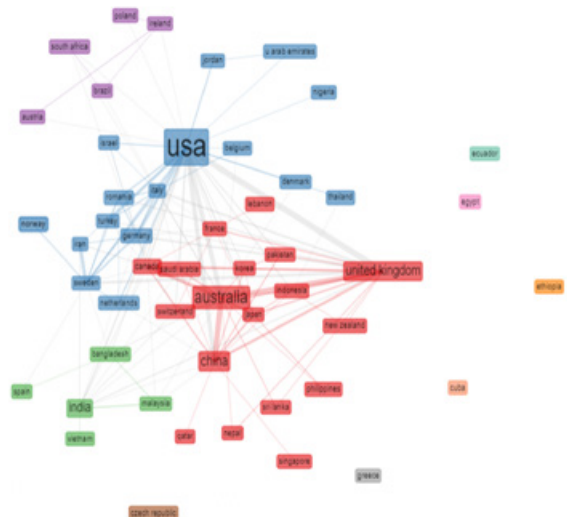
**Figure 9** shows a map of countries' collaboration network. Countries working on different topics are divided into 10 clusters. The blue cluster is represented by “United States of America (USA)”, which is the most frequently cooperating country. “Australia” represents the red cluster, “India” the green cluster and “South Africa” the purple cluster. Apart from these, Ethiopia, Czech Republic, Egypt, Greece, Ecuador and Cuba individually represent different clusters. At the same time, the USA (870 publications 4413 citations) Australia (296 publications 2431 citations) has the highest number of publications and citations on health disaster management. This is followed by Iran (222), China (217) and India (217).

Keywords are analyzed under four headings. These are plus keywords, keywords used by the author, keywords in the abstract and words in the title. Plus keywords refer to extra keywords used to further specialize a word<sup>19</sup>. In this research, only author keywords were analyzed.

**Figure 7:** Co-Citation Analysis of Publications.



**Figure 9:** Collaboration Network map of countries.



**Figure 10** shows the thematic map of studies on disaster management in health. Accordingly, it shows how the intensity of the themes changes when moving up and down on a vertical line. As we move upwards, it is seen that the density of themes increases and the frequency of research is high. In the upper right part of the diagram are the themes that have high centrality and intensity and form the foundation of the research area. These themes are the areas that researchers have studied and shown the most interest in. At the same time, these themes have strong links with other thematic areas and form the cornerstones of the research area. The themes in the upper left part are those that have been studied a lot before, but have become less relevant over time and their links with other thematic areas have weakened. This includes topics of research where there is over-specialization and where relationships with other themes are not established or are weak. The themes in the lower left part of the diagram represent emerging or emerging themes. These themes are areas of work that are understudied and have weak links to other thematic areas. Finally, the themes in the lower right part of the diagram represent themes that have not been sufficiently studied, although they are important for the development of the relevant research area<sup>27</sup>.

**Figure 11** shows the sections of the thematic map, which are categorized according to centrality and intensity ranking values using two special tools.

**Motor themes:** The themes in this quadrant are related to developing and structuring the research field. As they offer strong centrality and high intensity, they are treated as motor themes of the field. The motor themes of the author keywords are disaster and disaster preparedness.

**Figure 10:** Thematic map.



They are highly developed and isolated themes: These are strongly related, highly specialized and secondary, but do not have the appropriate back ground or importance for the field. the Very advanced and isolated themes of the author keywords are wireless sensor networks and climate change.

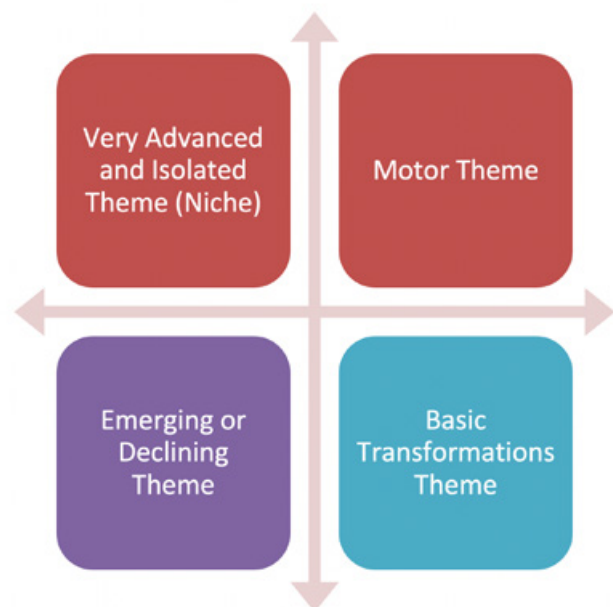
**Emerging or declining themes:** These themes are relatively weak and have low density and centrality. They mainly represent emerging or disappearing themes. The emerging or declining themes of the author keywords are Covid-19, disasters and climate change.

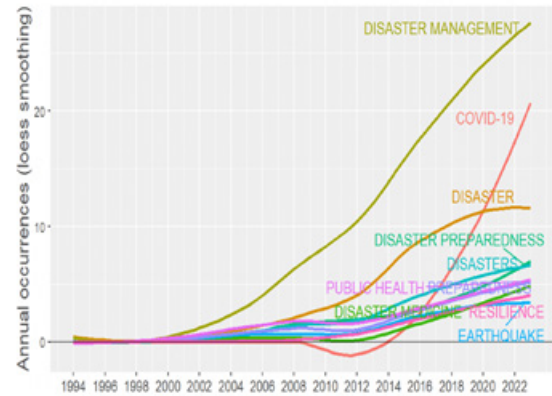
**Fundamental and transformational themes:** These themes are relevant to the research area. However, they are not well developed. This quadrant includes transversal and general core themes<sup>20</sup>. The core themes of the author keywords are disasters and disaster management.

**Figure 12** shows the trending topics of studies on disaster management in health. When the author keywords were analyzed, it was seen that the most used topic was “disaster preparedness” in 2019 (57) and public health in 2018 (57). This is followed by earthquake, medical disasters, and resilience. As of 2019, “Covid-19” is also among the most frequently used topics.

**Figure 13** shows the dynamics of author keywords of studies on disaster management in health. According to this, disaster management, which has gained momentum since 2003, has been the most used keyword with a steady increase. This is followed by “Covid-19”, which gained momentum rapidly in 2020.

**Figure 11:** Thematic map.



**Figure 12:** Trending topics of publications on disaster management in health.**Figure 13:** 13 Word dynamics of publications on disaster management in health.

## Discussion

This research reveals the effective aspects of the studies on disaster management in health through science mapping analysis. With science mapping analysis, various information, patterns, relationships and visuals specific to the researched topic can be displayed. In this context, 1290 scientific studies published between 1977 and 2023 (April) on disaster management in health were analyzed. There has been a significant increase in the number of scientific publications in the field of disaster management in health, especially after the 2000s. Especially the year 2022 is the year with the highest number of publications. Interest in disaster management in health has increased significantly after 2019. The most important reason for this is thought to be the Covid-19 that occurred in Wuhan, the capital of China's Hubei region, on November 17, 2019. "aTelehealth for global emergencies: Implications for coronavirus disease 2019 (Covid-19)" is the most cited work with 895 citations.

Results showed that the collaborations between the authors were mostly in the USA and Australia. The fact that studies published by researchers in many different countries are included in the literature draws attention to the importance of disaster management in health.

Authors who want to address the most important areas of disaster management in health can prioritize the motor themes of disasters and disaster preparedness. Authors who want to work on marginal topics; wireless sensor networks and climate change, authors who want to work on current issues; Covid-19, disasters and climate change, and authors who want to work on the most basic areas can conduct studies based on the themes of disasters and disaster management. The concept of disaster management is mostly used with the concept of disaster preparedness and the most frequently used keywords in the publications in the literature are seen to contain the phrase "health". In the results of the co-citation analysis, the concept of "world health" was found to be prominent.

In a study conducted by Palteki et al. (2023), bibliometric analysis of Hospital Disaster Plans between 2002 and 2021 was examined. It was observed that only hospitals were focused on disaster<sup>21</sup>. In another study by Gurple et al. (2021), a bibliometric analysis of 1649 publications in the Scopus database of studies on the relationship between laws and disaster management was conducted and as a result of the study, it was determined that the publications related to these two concepts were not sufficient<sup>22</sup>. Barnes et al. (2019) conducted a bibliometric analysis of publications containing the themes of "simulation techniques", "natural disasters" and "disaster management" and associated the results with government policy<sup>23</sup>. Jiang et al. (2019) analyzed the visuality of publications on disaster management and tourism crisis using CiteSpace. As a result of the study, it was found that publications in the USA and Australia collaborated better than others<sup>24</sup>. Sweileh (2019) conducted a bibliometric analysis of health-related natural disasters between 1900 and 2017. As a result of the study, based on the information in the literature on natural disasters in health, he determined that this field is growing rapidly, but he argued that research collaborations are insufficient in terms of internationalization<sup>25</sup>. Zhou et al. (2019) analyzed the publications on "medical disaster" in the Wos database and found that there were 564 publications on this subject<sup>26</sup>.

It has been seen in the literature review that studies on bibliometric analysis have not been carried out after certain years. In addition, it has been determined that studies on bibliometric analysis are limited to "medical disaster", "disaster management", "natural disaster" and limited bibliometric analysis has been carried out in the field of health.

## Conclusions and limitations

In conclusion, this research is a valuable tool for understanding the scientific productivity and impact of studies in the field of disaster management in

health through science mapping. With the covid 19, the tendency to disaster management in health has increased, however, it has been necessary to examine these studies in depth. This analysis can be used to follow the development of the field, identify popular topics and recognize important researchers. In this research, data on publications related to disaster management in health were scanned in the WOS database and analyzed in this context. Therefore, the use of only one database for analysis constitutes the limitations of the research. For this reason, it is thought that the scope of the research can be expanded by evaluating many studies published through different programs (Citespace, SciMAT) by using different databases. In this context, the sources used in the period when the research was conducted should be carefully selected.

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## Competing interests

All authors declare no competing interest.

## Funding

Not applicable

## Authors' contributions

İlknur Arslan Aras performed the data collection and analysis. Gülizar Gülcan Şeremet wrote the introduction, discussion, and conclusion sections and carefully checked the manuscript.

## Ethical Approval

Ethics committee approval is not required because secondary data has been used in the study.