

Bibliometric Analysis of Emergency Medicine in Disasters: 2004-2023

Afetlerde Acil Tıbbın Bibliyometrik Analizi: 2004-2023

✉ Gülbin Aydoğdu Umaç¹, ✉ Sarper Yılmaz²

¹İzmir City Hospital, Clinic of Emergency Medicine, İzmir, Turkey

²University of Health Sciences Turkey, Kartal Dr. Lütfi Kırdar City Hospital, Department of Emergency Medicine, İstanbul, Turkey

Cite as: Aydoğdu Umaç G, Yılmaz S. Bibliometric Analysis of Emergency Medicine in Disasters: 2004-2023. Anatol J Gen Med Res. 2024;34(3):298-309

Abstract

Objective: This study aims to conduct a bibliometric analysis of research on "emergency medicine in disasters" published between 2004 and 2023, highlighting the scientific developments, key themes, and research gaps in this growing field. With the increasing frequency of disasters due to factors like climate change, urbanization, and population growth, the importance of disaster emergency medicine has become more critical. While technological advancements have improved emergency medical responses, research shows that further development is needed. This analysis seeks to evaluate global trends and collaborations in disaster medicine research to provide a strategic roadmap for future studies and enhance the preparedness and effectiveness of health systems in responding to disasters.

Methods: A bibliometric review of 1,532 articles published between January 1, 2004 and December 31, 2023, was conducted using the Web of Science Core Collection database. The analysis focused on articles published in peer-reviewed journals, limited to the "emergency medicine" field, written in English, and meeting the defined timeframe. The selected articles were examined based on publication trends, citation counts, journal distribution, most-cited authors, and collaborative networks between institutions and countries. Tools such as keyword networks, bibliographic coupling, co-authorship analysis, and citation mapping were used to visualize research collaborations and thematic focus areas. VOSviewer software was employed to map research collaborations and identify the most influential studies in disaster medicine.

Results: The study's findings reveal a significant increase in research output, particularly following global crises such as coronavirus disease-2019 (COVID-19). Countries like the United States of America (USA), Canada, the United Kingdom, and China lead in both publications and international collaborations, demonstrating strong partnerships in disaster medicine research. Institutions such as Harvard University and Johns Hopkins University stand out for their high productivity and impact, with highly cited articles focusing on disaster-related health impacts, triage, and the mental health of responders. Key research themes include disaster preparedness, emergency medical services, and global health crises, underscoring the growing importance of international collaboration in advancing disaster medicine.

Conclusion: The bibliometric analysis of research on "emergency medicine in disasters" from 2004 to 2023 demonstrates a substantial increase in scientific output, especially following the COVID-19 pandemic. Key findings highlight the central role of journals like Prehospital and Disaster Medicine and the influential contributions of institutions such as Harvard University and Johns Hopkins University. Frequently cited articles focus on disaster health impacts, triage, and mental health support for healthcare workers, reflecting the critical importance of preparedness and response strategies. International collaborations, particularly among countries like the USA, Sweden, Iran, and Turkey, have expanded, underlining the growing global significance of disaster medicine. These results underscore the vital role that disaster emergency medicine plays in strengthening global health systems and the increasing academic focus on this field.

Keywords: Emergency medicine, disaster, response, emergencies, mass casualty



Address for Correspondence/Yazışma Adresi: Gülbin Aydoğdu Umaç MD, İzmir City Hospital, Clinic of Emergency Medicine, İzmir, Turkey
E-mail: dr.gulbinaydogdu@gmail.com
ORCID ID: orcid.org/0000-0002-9874-0343

Received/Geliş tarihi: 15.09.2024
Accepted/Kabul tarihi: 20.11.2024



Copyright© 2024 The Author. Published by Galenos Publishing House on behalf of University of Health Sciences Turkey, İzmir Tepecik Education and Research Hospital. This is an open access article under the Creative Commons AttributionNonCommercial 4.0 International (CC BY-NC 4.0) License.

Öz

Amaç: Bu çalışma, 2004-2023 yılları arasında yayımlanan "afetlerde acil tıp" konusundaki arařtırmaların bibliyometrik analizini yaparak bu hızla büyüyen alandaki bilimsel gelişmeleri, temel temaları ve arařtırma boşluklarını vurgulamayı amaçlamaktadır. İklim deđişikliği, kentleşme ve nüfus artışı gibi faktörlerle afetlerin sıklığının artması, afetlerde acil tıbbın önemini daha da kritik hale getirmiştir. Teknolojik ilerlemeler acil tıbbi müdahaleleri geliřtirmiş olsa da arařtırmalar bu alanda daha fazla gelişime ihtiyaç olduğunu göstermektedir. Bu analiz, afet tıbbi arařtırmalarındaki küresel eğilimleri ve iş birliklerini deđerlendirerek, gelecekteki çalışmalar için stratejik bir yol haritası sunmayı ve sađlık sistemlerinin afetlere karşı hazırlık ve etkinliğini artırmayı hedeflemektedir.

Yöntem: Bu çalışma, 1 Ocak 2004 ile 31 Aralık 2023 tarihleri arasında yayımlanan 1.532 makalenin bibliyometrik bir incelemesini içermektedir. İnceleme, Web of Science Core Collection veri tabanında yapılan tarama ile gerçekleştirilmiştir. Çalışma, yalnızca "acil tıp" alanındaki, İngilizce yazılmış ve hakemli dergilerde yayımlanmış makaleleri kapsamıştır. Seçilen makaleler; yayımlanma eğilimleri, atıf sayıları, dergi dağılımı, en çok atıf alan yazarlar ve kurumlar ile ülkeler arasındaki iş birlikleri açısından incelenmiştir. Arařtırma iş birliklerini ve tematik odak alanlarını görselleřtirmek için anahtar kelime ađları, bibliyografik eşleřtirme, ortak yazarlık analizi ve atıf haritalama gibi araçlar kullanılmıştır. VOSviewer yazılımı, arařtırma iş birliklerini haritalamak ve afet tıbbındaki en etkili çalışmaları belirlemek için kullanılmıştır.

Bulgular: Çalışmanın bulguları, özellikle koronavirüs hastalığı-2019 (COVID-19) gibi küresel krizlerin ardından arařtırma çıktılarında önemli bir artış olduğunu ortaya koymaktadır. Amerika Birleşik Devletleri (ABD), Kanada, Birleşik Krallık ve Çin, hem yayın sayıları hem de uluslararası iş birlikleri açısından lider konumdadır ve afet tıbbi arařtırmalarında güçlü ortaklıklar göstermektedir. Harvard Üniversitesi ve Johns Hopkins Üniversitesi gibi kurumlar, yüksek üretkenlik ve etki açısından öne çıkmaktadır; bu kurumların makaleleri, afet kaynaklı sađlık etkileri, triyaj ve sađlık çalışanlarının ruh sađlığı gibi konulara odaklanmaktadır. Temel arařtırma temaları arasında afet hazırlığı, acil sađlık hizmetleri ve küresel sađlık krizleri yer almakta olup, uluslararası iş birliğinin afet tıbbının ilerletilmesindeki önemi giderek artmaktadır.

Sonuç: 2004-2023 yılları arasında "afetlerde acil tıp" üzerine yapılan bibliyometrik analiz, özellikle COVID-19 pandemisinin ardından bilimsel yayınlarda önemli bir artış olduğunu göstermektedir. Temel bulgular, *Prehospital and Disaster Medicine* gibi dergilerin merkezi rolünü ve Harvard Üniversitesi ile Johns Hopkins Üniversitesi gibi kurumların etkili katkılarını vurgulamaktadır. Sıkça atıf alan makaleler, afet kaynaklı sađlık etkileri, triyaj ve sađlık çalışanlarına yönelik ruh sađlığı desteđi gibi konulara odaklanmaktadır ve bu durum, hazırlık ve müdahale stratejilerinin kritik önemini yansıtmaktadır. ABD, İsveç, İran ve Türkiye gibi ülkeler arasında uluslararası iş birlikleri genişlemiş olup, afet tıbbının artan küresel önemine işaret etmektedir. Bu sonuçlar, afetlerde acil tıbbın küresel sađlık sistemlerini güçlendirmedeki hayati rolünü ve bu alandaki akademik ilginin artan önemini ortaya koymaktadır.

Anahtar Kelimeler: Acil tıp, afet, müdahale, acil durumlar, kitlesel yaralanmalı olaylar

Introduction

Emergency medicine is a specialized area of healthcare that focuses on providing immediate and critical medical services during large-scale emergencies, such as natural disasters, terrorist attacks, and mass casualty events. The primary goal of emergency medicine in such scenarios is to ensure the survival of the maximum number of individuals by providing timely medical interventions, managing injuries, and preventing further health complications. This requires the coordination of healthcare resources, rapid decision-making, and the use of specialized protocols to address the unique challenges presented by high-pressure, unpredictable environments⁽¹⁾.

The importance of emergency medicine during disasters lies in its ability to mitigate the effects of catastrophic events on human health⁽²⁾. During a disaster, local medical infrastructure can be overwhelmed or even destroyed, making efficient medical care essential to prevent further loss of life. Emergency medical systems must respond swiftly to assess the scope of the disaster, triage victims based on

the severity of their injuries, and ensure the allocation of limited resources where they are most needed⁽³⁾. Effective disaster response can dramatically reduce mortality and morbidity rates, making it a critical component of national and global health security⁽⁴⁾.

The study of emergency medicine during disasters began to gain prominence in the latter half of the 20th century, largely as a response to an increasing number of natural and man-made disasters. Early work by researchers such as Quarantelli and Taylor⁽⁵⁾ emphasized the need for organized, systematic approaches to emergency medical services in times of crisis. Since then, advances in information technology and healthcare systems have further transformed the field. Chan et al.⁽⁶⁾ highlighted the role of emerging technologies in enhancing emergency medical care during disasters, facilitating faster communication, and more efficient use of medical resources. In terms of its place in medicine, emergency disaster medicine plays a vital and expanding role. The field blends principles of emergency care, public health, trauma medicine, and logistics, making

it a multidisciplinary field that not only saves lives in acute situations but also contributes to the overall preparedness and resilience of healthcare systems⁽⁷⁻⁹⁾. Research on disaster triage and management, such as the systematic reviews by Bazyar et al.⁽¹⁰⁾, continues to refine best practices, ensuring that emergency medical professionals are equipped with the tools and knowledge to handle diverse disaster scenarios⁽¹¹⁾.

Its importance has grown with the frequency and scale of global emergencies, and its research and practice play pivotal roles in improving outcomes during crises. As the world continues to face an increasing array of disaster threats, the development of more sophisticated disaster medicine approaches remains crucial.

The purpose of this study was to conduct a bibliometric analysis of research in the field of emergency medicine in disasters over the past 20 years to identify scientific developments, focal points, and research gaps in this area. With the increasing frequency of disasters, driven by factors such as climate change, urbanization, and population growth, the importance of disaster emergency medicine has become increasingly critical. While technological advancements have improved emergency medical interventions, research has revealed that further development of these processes is needed.

This analysis evaluates global trends and collaborations in studies on disaster response in healthcare systems, providing a strategic roadmap for future research to enhance preparedness and effectiveness in medical interventions during disasters.

Materials and Methods

This study conducted a bibliometric analysis of research on "emergency medicine in disasters" published between 2004 and 2023. To ensure systematic and transparent reporting, the methodology was revised following the Preliminary guideline for reporting bibliometric reviews of the biomedical literature guidelines⁽¹²⁾. The analysis focuses on identifying key trends, influential publications, and collaborations in the field.

Eligibility Criteria: The study included articles that met the following criteria:

- **Topic:** Research specifically related to emergency medicine in disasters, covering areas such as disaster response, triage, prehospital care, and mass casualty incidents.

- **Publication Type:** Only peer-reviewed journal articles were included. Other publication types such as books, proceedings, and book chapters were excluded.

- **Language:** Articles had to be published in English.

- **Time frame:** The selected studies were published between January 1, 2004, and December 31, 2023.

- **Database:** Articles had to be indexed in the Web of Science (WoS) Core Collection database.

Articles Information Sources: The data for this bibliometric analysis were extracted from the WoS Core Collection database. The WoS was selected due to its extensive coverage of high-quality, peer-reviewed journals in various disciplines. Data collection was conducted between January 2024 and March 2024. had to be indexed in the WoS Core Collection database.

Search Strategy: A comprehensive search strategy was developed to capture all relevant studies on emergency medicine during disasters. The search terms were expanded based on the reviewer's suggestion, incorporating a wider range of keywords related to disaster medicine. The final search string included the following terms: emergency medicine in disasters, disaster medicine, emergency medical services in disasters, mass casualty incidents, disaster response, triage in disasters, prehospital care in disasters, surge capacity, earthquake, pandemic, hurricane, flood. These terms were used to query the titles, abstracts, and keywords of articles in the WoS database.

Study Selection Process: The initial search yielded 2,145 articles. After removing duplicates, a total of 1,932 articles were screened for relevance based on their titles and abstracts. Two independent reviewers assessed the relevance of each article, ensuring that only studies directly related to emergency medicine during disasters were included. Disagreements were resolved through discussion, and the final sample comprised 1,532 articles.

Data Collection Process: For each article, data on the following variables were extracted: Title, authors, publication year, journal name, impact factor, country of origin, institution, number of citations, WoS subject categories, and keywords. The data extraction was performed by two independent reviewers, and any discrepancies were resolved by consensus.

Data Synthesis and Analysis: The data were analyzed using VOSviewer (Leiden University, Netherlands; version 1.6.11) to visualize research trends and collaboration networks. The analysis focused on the following: Analysis of articles by year, analysis of articles by journal, most cited articles: Authors,

article titles, journals, publication years, and citation counts, keyword analysis, institutions associated with authors, analysis of inter-institutional publications, analysis of author collaboration, and citation distribution by country⁽¹³⁾.

Statistical Analysis

The data collected for this bibliometric analysis were systematically analyzed to identify trends and patterns. Descriptive statistics, including frequencies and percentages, were used to summarize the number of publications, citation counts, and the distribution of articles across journals and institutions. Temporal trends in publication output were assessed by examining annual variations in article numbers. To understand the relationships between keywords, co-occurrence network analysis was performed using VOSviewer. This analysis focused on identifying clusters and connections among the 200 most frequently used keywords, providing insights into thematic focuses in the literature. The clustering coefficients and the density of keyword connections were calculated to evaluate the strength of relationships within the dataset. Institutional and country-level collaboration networks were visualized using bibliometric mapping techniques. The intensity and frequency of collaborations were measured by the thickness of the connecting lines, and the clusters revealed shared research focuses among countries and institutions.

Results

1. Analysis of Articles by Year

The number of articles published on the topic of “emergency medicine in disasters” by year, according to WoS data, is presented in Figure 1. Figure 1 shows the annual variation in the number of articles published on “emergency medicine in disasters” (disaster emergency medicine) between 2004 and 2023. This graph illustrates how academic interest in the topic has fluctuated over the years and highlights the overall growth trend. In 2004, only 19 articles were published in this field; however, a significant increase was observed in 2005, with 38 articles published. This increase indicates that “emergency medicine in disasters” began to attract increasing attention within the scientific community. In 2006 and 2007, the number of published articles was 74 and 68, respectively. These years have witnessed a growing research agenda in disaster emergency medicine, with many studies being conducted in this area. The increase in 2006 may be explained by the occurrence of various disasters during this period, thus driving the need for more scientific investigation. Between

2008 and 2010, there was a relative stabilization and slight fluctuations in the number of articles. In 2008, 72 articles were published, but the number decreased to 61 in 2009 and 59 in 2010. This variation suggests that the research field was starting to stabilize, with scientific interest leveling off. From 2011 to 2014, there was another increase in the number of publications. Although 64 articles were published in 2011, the number rose to 84 by 2013. Although a slight decrease to 72 articles was observed in 2014, the general trend during this period indicates a rising scientific interest in the topic. The years 2015–2019 represent a steady period of growth in disaster emergency medicine research. In 2015, 86 articles were published, and by 2019, this number had risen to 89. This consistent growth indicates a growing global interest in this field, with more researchers contributing to this field. The years 2020–2023 saw a sharp increase in the number of articles influenced by global crises such as the COVID-19 pandemic. In 2020, 108 articles were published, followed by 104 in 2021, 114 in 2022, and 101 in 2023. This surge reflects the increased importance of disaster emergency medicine during large-scale health crises like the pandemic.

Overall, the graph demonstrates a significant rise in research on “emergency medicine in disasters” in recent years, with continuous academic interest driving the field forward. The increasing need for emergency medicine during disasters has contributed to the sustained growth of research in this area.

2. Analysis of Journal Articles

The number of articles related to “emergency medicine in disasters” published in various journals according to the WoS is presented in Table 1. Table 1 presents the distribution of articles published in the field of disaster emergency medicine across various journals, along with the number of articles and their percentage of total publications. The table indicates that a substantial portion of disaster emergency medicine literature is concentrated in specific key journals, with Prehospital and Disaster Medicine playing a central role in the field. However, other journals also make significant contributions, ensuring a broad and diverse representation of research in this field.

3. Most Cited Articles: Authors, Article Titles, Journals, Publication Years, and Citation Counts

The citation counts, author information, article titles, journals, and publication years of the most cited articles related to “emergency medicine in disasters” are detailed in Table 2. Table 2 provides a detailed overview of the

most cited articles in the field of “emergency medicine in disasters” and highlights the impact of these studies on the literature. This table identifies the most influential articles within a specific research area, showing the most frequently referenced studies and how they have contributed to scientific knowledge. The high citation counts of these articles demonstrate their impact, not only in theoretical research but also in practical application. Such analyses are

Table 1. Distribution of articles published in the field of disaster emergency medicine across various journals, along with the number of articles and their percentage of total publications

| Rank | Journal name | Number of articles | % |
|------|---|--------------------|-------|
| 1 | Prehospital and Disaster Medicine | 653 | 42.62 |
| 2 | Academic Emergency Medicine | 63 | 4.11 |
| 3 | Annals of Emergency Medicine | 55 | 3.59 |
| 4 | Prehospital Emergency Care | 53 | 3.46 |
| 5 | Journal of Emergency Medicine | 51 | 3.32 |
| 6 | European Journal of Trauma and Emergency Surgery | 45 | 2.93 |
| 7 | Emergency Medicine Journal | 39 | 2.54 |
| 8 | American Journal of Emergency Medicine | 37 | 2.41 |
| 9 | European Journal of Emergency Medicine | 37 | 2.41 |
| 10 | BMC Emergency Medicine | 34 | 2.21 |
| 11 | Scandinavian Journal of Trauma Resuscitation Emergency Medicine | 34 | 2.21 |
| 12 | Emergency Medicine Australasia | 33 | 2.15 |
| 13 | Pediatric Emergency Care | 33 | 2.15 |
| 14 | Western Journal of Emergency Medicine | 28 | 1.82 |
| 15 | International Journal of Emergency Medicine | 23 | 1.50 |
| 16 | Notfall Rettungsmedizin | 21 | 1.37 |
| 17 | Injury International Journal of the Care of the Injured | 20 | 1.30 |
| 18 | Trauma Monthly | 20 | 1.30 |
| 19 | Hong Kong Journal of Emergency Medicine | 18 | 1.17 |
| 20 | Eurasian Journal of Emergency Medicine | 17 | 1.11 |
| 21 | Others | 212 | 14,33 |

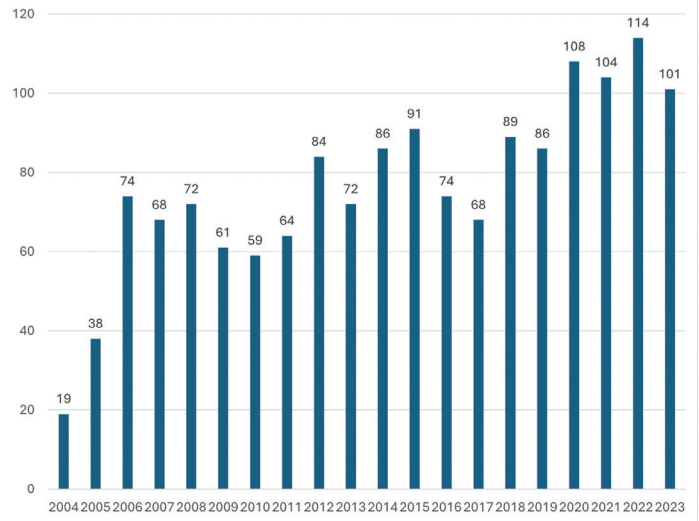


Figure 1. Number of annual articles published on emergency medicine during disasters

crucial for understanding which studies are prioritized in the research community and which topics garner the most attention⁽¹⁴⁾.

4. Keyword Analysis

Researchers carefully select keywords that best represent the core themes and key findings of their work because well-chosen keywords can significantly enhance the visibility and impact of a study⁽¹⁵⁾. The common keywords and their usage frequencies in studies on “emergency medicine in disasters” from the WoS database are shown in Figure 2. In the analysis, a minimum keyword occurrence of 5 was set, meaning that a keyword must have been used at least 5 times to be included in the analysis. This threshold allows the analysis to focus on frequently used and meaningful terms. In total, 2,918 different keywords were identified; however, only 200 keywords met the criteria of being used at least 5 times. Thus, the analysis examined the relationships among these 200 keywords. This analysis is useful for identifying the most frequently used keywords in a particular research area. Thus, 2,556 connections and 12 distinct clusters were identified among the 200 keywords. Figure 2 provides a detailed overview of the most frequently used keywords in the field of “emergency medicine in disasters” and their frequency of use. This analysis helps us understand which keywords are most prevalent in the literature and how these terms are related to one another. The most frequently used keyword is “disaster” which appears a total of 304 times. This indicates that “disaster” is a central concept in disaster medicine

Table 2. Most cited articles: Authors, article titles, journals, publication years, and citation counts

| No | Author(s) | Article title | Journal name | Publication year | Citation count |
|----|--|--|-----------------------------------|------------------|----------------|
| 1 | Du WW, FitzGerald GJ, Clark M, Hou XY. | Health impacts of floods | Prehospital and Disaster Medicine | 2010 | 197 |
| 2 | Hick JL, Hanfling D, Burstein JL, DeAtley C, Barbisch D, Bogdan GM, Cantrill S. | Health care facility and community strategies for patient care surge capacity | Annals of Emergency Medicine | 2004 | 191 |
| 3 | Naushad VA, Bierens JJLM, Nishan KP, Firjeeth C.P, Mohammad OH, Maliyakkal AM, Hadan SC, Schreiber MD. | A systematic review of the impact of disaster on the mental health of medical responders | Prehospital and Disaster Medicine | 2019 | 184 |
| 4 | Auf der Heide E. | The importance of evidence-based disaster planning | Annals of Emergency Medicine | 2006 | 182 |
| 5 | Kahn CA, Schultz CH, Miller KT, Anderson CL. | Does START triage work? an outcomes assessment after a disaster | Annals of Emergency Medicine | 2009 | 137 |
| 6 | FitzGerald G, Du WW, Jamal A, Clark M, Hou XY. | Flood fatalities in contemporary Australia (1997-2008) | Emergency Medicine Australasia | 2010 | 131 |
| 7 | Kaji A, Koenig KL, Bey T. | Surge capacity for healthcare systems: A conceptual framework | Academic Emergency Medicine | 2006 | 123 |
| 8 | Barbisch DF, Koenig KL. | Understanding surge capacity: Essential elements | Academic Emergency Medicine | 2006 | 120 |
| 9 | Hick JL, O'Laughlin DT. | Concept of operations for triage of mechanical ventilation in an epidemic | Academic Emergency Medicine | 2006 | 118 |
| 10 | Neyman G, Irvin CB. | A single ventilator for multiple simulated patients to meet disaster surge | Academic Emergency Medicine | 2006 | 117 |

research, and many studies have focused on this term. The term "disaster medicine" appears 173 times, representing a more specific subfield. This research highlights research focused on the technical aspects of disaster medicine and how health services are organized during disasters. The keyword "disasters" appears 132 times and is closely related to "disasters" showing that the two terms are often used in similar contexts within the literature. "Triage" appears 108 times, reflecting the frequent focus on prioritization and patient sorting processes in disaster research. Studies on how limited resources are allocated during disasters tend to focus on this keyword. "Disaster planning" is used 104 times, indicating that planning and preparation for disasters are common research topics. "Emergency medical services" is another frequently used keyword, with 99 occurrences,

highlighting the importance of research on the organization and implementation of healthcare services during disasters. The keyword "earthquake" appears 92 times, underscoring the significant role of earthquakes in disaster medicine research. This reflects the global prevalence of earthquakes and the numerous studies that have focused on how emergency medical services should be organized in response to such events. "Preparedness" and "disaster preparedness" are used 79 and 55 times, respectively, indicating that preparedness plays a crucial role in disaster medicine, with numerous studies dedicated to this subject in the literature. "Emergency medicine" appears 56 times, demonstrating the frequent examination of emergency medical practices in disaster-related research. The term "education" is also used 56 times, highlighting the importance of increasing awareness and

is productive in disaster medicine research and has an extensive network of collaborators. Yale University, with 33 articles and 154 connections, has a broad collaboration network, indicating its active role in this field and its development of international collaborations. Johns Hopkins University, which has 29 articles and 154 connections, also possesses a significant collaboration network. The large number of connections underscores the importance of Johns Hopkins' contributions to disaster medicine through scientific partnerships. Brown University, with 25 articles and 148 connections, also has a wide collaboration network and plays an active role in disaster medicine research. These types of collaboration analyses are crucial for understanding which institutions play a central role in academic research and how they interact with others. Such inter-institutional collaborations play a critical role in accelerating scientific progress and fostering knowledge sharing.

7. Analysis of Author Collaboration

Bibliographic coupling is a method used to examine the relationships between authors in academic works. When two or more authors cite the same sources, a connection between them is assumed⁽¹⁷⁾. This indicates that the authors are working in similar research areas or are drawing from the same literature. Zhao and Strotmann⁽¹⁸⁾ noted its effectiveness in tracking the dissemination of literature and emphasized the importance of bibliographic coupling as a tool for analyzing scientific literature. The WoS analyzes the collaboration network among authors of articles on "emergency medicine in disasters" has been analyzed in detail. The findings of this analysis are presented in Figure 4. Figure 4 presents the bibliographic relationships between authors who have published at least 5 articles in a specific research field. In this study, a total of 5,958 authors were evaluated, but only 107 met the set criteria. The selection of authors with a minimum of 5 publications ensures that the

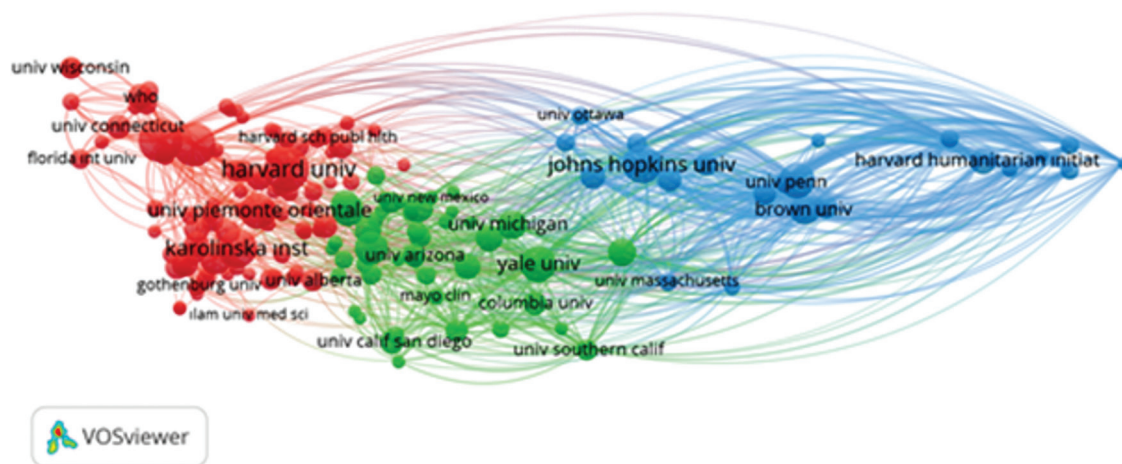


Figure 3. Bibliometric network visualization of inter-institutional collaboration

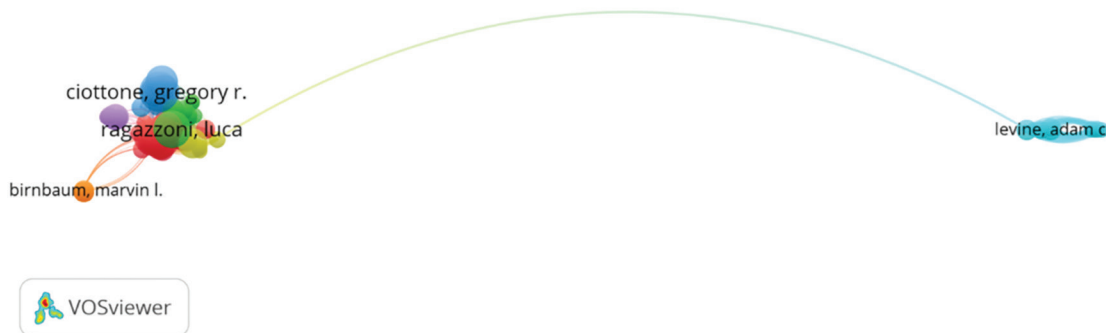


Figure 4. Bibliometric network visualization of author collaboration

analysis focuses on those authors who have made significant contributions to the literature and have enough publications. This threshold allows for a more reliable assessment of authors' productivity and scientific impact. A common method in scientific studies is to set a minimum publication threshold to enhance the accuracy and scope of the analysis. This approach excludes less frequent or isolated studies, allowing for a clearer examination of key contributors in the research area and their relationships⁽¹⁹⁾. By highlighting researchers who have made a notable impact on the literature and are actively conducting studies, the analysis provides more consistent and meaningful results. The analysis in Figure 4 reveals 7 distinct clusters among the 107 authors. Each cluster represents a group of authors connected through a specific research theme or area. These clusters show how authors are linked through shared references and highlight their focus on specific topics. Such analyses are highly valuable for identifying key figures in a research field and understanding collaborative dynamics in the scientific community⁽¹⁷⁾. The figure displays bibliographic connections and collaboration networks between authors in the field of "emergency medicine in disasters". Each circle represents

an author, and the size of the circle reflects the number of articles the author has published and their scientific contribution. The lines between authors indicate that they have cited the same sources, establishing a bibliographic connection. The thickness of the lines represents the strength of the connection and the frequency with which the two authors reference the same sources. In the cluster on the left, Gregory R. Ciottone and Luca Ragazzoni have been shown to have a strong collaborative relationship. There is a dense bibliographic connection between these two authors. Marvin L. Birnbaum is also a member of this cluster and forms strong connections with other authors. These links demonstrate that these authors are active in similar research areas and frequently associate with one another in scientific literature. These authors focused on a specific theme or topic in disaster medicine and collaborated by citing the same sources. On the right side of the figure is Adam C. Levine appears in a more isolated position.

Levine has fewer bibliographic connections than other authors, which may indicate fewer collaborations or a focus on a different research area. These connections between

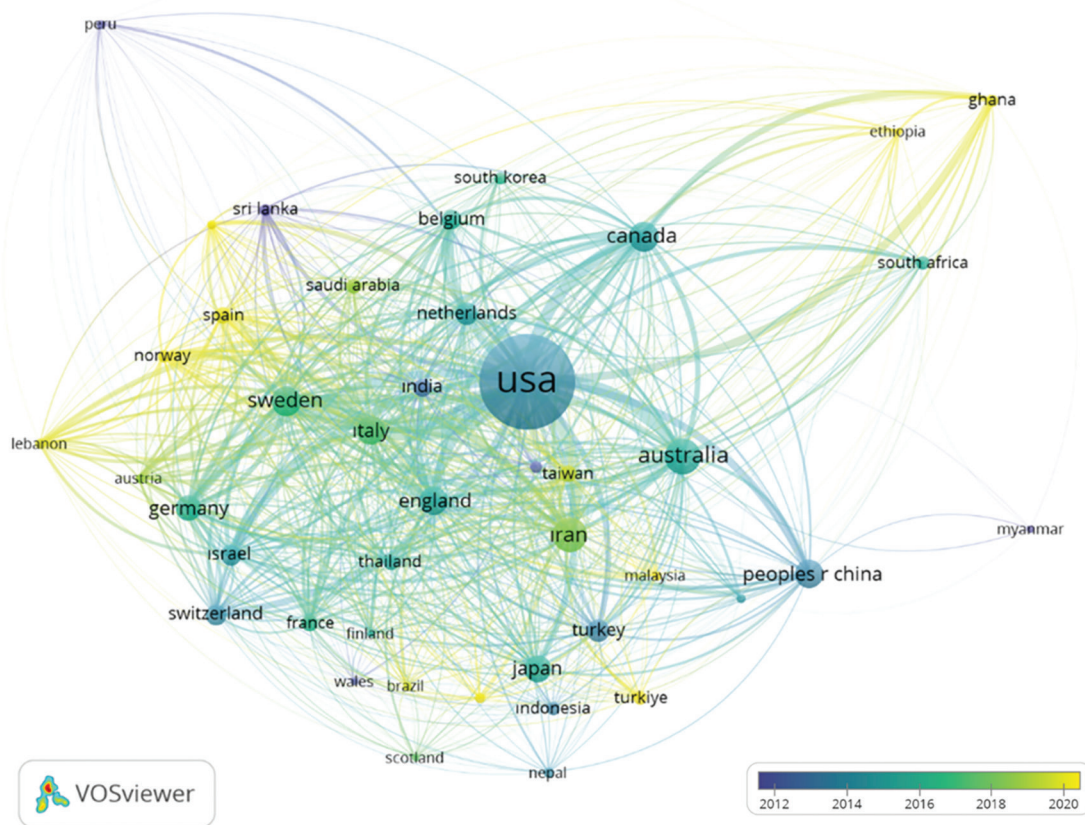


Figure 5. Distribution of citations by country

authors reveal which themes are prominent in the literature and which authors have broader collaboration networks.

8. Citation Distribution by Country

The distribution of citations by country for articles published on the topic of "emergency medicine in disasters" in the WoS database is shown in Figure 4. This analysis shows the extent to which scientists from different countries are active in disaster medicine and how they contribute to the literature. Figure 5 presents a detailed visualization of the distribution of citations across countries for articles published in the WoS database, as well as the academic collaborations between these countries. The analysis considers countries with a minimum of 5 published documents, and 43 countries met this criterion. A total of 8 clusters were identified, with each cluster representing a specific research theme or collaboration network. Figure 5 illustrates the scientific collaboration network between countries in the field of "emergency medicine in disasters" and how these networks have evolved over the years. Each circle represents a country, and the size of the circle indicates the volume of scientific contributions (number of publications and citations) from that country. The lines connecting the circles represent collaborations between countries, whereas the thickness of the lines reflects the intensity of the collaborations. The colors indicate when these collaborations took place, with dark blue representing earlier years (2012) and yellow representing more recent years (2020). The United States (USA) is represented by the largest circle and has 42 connections, indicating that it plays a central role in disaster medicine. The USA is the country with the largest number of global collaborations, with the green-blue tones of the connections indicating that the majority of these collaborations have occurred since 2015. Strong scientific relationships exist between the USA and countries such as Canada, the United Kingdom, Australia, and China. Sweden, with 41 connections, demonstrates a significant increase in its international collaborations in disaster medicine in recent years, as highlighted by the green and yellow tones of its connections. Sweden has established robust partnerships with the USA, Germany, the United Kingdom, and other European countries. Iran, with 40 connections, has recently become more active in international collaborations in disaster medicine. Iran's relationships with the USA, the United Kingdom, China, and Italy stand out. The lighter colors of its connections indicate that most of these collaborations intensified after 2015, indicating Iran's growing contribution to the field in recent years. Turkey, which has 40 connections, has become an important player

in disaster medicine research. Turkey has formed strong partnerships with countries like Australia, Japan, and South Korea. The green tones in Turkey's connections indicate that international collaborations have increased in recent years, demonstrating the country's expanding scientific contribution to disaster medicine. China and Japan, as two of Asia's leading countries in this field, have developed strong collaborations with each other and with countries like the USA. China has shown a notable increase in international collaborations in disaster medicine since 2015. Germany and the United Kingdom are among Europe's strongest contributors in this field, with significant collaborations with the United States and Sweden. The United Kingdom's connections reveal extensive relationships with countries across Asia, Europe, and the America. This visualization effectively illustrates the scientific collaborations between countries in disaster medicine and how these collaborations have changed over the years. Countries like the USA, Sweden, Iran, and Turkey have taken on important roles in the field, and their scientific contributions and collaborations have notably increased in recent years.

Discussion

This study presents a bibliometric analysis of research published between 2004 and 2023 on "emergency medicine in disasters", highlighting academic trends, collaboration networks, and key publications in the field. The findings reveal a significant increase in scientific output during the COVID-19 pandemic, demonstrating the growing importance of disaster medicine and its critical role in global health systems. Topics such as disaster planning, triage processes, and the mental health of healthcare workers were among the most studied and cited. These results are consistent with previous studies on the subject^(20,21).

Garbern et al.'s⁽²²⁾ bibliometric analysis on global emergency medicine authorship representation emphasized the increasing global participation in emergency medicine literature. Similarly, our study shows that countries like the USA, Sweden, Iran, and Turkey have made significant contributions to disaster medicine literature in recent years. This reflects the expansion of international collaboration networks that have enhanced the dissemination and effectiveness of scientific knowledge in disaster medicine.

The study by Gong et al.⁽²³⁾ on diagnostic imaging in disasters highlighted the growing importance of this area in disaster management and highlighted the increasing volume of related literature. Our findings also revealed that

a substantial portion of the disaster medicine literature (42.62%) was concentrated in the "Prehospital and Disaster Medicine" journal. This journal plays a central role in the dissemination of scientific knowledge, like how diagnostic imaging and triage processes are key focus in disaster management research.

Golfiruzi et al.⁽²⁴⁾, in their mapping of global research in emergency medicine, emphasized the increasing prominence of disaster medicine as a research area and highlighted the role of international collaborations. Our study similarly identified institutions like Harvard University, Johns Hopkins University, and the University of California, Irvine, as key contributors with extensive collaboration networks. These findings, consistent with those of Golfiruzi et al.⁽²⁴⁾, underscore the importance of academic productivity and collaboration in advancing disaster medicine literature.

Xu et al.⁽²⁵⁾ conducted a bibliometric analysis of prehospital emergency care from 2000 to 2020, emphasizing the growing significance of this research area, particularly in triage and disaster planning. Our study also identified "triage" and "disaster planning" as frequently used keywords, reaffirming the long-standing importance of these key areas in disaster medicine literature. These findings indicate that preparation and response strategies continue to be central topics of focus in the field. Bazyar et al.'s⁽¹⁰⁾ systematic review of triage principles highlighted the critical role of effective triage in the success of healthcare services during disasters. In line with this, triage processes were among the most frequently cited topics in disaster medicine literature. This underscores the importance of triage and disaster planning as essential elements in the organization and delivery of healthcare services during emergencies.

Study Limitations

This study acknowledges that the search was limited to the WoS database and articles published in English, which may have resulted in the exclusion of relevant studies published in other databases or languages. Additionally, while efforts were made to expand the search terms, some relevant articles may have been missed because of the specificity of the keywords.

Conclusion

This study shows that disaster medicine research has grown substantially in academic interest and scientific collaboration from 2004 to 2023. Global crises, such as the COVID-19 pandemic, have further amplified the importance of disaster medicine, with a surge in related publications.

Institutions such as Harvard University and Johns Hopkins University play a leading role in fostering extensive collaboration networks that contribute to disaster medicine's growing impact on global health systems. Future research in this area will benefit from the expansion of collaborative networks and the promotion of interdisciplinary studies, further enriching the knowledge base in disaster medicine.

Ethics

Ethics Committee Approval: Ethics committee approval is not required.

Informed Consent: Informed consent was not required.

Footnotes

Authorship Contributions

Concept: G.A.U., S.Y., Design: G.A.U., S.Y., Data Collection or Processing: G.A.U., S.Y., Analysis or Interpretation: G.A.U., S.Y., Literature Search: G.A.U., S.Y., Writing: G.A.U., S.Y.

Conflict of Interest: No conflict of interest was declared by the authors.

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

References

1. Wang SJ. Emergency medicine in disasters. *Hanyang Med Rev.* 2015;35:124-30.
2. Şenol Balaban M, Doğulu C, Akdede N, et al. Emergency response, and community impact after February 6, 2023 Kahramanmaraş Pazarcık and Elbistan earthquakes: reconnaissance findings and observations on affected region in Türkiye. *Bull Earthquake Eng.* 2024.
3. Ahn C, Lim T. Emergency medical services in disasters. *Hanyang Med Rev.* 2015;35:136-40.
4. Yılmaz S, Karakayali O, Yılmaz S, et al. Emergency medicine association of turkey disaster committee summary of field observations of February 6th Kahramanmaraş earthquakes. *Prehospital and Disaster Medicine.* 2023;38:415-8.
5. Quarantelli EL, Dynes RR. Response to social crisis and disaster. *Annual Review of Sociology.* 1977;3:23-49.
6. Chan TC, Killeen J, Griswold W, Lenert L. Information technology and emergency medical care during disasters. *Acad Emerg Med.* 2004;11:1229-36.
7. Yılmaz S. Transportation model utilized in the first week following the Kahramanmaraş earthquakes in Turkey: transport health centers. *Scand J Trauma Resusc Emerg Med.* 2023;31:67.
8. Özel M, Altıntaş M, Tatliparmak AC, Yılmaz S, Ak R. The role of the Mangled Extremity Severity Score in amputation triage facility for patients with catastrophic earthquake admissions. *Injury.* 2023;54:111003.
9. Yılmaz S, Cetinkaya R, Ozel M, Tatliparmak AC, Ak R. Enhancing triage and management in earthquake-related injuries: The SAFE-QUAKE

- scoring system for predicting dialysis requirements. *Prehosp Disaster Med.* 2023;38:716-24.
10. Bazyar J, Farrokhi M, Salari A, Khankeh HR. The principles of triage in emergencies and disasters: A systematic review. *Prehospital and Disaster Medicine.* 2020;35:305-13.
 11. Yılmaz S, Tatliparmak AC, Karakayali O, et al. February 6th, Kahramanmaraş earthquakes and the disaster management algorithm of adult emergency medicine in Turkey: An experience review. *Turk J Emerg Med.* 2024;24:80-9.
 12. Montazeri A, Mohammadi S, M Hesari P, et al. Preliminary guideline for reporting bibliometric reviews of the biomedical literature (BIBLIO): a minimum requirements. *Syst Rev.* 2023;12:239.
 13. Mulet-Forteza C, Martorell-Cunill O, Merigó JM, Genovart-Balaguer J, Mauleon-Mendez E. Twenty-five years of the *Journal of Travel & Tourism Marketing*: a bibliometric ranking. *Journal of Travel & Tourism Marketing.* 2018;35:1201-21.
 14. Bornmann L, Daniel H. What are the citation count measured? A review of studies on citing behavior. *J Doc.* 2008;64:45-80.
 15. Butler L. Explaining Australia's increased share of ISI publications—the effects of a funding formula based on publication counts. *Research Policy.* 2003;32:143-55.
 16. Moed HF. *Citation analysis in research evaluation.* 1st ed. Springer Dordrecht; 2005.
 17. Boyack K, Klavans R. Co-citation analysis, bibliographic coupling, and direct citation: Which citation approach represents the research front most accurately? *Journal of the American Society for Information Science and Technology.* 2010;61:2389-404.
 18. Zhao, D, Strotmann A. Information science during the first decade of the web: An enriched author co-citation analysis. *Journal of the American Society for Information Science and Technology.* 2008;59:916-37.
 19. Crane D. *Invisible colleges; Diffusion of knowledge in scientific communities.* Chicago: University of Chicago Press; 1972. p. 213.
 20. Yılmaz S, Tatliparmak AC, Ak R. START-A (Simple triage, rapid treatment and analgesia) in mass casualty incidents. *Wilderness Environ Med.* 2024;35:246-8.
 21. Yılmaz S, Ozel M, Tatliparmak AC, Ak R. START: The fusion of rapid treatment and triage - A broader perspective for artificial intelligence comparison. *Am J Emerg Med.* 2024;76:241-2.
 22. Garbern SC, Hyuha G, González Marqués C, et al. Authorship representation in global emergency medicine: a bibliometric analysis from 2016 to 2020. *BMJ Glob Health.* 2022;7:e009538.
 23. Gong B, Mohammed MF, Nicolaou S, Nasrullah M, Forster BB, Khosa F. diagnostic imaging in disasters: A bibliometric analysis. *Disaster Med Public Health Prep.* 2018;12:265-77.
 24. Golfiruzi S, Nouri M, Sheikhshoei F, et al. Mapping global research in emergency medicine; a bibliometric analysis of documents indexed in the Web of Science database. *Arch Acad Emerg Med.* 2023;11:e53.
 25. Xu L, Tang F, Wang Y, et al. Research progress of prehospital emergency during 2000-2020: a bibliometric analysis. *Am J Transl Res.* 2021;13:1109-24.