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REVIEW ARTICLE

A Bibliometric Analysis of Hospital Disaster Preparedness

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Abstract: Effective disaster management in hospitals is essential to ensure optimal preparedness and response in emergency situations that can save lives and reduce negative impacts on patients and staff. The main objectives of this study were to identify research trends and patterns in hospital disaster management, determine the significant contributions of authors, institutions, and countries in this field, and map collaboration networks. Bibliometric methods were used, with data collected from Scopus. The study also conducted a keyword analysis to understand the current research focus and evaluate the impact of research through citation analysis. The results of the analysis showed that the United States was the most contributing country with more than 450 publications, followed by Australia and the United Kingdom. The most dominant keywords were 'hospital disaster preparedness,' 'disaster management,' and 'emergency service.' International collaboration networks involved the United States the most, while recent research trends show an increased focus on simulation training for disaster preparedness. Hospital disaster preparedness research highlights a global focus on enhancing resilience and operational efficiency during crises. Strengthening international collaboration and evidence-based strategies is vital to address complex future disasters, particularly in light of climate change-induced risks.

Keywords: Bibliometric; Disaster management; emergency service; Hospital disaster preparedness; Research trends

INTRODUCTION

In a disaster situation, hospitals will be the last place to treat victims, so it is important for hospitals to make adequate preparations(1). This preparation may take the form of an emergency or contingency plan, which also aims to keep the hospital functioning for existing patients (2). This plan is commonly known as the Hospital Disaster Management Plan (HDP). When disaster strikes, there is always chaos that can disrupt the patient care process and

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result in sub-optimal outcomes (3). With a good HDP, the chaos is kept as short as possible so that services can still be carried out according to established standards (4), to minimize mortality and morbidity (5).

The Disaster Management Plan is designed to ensure that the hospital can continue to provide optimal services even in the event of an emergency (1). When disasters occur, there is often chaos that has the potential to disrupt the patient care process. With a well-designed and implemented HDP, hospitals can minimize this disruption, keep operations on track, and reduce the risk of death and injury to patients(6). In addition, the HDP also includes training and simulations for medical and non-medical staff, procurement of emergency equipment, as well as coordination with relevant agencies such as the health department and disaster management agencies (4). This is important so that the hospital can respond quickly and effectively when a disaster strikes, ensuring that all patients, both newly arrived and previously treated, receive adequate care. Thus, the hospital can maintain its operations and services despite the crisis situation.

A bibliometric approach is a useful method for understanding trends in research related to hospital disaster preparedness. Using bibliometric analysis, researchers can identify studies that have been conducted around the world, reveal the main topics that have been researched, and find gaps in the existing literature (7). Bibliometrics can help us understand which countries are most active in publishing research on hospital preparedness and what topics are most frequently covered. It provides a broad picture of the spread of scientific and technological and methodological advances in this field.

Although studies on hospital disaster preparedness have increased in the last two decades, there has been no comprehensive bibliometric analysis mapping global research trends in this field. This study aims to fill this gap by conducting a bibliometric analysis of scientific publications to identify publication patterns, author and institutional collaborations, as well as emerging topics in hospital disaster preparedness research

METHODS

This study used bibliometric analysis to map the literature related to disaster preparedness plans in hospitals. Bibliometrics is a quantitative approach used to analyze scientific publications with the aim of identifying patterns, trends and relationships in research in a field (8). This method involves statistical analysis of the published literature to understand the development of the research, the contributions of authors, institutions, and countries, as well as discovering the main topics researched. The process involves several key steps, which are detailed below.

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This literature analysis used Scopus as the main database as it provides relevant peer-reviewed articles in various fields, including hospital disaster preparedness. The literature search focused on articles published in English up to 2023, using the keywords 'hospital disaster preparedness' and a combination of Boolean logic to ensure efficient results. Articles that were editorial, opinion, or irrelevant were excluded from the analysis. The extracted data included important information such as article title, author name, year of publication, journal, and author's country of origin. In addition, research categories and keywords were analyzed to identify dominant trends in the study.

Citation analysis was conducted to find the most influential articles, authors in the field of hospital disaster preparedness. Co-authorship networks were visualized using VOS viewer to understand collaboration patterns between authors and institutions. Topic trends and major keywords were also analyzed using the same tool to identify research developments over time. Geographical analysis was conducted to map the distribution of the most active regions in publishing this research, with the results showing the United States, United Kingdom and Australia as the countries with the largest contributions. VOS viewer software was used to build the network visualization (9). This analysis provides an in-depth insight into the global research focus on hospital disaster preparedness.

RESULTS

The most productive Countries in the field of hospital disaster planning research

Figure 1 shows the number of documents by country or region that contributed to the corresponding publication. From the graph, it can be seen that the United States has the highest number of publications with more than 450 documents, far exceeding other countries. Australia comes second with about 100 documents, followed by the United Kingdom, Germany, and Canada, which have about 50 to 80 documents each. Countries such as Turkey, France, Japan, Belgium and the Netherlands also contribute, but with a lower number of documents, ranging from 20 to 40 documents.

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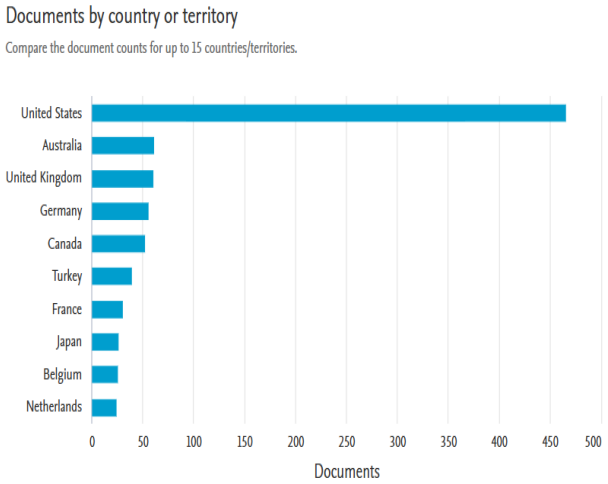

Figure 1. Number of documents by country

The visualization map in Figure 2 illustrates the network of collaboration between countries in disaster preparedness-related research, with the United States emerging as a major center of collaboration. The United States appears to have very strong relationships with countries around the world, including major countries such as Canada, Australia, Germany, Turkey, Japan and the United Kingdom. Relationships shown with colored lines indicate research collaborations between these countries, with the thickness of the line indicating the frequency or intensity of collaboration.

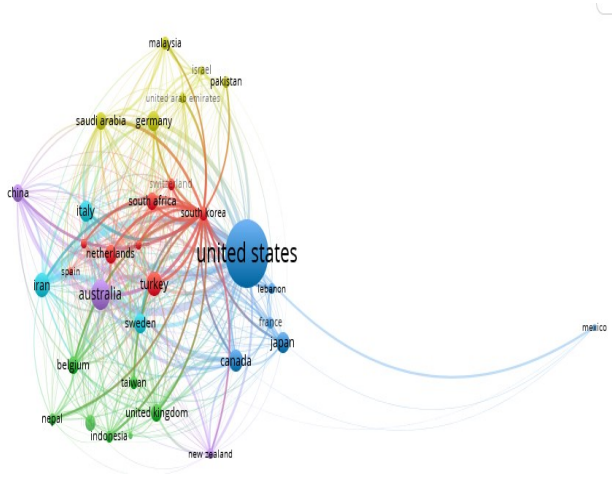

Figure 2. Network of collaboration between countries

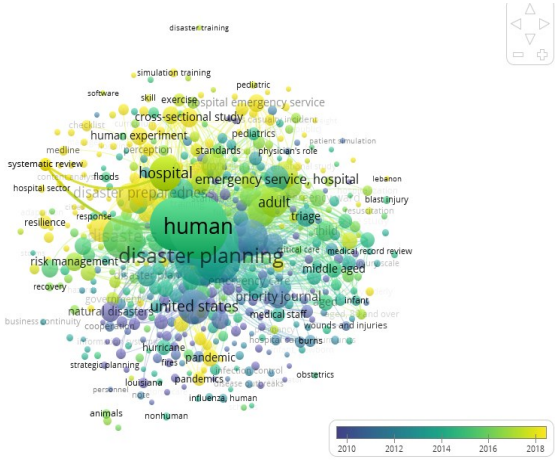

Figure 3. The most frequent words in the field of hospital disaster preparedness

Table 1. Top 10 categories of most frequent words

Main Category	Sub-Categories/Related Topics	Description
Human	Human experiment, adult, middle-aged, pediatric, elderly	Focus on human aspects in disaster planning.
Planning	Risk management, strategic planning, resilience, natural	Focus on strategic planning for

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Main Category	Sub-Categories/Related Topics	Description
	disasters, pandemics, hospital sector	disaster preparedness.
Hospital	Hospital emergency service, triage, medical staff, critical care, recovery, medical record review	Related to emergency services at hospitals and medical personnel.
Emergency Services	Simulation training, disaster training, response, coordination, cross-sectional study, skill exercise	Simulation training and responses in emergency services.
Disaster Preparedness	Checklist, business continuity, governance, cooperation, recovery	Steps for disaster preparedness.
Natural Disasters	Floods, hurricane, earthquakes	Types of disasters frequently studied.
Medical Aspects	Burns, wounds and injuries, obstetrics, infectious disease outbreaks	Medical aspects related to disasters.
Pandemics	Influenza, infection control, pandemics	Focus on preparedness for pandemics.
Geography	United States, Lebanon, Louisiana	Locations frequently studied in disaster research.

The most frequent words in the field of hospital disaster preparedness

Figure 3 depicts a keyword co-occurrence map related to disaster planning and preparedness, focusing on topics such as "human," "hospital," "disaster planning," and "emergency service." The keywords are clustered based on thematic similarity, with larger nodes indicating higher frequencies. Temporal trends are indicated by color, showing the evolution of focus areas between 2010 and 2018, transitioning from earlier concerns like "natural disasters" and "pandemics" to later topics like "simulation training" and "triage." This map highlights key themes and shifts in research focus over time within the field

The table 1 presents the top 10 categories of the most frequently mentioned words in disaster-related research. The main categories include human aspects, strategic planning, hospital services, emergency services, disaster preparedness, natural disasters, medical aspects, pandemics, and frequently studied locations. Each category encompasses related subtopics that highlight key areas of focus in disaster preparedness and response.

DISCUSION

Analysis the Number of Documents by Year

This graph shows an interesting pattern in scientific publications related to a topic (possibly disaster medicine or public health related) throughout the 20th and 21st centuries. The first major spike in 1948 may reflect the influence of major global events,

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such as the end of World War II, where there was an increased need for research in medicine and post-war crisis management. After 1948, although publications declined, an upward trend started to be seen again after the 1970s, reflecting the shifting focus of the medical and academic world towards new challenges such as technological developments, vaccine discovery, or more efficient handling of natural disasters.

In the late 1990s to early 2000s, a significant increase in the number of publications can be attributed to major natural disasters such as the 2004 Indian Ocean Tsunami, the 9/11 terrorist attacks, as well as the global health crisis that generated greater interest in research related to disaster management and health system preparedness. The highest peak in 2010 reflects the intensity of attention to research in this area, which may have been influenced by the development of pandemics and health crises around the world. Overall, the trend of increasing publications from the late 20th century to the 21st century highlights the importance of increasing medical and research capacity related to disaster response and public health preparedness in the face of evolving global challenges.

Documents by Year by Source

The increase in the number of publications after 1990, especially from Prehospital and Disaster Medicine & Disaster Medicine and Public Health Preparedness, reflects the increased global attention to the issue of disaster medicine and public health preparedness. One factor that may have contributed to this increase is the occurrence of a number of major disasters, both natural and man-made, that triggered the need for better medical response. For example, events such as the 9/11 Attacks, the 2004 Indian Ocean Tsunami and various emerging pandemics may have prompted increased attention to disaster management in the health sector. In addition, the development of medical literature may also be influenced by the emergence of global health crises, such as influenza or COVID-19 pandemics, which encourage more research in the field of public health preparedness. This can be seen in the large spike in publications from Disaster Medicine and Public Health Preparedness in the period of 2018 and 2020, which likely relates to the response to the COVID-19 pandemic.

Number of Documents by Country and the Collaboration

The United States' dominance in the number of publications reflects its leading role as one of the global centers of research, particularly in fields related to disaster medicine, public health, and other related topics. With its advanced research infrastructure and many

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leading universities and research institutes, the United States is able to lead the way in the production of scientific literature related to these important topics. Second- and third-placed Australia and the United Kingdom show significant contributions, reflecting these countries' focus on public health and disaster management, particularly in relation to natural disasters such as bushfires in Australia or floods in the UK. Germany, which also shows a large contribution, may be related to the country's attention to advanced health systems and mature disaster preparedness. Other countries such as Turkey, Japan and the Netherlands, although smaller in contribution compared to the United States, also made important contributions. Turkey and Japan, which are frequently hit by earthquakes and other natural disasters, show active involvement in disaster response-related research(10,11).

Analysis Country

Several other countries also emerge as important nodes in this network, although not to the same extent as the United States. Australia, Germany and Turkey stand out as secondary centers with many cross-country collaborations, especially with countries in Europe and Asia. Countries such as Iran, China and Italy are also involved in this network, demonstrating their role in research and their contribution to the international literature on disaster preparedness. Interestingly, countries that also experience frequent natural disasters, such as Indonesia, Nepal and Saudi Arabia, are also visible in this network, albeit with relatively fewer collaborations compared to the United States. Canada and Japan also engage in significant collaborations with the United States, which may reflect their national priorities in disaster management and health preparedness research.

Overall, this map shows that the United States is a key player in the global network of disaster preparedness research, with many extensive international collaborations. This reflects the country's research capabilities and commitment to improving global preparedness for disasters of all kinds. It also demonstrates the importance of collaboration between countries in addressing global challenges that require cross-border approaches and knowledge sharing.

Analysis Authors Collaboration

Collaboration among authors in research on disaster preparedness in hospitals plays a crucial role in advancing knowledge and practices in this field. Authors like Kaji A.H., Lewis R.J., and Hospita serve as central figures in the collaboration network, highlighting their involvement in various studies and publications. Similarly, the

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intensive collaboration between Djalali A., Castren M., and Khankhe underscores their significant contributions to related research. Such collaborations facilitate broader exchanges of knowledge, resources, and expertise, ultimately enhancing the quality and effectiveness of research. Additionally, collaboration helps promote the standardization of procedures and disaster preparedness policies in hospitals, which is essential for an effective response to emergencies.

In Indonesia, several studies have emphasized the importance of collaboration in hospital disaster management. For example, research has shown that hospitals in Indonesia are generally at a standard level of preparedness for disasters, with established policies and standard operating procedures, although these are not always well-implemented by hospital management. Whereas the research by Suparni et al., found that all public hospitals included in their study (n=5) were classified as level B hospitals. This classification indicates that their emergency and disaster response, as well as recovery planning, were limited. Additionally, coordination in managing emergency and disaster-related activities was minimal (12).

Moreover, partnerships among various stakeholders, such as governments, hospitals, and non-governmental organizations, are critical for improving disaster preparedness (12–15). For instance, the collaboration between the Muhammadiyah Covid-19 Command Center (MCCC) and the Regional Disaster Management Agency (BPBD) was built on mutual trust, demonstrating the importance of collaboration in disaster response (16–20).Thus, collaboration among authors and institutions in disaster preparedness research in hospitals is vital to enhancing the capacity and effectiveness of disaster response at both national and international levels.

The Keywords Analysis

The keyword map displayed in figure 5 provides insight into research trends related to disaster preparedness in hospitals, based on bibliometric analysis. Keywords such as ‘human’, ‘disaster planning’ and ‘hospital’ emerged as the most prominent keywords, indicating that most research focuses on disaster planning involving humans, both in the context of hospital response and human resource preparedness. This research focuses not only on the physical aspects of hospital preparedness, but also on emergency services management and the role of people in responding to disasters. The keywords ‘disaster preparedness’ and ‘emergency service’ further reinforce this, with topics such as triage, critical care, and hospital emergency service becoming important elements in the literature related to emergency management in hospitals.

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A large focus was also seen on types of disasters, especially pandemics, natural disasters, fires, and hurricanes, which is reflected in keywords such as ‘pandemic’, ‘natural disasters’, and ‘hurricane’. This suggests that research on hospital disaster preparedness is heavily focused on different types of natural disasters and global health crises, such as the flu pandemic and COVID-19. In addition, keywords such as ‘risk management’ and ‘resilience’ signify the importance of risk management and resilience of hospital systems in dealing with unexpected emergency situations.

The map also shows a significant geographical role, with ‘United States’ emerging as a dominant keyword, indicating that much of the research in this area originates from or focuses on the United States context. The country has a long history of dealing with disasters and has developed a strong research infrastructure in terms of hospital disaster preparedness. In addition, there are several demographic keywords such as ‘adult’, ‘middle aged’ and ‘pediatric’, reflecting the literature's attention to hospital preparedness in dealing with various age groups, including vulnerable groups such as children and the elderly.

Recent Research and the Need for Increasing Attention

The map further highlights emerging trends within hospital disaster management research, specifically emphasizing the growing significance of terms such as "simulation training," "exercise," and "pediatrics," marked in yellow. These keywords suggest a clear shift in focus towards innovative strategies aimed at enhancing hospital staff preparedness. Simulation training, in particular, has gained substantial attention as an effective method for training healthcare professionals in responding to complex disaster scenarios. This approach allows for immersive, hands-on experiences that improve decision-making, communication, and coordination skills in a controlled yet realistic environment, thus helping staff better anticipate and respond to unpredictable disaster events.

Furthermore, the growing focus on pediatric care in disaster settings is a notable and critical development. Pediatric patients have unique needs during disasters, requiring specialized medical care and attention that may differ from that of adults. The rising emphasis on pediatric care in the context of disaster preparedness reflects an increasing recognition of this vulnerability, underscoring the necessity to ensure that hospitals are equipped with the resources, training, and protocols to address the specific challenges of treating children in emergency situations. This shift not only highlights gaps in disaster planning but also calls for more targeted research and policy development to improve pediatric disaster

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care protocols, ultimately strengthening overall hospital disaster preparedness.

Simulation training for hospital staff

Simulation allows healthcare professionals to refine their skills collectively, rather than working independently within their specific disciplines. By bringing together a diverse team, they can practice essential tasks such as transferring patient care, navigating crowded spaces, effectively exchanging reports, requesting and administering medications, utilizing closed-loop communication, and properly wearing protective gear and clothing.

Limitation

This study has several limitations that should be considered. The reliance on bibliometric data may not fully capture the practical applications of hospital disaster management across different regions and contexts. Additionally, the analysis was confined to articles published in selected databases, which might have excluded relevant studies from other sources or regions. As a result, the research might not reflect the full spectrum of global practices in hospital disaster preparedness. Furthermore, regional disparities in disaster preparedness may not have been adequately addressed due to the focus on published literature rather than firsthand, real-world data.

CONCLUSION

This study underscores the importance of hospital disaster preparedness as a fundamental component of a resilient health system. The bibliometric analysis reveals that the United States leads in scientific publications related to hospital disaster management, with Australia and the United Kingdom following closely. The research primarily focuses on disaster planning and preparedness, emphasizing the management of both physical infrastructure and human resources. The findings suggest that there is a pressing need for stronger global collaboration and the implementation of evidence-based strategies to enhance hospital preparedness, particularly as the complexity of future disasters increases, compounded by the growing risks associated with climate change.

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REFERENCES

1. Khirekar J, Badge A, Bandre GR, Shahu S. Disaster Preparedness in Hospitals. Cureus. 2023 Dec;15(12):e50073.
2. Fischer RJ, Halibozek EP, Walters DC. Contingency Planning Emergency Response and Safety. Introduction to Security. 2019. p. 249–68.
3. Abrons J, Smith JG. When disaster strikes: managing chaos and instilling lessons for future events. Public Heal Pharm Pract. :111.
4. Beyramijam M, Rasouli-Ghahfarokhi SM, Fathollahzadeh A, Rahimzadeh A,

E-ISSN :2722-0877
DOI: https://doi.org/10.30596/jih.v6i2.23809

Shahabirabori MA, Aminizadeh M. The effect of education and implementation of "National Hospital Disaster Preparedness Plan" on an Iranian hospital preparedness: An interventional study. J Educ Health Promot. 2019;8:215.
5. Hendrickx C, D'Hoker S, Michiels G, Sabbe MB. Principles of hospital disaster management: An integrated and multidisciplinary approach. B-ENT. 2016;12(26/2):139–48.
6. Afik A, Khoiyati A. Experiences of Nurses in the Implementation of Hospital Disaster Plan: A Phenomenological Study. In: Third International Conference on Sustainable Innovation 2019–Health Science and Nursing (IcoSIHSN 2019). Atlantis Press; 2019. p. 197–202.
7. University of Illinois Chicago. Bibliometric Analysis and Visualization [Internet]. 2024. Available from: https://researchguides.uic.edu/bibliometrics/vosviewer
8. Donthu N, Kumar S, Mukherjee D, Pandey N, Lim WM. How to conduct a bibliometric analysis: An overview and guidelines. J Bus Res [Internet]. 2021;133:285–96. Available from: https://www.sciencedirect.com/science/article/pii/S0148296321003155
9. Singh P, Singh B. Analysis of Social Structures in Scientometrics. In 2019. p. 245–54.
10. Ocal A. Natural disasters in Turkey: Social and economic perspective. Int J Disaster Risk Manag. 2019;1(1):51–61.
11. Suparni; Fatma Lestari; Ede Surya Darmawan; Robiana Modjo; Senol Dane. Are Indonesian Hospitals Ready to Response to Disaster? Hospital Disaster Preparedness in West Java Province. J Res Med Dent Sci [Internet]. 2020;8(4). Available from: https://www.jrmds.in/articles/are-indonesian-hospitals-ready-to-response-to-disaster-hospital-disaster-preparedness-in-west-java-province-54685.html
12. Okdinawati L, Dwiputranti MI, Oktora RA. The role and multi parties interaction and coordination mechanism on disaster management. Int J Emerg Manag. 2019;15(2):187–204.
13. Lobangpali NM, de Fretes CHJ, Hergianasari P. The Role of Multi-Stakeholder Partnership in Humanitarian Diplomacy in the Seroja Storm Event in East Nusa Tenggara 2021. J Soc Res. 2023;2(6):1937–60.
14. Sari S. The governmental and non-governmental approaches to maintain medium and long-term disaster resilience after a mega-disaster [Internet]. Bonn: Universitäts-und Landesbibliothek Bonn; 2019. Available from: https://bonndoc.ulb.uni-bonn.de/xmlui/handle/20.500.11811/8047
15. Wahyuli S, Nurfarhaty N, Haeril H. Natural Disaster Management in Local Government from the Perspective of Collaborative Governance. J Stud Ilmu Pemerintah [Internet]. 2023;4(1):93–102. Available from: https://jurnal-umbuton.ac.id/index.php/jsip/article/view/3099
16. Qodarsasi U, Huda RN, Zuma UA. Strengthening communities' disaster resilience during COVID-19 time: A case of Muhammadiyah in Indonesia. Simulacra. 2021;4(2):229–45.
17. Prakasa SUW, Hariri A, Fatmawati IN. Social aid of Covid-19 corruption: strategy and mitigation policy of Muhammadiyah East Java. Soc aid Covid-19 Corrupt Strateg Mitig policy Muhammadiyah East Java. 2021;29(1):27–45.
18. Humaidi N, Darmayanti R, Sugianto R. Challenges of Muhammadiyah's contribution in handling Covid-19 in the MCCC program in Indonesia. Khazanah Sos. 2022;4(1):176–86.
19. Ichsan M. Disaster Management in Indonesia: Muhammadiyah's Strategy and Contribution in.
20. Jundi A. Manajemen Komunikasi Organisasi Lembaga Penanggulangan Bencana–Muhammadiyah Disaster Management Center

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