

Original article

Global trends in school disaster preparedness research: bibliometric analysis of impacts on public health and safety

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Abstract

Background: Disasters, caused by natural or artificial triggers, result in the daily disruption of human activities. The extent of their impact is affected by community vulnerability and resource capacity. Effective disaster management involves a cycle of mitigation, preparedness, response, and recovery. One such mitigation measure, which integrates education and capacity building, is to establish school disaster preparedness.

Objective: The aim of this research was to perform a bibliometric analysis of Scopus publications relating to school disaster preparedness.

Methods: A bibliometric analysis of publications indexed in Scopus from 1965 to 2024. Data were processed and visualized using VOSviewer to explore trends in annual outputs, contributing countries and institutions, citation performance, and co-occurring keywords.

Results: This bibliometric analysis identified 868 publications on school disaster preparedness, with a notable increase occurring following the COVID-19 pandemic. The most active countries in this field were the United States, Indonesia, and Japan. Prominent research themes included *disaster training*, *earthquake preparedness*, and *community awareness*, reflecting the interdisciplinary nature of school disaster preparedness. Of the 2197 institutions that contributed a document, the *International Journal of Disaster Risk Reduction* published the most articles. Keywords such as “*disaster preparedness*,” “*emergency preparedness*,” and “*education*” highlight the central role of schools in promoting proactive disaster management.

Conclusion: Our results show that there is growing research interest in school disaster preparedness, which emphasizes the importance of educational programs, community engagement, and cross-disciplinary collaboration. The incorporation of health and public safety considerations into school preparedness initiatives can reduce disaster-related risks and improve the safety and wellbeing of vulnerable populations.

Keywords: Bibliometric analysis, disaster risk reduction, school disaster preparedness.

Disasters have significantly altered social, economic, and environmental conditions in many countries, often disrupting the normal function of communities and overcoming their capacity to cope.⁽¹⁾ These events may arise from natural processes, such as earthquakes, tsunamis, and volcanic eruptions, or human-related activities, such as conflict, terrorism, industrial accidents, fires, and technological failures.^(2,3) In recent years, the frequency and complexity of disaster events have increased, particularly in areas with high

population density or rapid development.⁽⁴⁾ The severity of disaster impacts is dependent on various factors, including hazard intensity, community vulnerability, and the availability of resources, and these impacts are often have both direct and indirect consequences, including environmental damage, physical injury, psychological distress, and loss of life. To respond to such challenges, disaster management is often approached as a continuous cycle consisting of mitigation, preparedness, response, and recovery, emphasizing the need for greater awareness and readiness in facing unexpected events.⁽⁵⁾

The mitigation and preparedness phases are essential for reducing disaster risks before events occur.⁽⁶⁾ However, existing disaster response efforts are often limited by delays in coordination, resource constraints, and a predominantly reactive approach,

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which lead to greater losses in vulnerable communities. In contrast, disaster adaptation emphasizes proactive efforts by improving risk perception, identifying potential hazards, and enhancing management strategies. The concept of adaptive capacity reflects the evolving paradigm of disaster management, which highlights the importance of community awareness and readiness when facing uncertain events.⁽⁷⁾ The adaptation process is a key component of mitigation, encouraging societies to take preventive actions before disasters occur.⁽⁸⁾ One important example is the development of disaster-resilient schools, integrating education and capacity building to strengthen preparedness at the community level.

A previous study identified that school students, despite being a vulnerable population, are often underrepresented in disaster preparedness efforts.⁽⁹⁾ This limited involvement is reflected by the generally low levels of risk awareness and preparedness among students; this has been highlighted in various studies, which show that children and adolescents tend to have insufficient knowledge of appropriate responses during emergencies.⁽⁹⁾ Consequently, the roles of teachers and trainers become crucial for delivering clear, practical, and age-appropriate guidance. However, students have demonstrated strong adaptability and learning capacity, making them highly receptive to disaster-related training. With the proper education and training, they are more likely to respond effectively during disasters, bolster community safety, and support local disaster management efforts.⁽¹⁰⁾

School-based disaster preparedness programs have emerged as a key strategy for implementing mitigation and preparedness efforts, particularly because schools are one of the most effective settings for building early awareness and long-term behavioral change. Schools should be prioritized as they accommodate large numbers of children, a vulnerable population during disasters, while also serving as a strategic environment for knowledge transfer that can be extended to families and communities. The provision of disaster education at an early age helps to shape children's risk perception and decision-making skills, which can affect their responses to future emergencies.⁽¹¹⁾ Several countries have implemented such initiatives. Examples include the United States, which has introduced school-based safety programs that train students to respond effectively in disaster situations;⁽¹²⁾ New Zealand, which has integrated disaster education and training into its school system;⁽¹³⁾ and Indonesia, particularly in the Special Region of Yogyakarta, where disaster risk reduction

programs have been widely implemented in elementary schools to strengthen capacity and reduce potential risks.⁽¹¹⁾

Bibliometric analysis, a technique for systematically mapping large volumes of scientific data, enables the identification of publication patterns, key contributors, collaboration networks, and emerging research themes in a structured and objective manner. Unlike conventional literature reviews, bibliometrics provides a broader and more measurable overview of research development over time. The aim of this study was to conduct a comprehensive bibliometric analysis of Scopus-indexed publications related to school disaster preparedness, with a focus on identifying global trends in research and their implications for public health and safety.

Materials and methods

A bibliometric analysis of publications on school disaster preparedness was performed using the Scopus database, which was chosen for its comprehensive coverage, high academic standards, and complete bibliographic information.⁽¹⁴⁾ Literature from 1965 to 2024 was retrieved on May 31, 2024, with no restriction on document type or language, to capture a broad range of evidence. Retrieved documents included articles, reviews, conference papers, book chapters, and other scholarly documents. The search strategy targeted titles, abstracts, and keywords using the terms “*disaster preparedness*” AND “*school preparedness*” OR “*school disaster preparedness*.”

The retrieved documents were exported in TSV format and processed using VOSviewer, a visualization tool developed by the Center for Science and Technology Studies at Leiden University, Netherlands, which allows co-authorship, co-citation, and keyword co-occurrence networks to be mapped. In the visualization, node size reflects the frequency or influence of a document, author, or keyword, whereas node color identifies clusters of related research topics.⁽¹⁵⁾

The bibliometric analysis performed in this study comprehensively examines multiple dimensions of school disaster preparedness research to provide a holistic understanding of the field. First, the publication summary follows the increase in scientific output over time, revealing emerging trends and shifts in research. Second, the most productive countries are identified, highlighting national contributions and regional patterns of knowledge production. Third, key institutions are examined to understand the main organizations driving

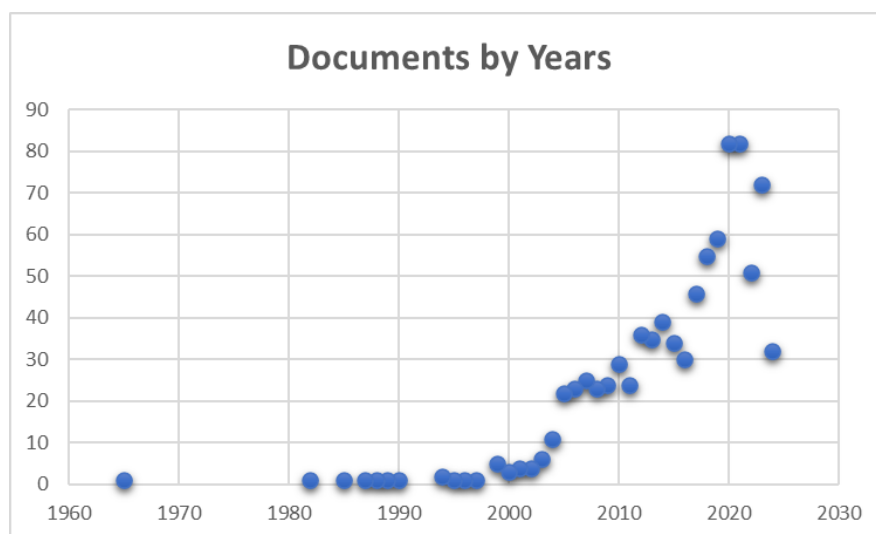


Figure 1. Annual documents on school disaster preparedness research by years.

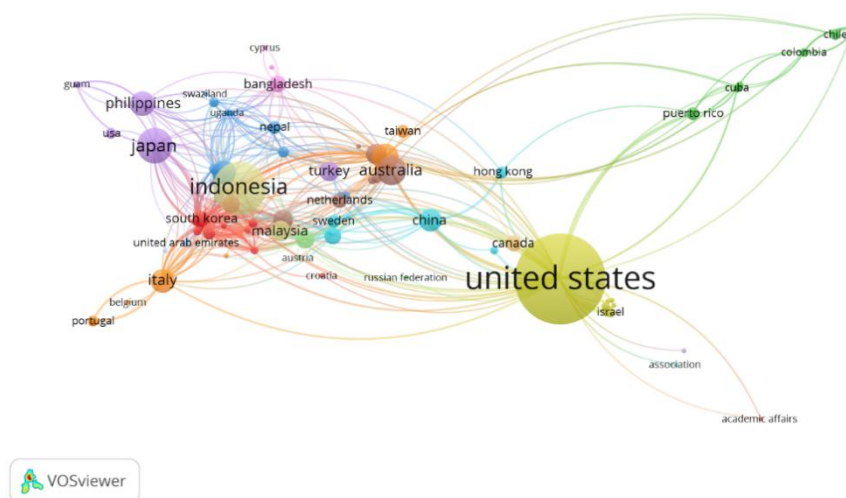


Figure 2. Network visualization of countries on school disaster preparedness research.

research, promoting collaborations, and influencing policy and practice. Additionally, the most prominent journals and conferences are analyzed to identify the primary platforms for disseminating research findings. Keyword and term co-occurrence analyses are also used to reveal dominant themes, recurring topics, and evolving areas of interest within the field, allowing for a nuanced understanding of research priorities. Finally, the evaluation of highly cited documents provides insight into the most influential studies that have guided theoretical frameworks, methodological approaches, and practical applications to direct future research and evidence-based policy development relating to school disaster preparedness.

Results

This study analyzed the progression of school disaster preparedness research from 1965 to 2024 using bibliometric methods. In total, 868 documents were identified in the Scopus database: 593 articles, 128 conference papers, 75 reviews, 32 book chapters, and 8 books, as well as other document types. **Figure 1** illustrates the annual publication trend, showing the initial number of publications in 1965, and limited research until 1985. Then, the number of publications increased gradually after 1999 and rose sharply following 2020, reflecting growing global interest in the topic, particularly during and after the COVID-19 pandemic.

Table 1. Top Journals most publications on school disaster preparedness research.

Rank	Source	Country	Documents	Citations
1	International Journal of Disaster Risk Reduction	UK	46	969
2	IOP Conference Series: Earth and Environmental Science	UK	46	93
3	Public Health Reports	US	35	656
4	Disaster Medicine and Public Health Preparedness	UK	34	293
5	Prehospital And Disaster Medicine	UK	18	248
6	Journal of Physics: Conference Series	UK	16	32
7	American Journal of Disaster Medicine	US	15	145
8	Natural Hazards	Netherlands	14	1225
9	International Journal of Environmental Research and Public Health	Switzerland	11	194
10	Journal of Public Health Management and Practice	US	11	154

Table 2. Top Author the most publications on school disaster preparedness research.

Author	Documents	Institution	Country
Rina Suryani Oktari	7	University of Syiah Kuala	Indonesia
Kevin R. Ronan	7	Massey University	New Zealand
Rajib Shaw	7	Kyoto University	Japan
Hamed Seddighi	6	University of Social Welfare and Rehabilitation Sciences	Iran
Yousefzadeh	6	University of Groningen	Netherlands
Raymond V Burke	5	University of Nebraska	United States
Ahmad Fauzia	5	State University of Padang	Indonesia
David M Johnston	5	Institute of Geological and Nuclear Sciences	New Zealand
Hiromi Kawasaki	5	Hiroshima University	Japan
Monica Lopez Lopez	5	University of Groningen	Netherlands

In total, 116 countries contributed to this field; the United States was the leader in both the number of publications (359) and citations (5609), followed by Indonesia (123 publications and 593 citations), Japan (55 documents), Australia (40), United Kingdom (31), Philippines (27), Italy (26), India (25), China (23), and Malaysia (20). There was no correlation between the number of documents and the number of citations. For example, Germany had published 16 documents that had been cited 1172 times whereas the Philippines had published 27 documents that had only been cited 60 times. **Figure 2** presents the network of 58 countries meeting the analysis threshold, highlighting collaborative relationships. Although the number of publications and citations are not always correlated, this visualization reveals the distribution and connections of research activity across nations.

There were 2197 institutions that actively contributed to school preparedness disaster research. The *Centers for Disease Control and Prevention*, in the United States, had the highest number of publications (22), followed by *Yogyakarta State University* in Indonesia (19 documents), *Johns Hopkins Bloomberg School of Public Health* in the United States (15 documents), *Syiah Kuala University* in Indonesia (14 documents), Saint Louis University in Spain (13 documents), and The University

of Alabama at Birmingham in the United States (11 documents).

In total, 455 journals published research on school disaster preparedness; the top 10 sources are summarized in **Table 1**, along with publication counts, citations, country of origin, and Scopus quartile rankings. There are two journals with the highest publications totaling 46 documents. Both journals were published in the same country, namely the United Kingdom. Based on the Scopus indexing, most of the contributing journals were in Q2, and the United Kingdom was the country with the highest journal publisher contribution.

From 1965 to 2024, 843 authors contributed to research on school disaster preparedness. **Table 2** presents the 10 most prolific authors: Rina Suryani Oktari, Kevin R. Ronan, and Rajib Shaw each published seven documents; Hamed Seddighi and Sepideh Yousefzadeh contributed six publications each; and several other authors published between four and five documents. These findings indicate that a relatively small core group of highly active contributors are driving research in this field alongside a broader network of authors with occasional contributions. Keyword analysis identified 1675 unique terms, of which 81 met the minimum occurrence threshold of 10 for inclusion in network visualization (**Figure 3**).

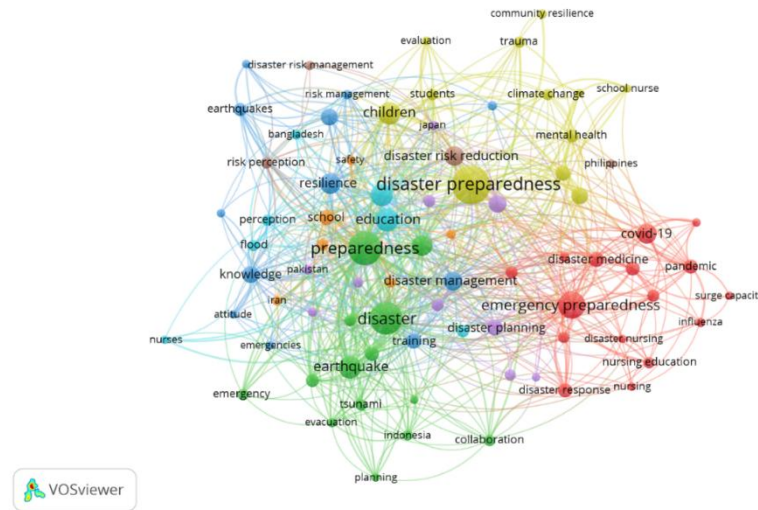


Figure 3. Network visualization of author keywords on school disaster preparedness research.

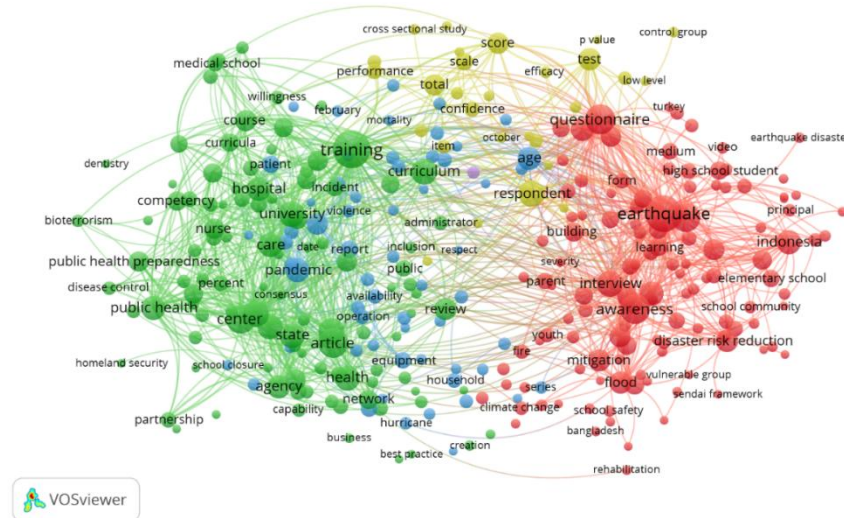


Figure 4. Network visualization of term on school disaster preparedness research.

The most frequent keywords were “*Disaster Preparedness*,” with 94 occurrences and a confidence value of 124, “*Preparedness*” (75 occurrences), “*Disaster*” (69 occurrences), “*Emergency preparedness*” (47 repetitions), “*Education*” (36 occurrences), “*Disasters*” (34 occurrences), “*Earthquake*” (33 occurrences), “*Children*” (32 occurrences), “*School*” (28 occurrences), and “*Resilience*” (27 occurrences). These keywords reflect both the conceptual focus and practical orientation of the field, showing the emphasis on education, risk reduction, and vulnerability of children in school settings.

Thematic analysis identified 18,998 unique terms across the documents, with 319 themes meeting the predefined occurrence threshold for mapping (Figure 4). “*Training*” was the main theme of the research, school preparedness disaster, with 175 occurrences with a relevance score of 2.27. “*Earthquake*” was the second most frequently used theme, with 171 occurrences and a relevance score of 6.73; “*Awareness*” and “*Questionnaire*” had 110 occurrences, followed by “*article*” and “*Center*” (109 occurrences each) and “*Teacher*” (104 occurrence). These seven themes are the most frequently used themes, with occurrence values of more than 100 times.

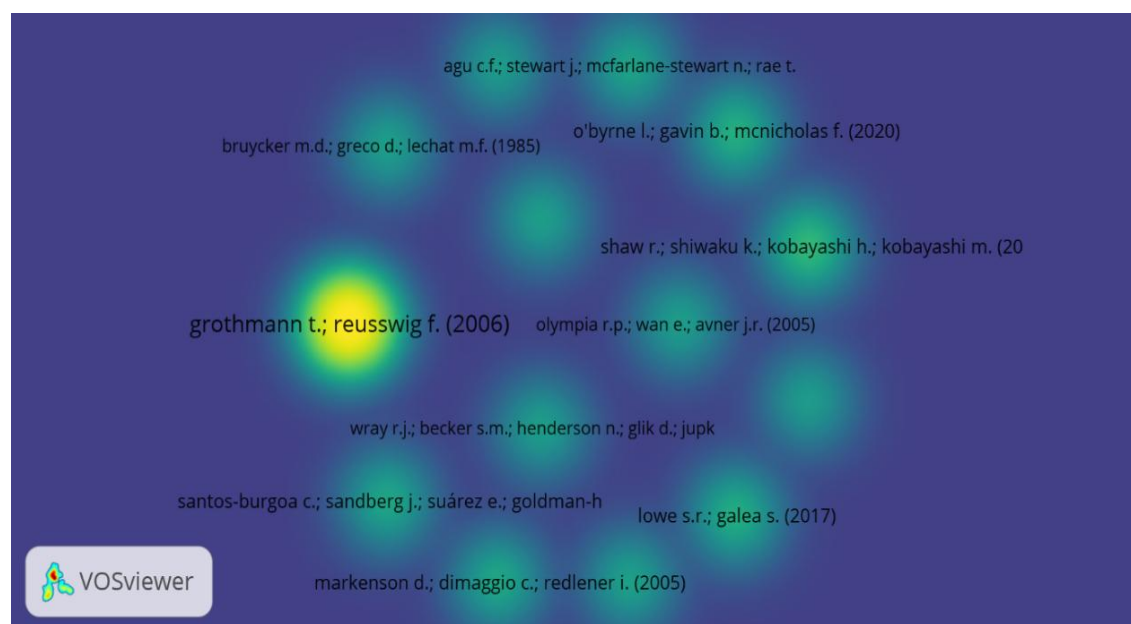


Figure 5. Top 15 documents with most cited-on school disaster preparedness research.

The 15 documents with the number of highest citations (**Figure 5**) are the documents that meet the threshold value of more than 100 citations. In the figure, the color density indicates the number of citations for each document. The Grothman and Reuss Wig document in 2006, entitled “*People at risk of flooding: Why some residents take precautionary action while others do not*” is the document with the highest number of citations (965). The study of Shaw et al. (2004), entitled “*Linking experience, education, perception, and earthquake preparedness*,” had the second highest number of citations (190). The article “*Medical students and COVID-19: the need for pandemic preparedness*” by O’Byrne, et al. (2020) has been cited 154 times; “*The mental health consequences of mass shootings*” by Lowe and Galea (2017) has been cited 151 times; “*Preparing health professions students for terrorism, disaster, and public health emergencies: core competencies*” by Markenson, et al. (2005) has been cited 131 times.

Discussion

The results of the bibliometric analysis demonstrate the steady growth of school disaster preparedness research, with a marked increase in the number publications following the COVID-19 pandemic, particularly in 2020 and 2021. The United States and Indonesia are the most active contributors; however, citation counts do not always correspond to publication volume. Key institutions in these countries, including the Career Development Center and Yogyakarta State University, are central to advancing this field of

research, although journals published in the United Kingdom contribute the majority of publications. The field is interdisciplinary—medicine and social sciences dominate—reflecting the dual focus on health impacts and societal behavior in disaster contexts.

Preparedness programs in schools, including emergency drills, simulation exercises, and first responder training, have been implemented in various countries, including the United States, Indonesia, and Japan. These activities improve students’ confidence, risk awareness, and practical skills, leading to more effective responses during actual disasters. In the United States, national initiatives led by FEMA guide both practice and research on school safety.^(16,17) Indonesia incorporates disaster risk reduction into education through programs such as Sekolah Siaga Bencana, especially in regions prone to earthquakes and tsunamis.^(18–20) Japan, shaped by experiences such as the 1995 Hanshin-Awaji earthquake, integrates disaster education, regular drills, and community preparedness exercises into school curricula.^(21, 22) These nations’ efforts highlight the connection between practical implementation and research contributions in school disaster preparedness.

The impact of school disaster preparedness extends beyond simply increasing knowledge. Well-designed programs can minimize both physical injuries and other health risks, such as psychological stress, infections, and accidents, among students and staff. By promoting awareness and proactive responses, schools act as community centers that reduce disaster risk for the wider population.⁽²³⁾ Our analysis of research trends shows that *disaster preparedness* is the most frequently used keyword, reflecting a growing

focus on proactive disaster management. Other commonly repeated keywords include preparedness, emergency preparedness, disaster, and education, highlighting that disaster readiness requires coordinated efforts across multiple sectors. Hence, education is not limited only to classroom lessons but also involves practical training and ongoing evaluation to ensure effective preparedness outcomes.^(24, 25)

Training emerges as a central theme in the research, with frequent mentions highlighting its importance in building practical skills and experience, specifically for “first responders,” such as firefighters, nurses, and rapid response teams.^(26, 27) Earthquakes are another dominant theme, indicating their prevalence and the need for targeted preparedness strategies in schools.⁽²⁸⁾ Awareness is also a recurring focus, and emphasizes the need to foster a proactive mindset among students and staff.^(29, 30) Together, these themes demonstrate the multifaceted nature of school disaster preparedness, combining hands-on training, risk knowledge, and behavioral awareness to strengthen readiness for all types of emergencies.

Previous studies have highlighted the importance of experience, education, and training in disaster preparedness across different contexts. Grothman and Reuss Wig found that personal experience, risk perception, and social influences strongly affected individuals’ preparedness for flooding, and suggested that these factors would be a good target for awareness campaigns.⁽³¹⁾ Similarly, Shaw demonstrated that past earthquake experiences and formal education significantly enhanced individuals’ readiness, emphasizing the role of education in shaping effective preparedness strategies.⁽³²⁾ During the COVID-19 pandemic, O’Byrne and colleagues identified gaps in medical students’ preparedness, highlighting the need to integrate pandemic response training into medical curricula.⁽³³⁾ Lowe and Galea showed the severe psychological impacts of mass shootings, underlining the necessity for targeted mental health interventions.⁽³³⁾ Studies by Markenson emphasized that students in the health profession require structured and comprehensive training in responding to terrorism, disasters, and public health emergencies, confirming that systematic and practical training is essential for effective emergency response and resilience.⁽³⁴⁾

The results of the bibliometric analysis also indicate that research in school disaster preparedness is highly multidisciplinary: medicine accounted for

approximately 28.5% of the publications, reflecting the importance of addressing health risks, and social sciences accounted for 18.9%, highlighting behavioral and societal dimensions of disaster management;⁽³⁵⁾ and earth and planetary sciences and environmental science each accounted for approximately 10.0%, reinforcing the relevance of understanding hazard exposure and environmental risk factors in preparedness planning.⁽³⁶⁾

School disaster preparedness is crucial for reducing physical damage and mitigating health risks, including injuries, infections, and psychological stress, particularly in children, who are highly vulnerable during disasters. This research shows that structured training programs, emergency drills, and awareness campaigns in schools can enhance students’ knowledge, practical skills, and confidence, leading to more effective responses in real disaster situations. The integration of these programs into school curricula while adapting them to local hazard profiles and resource availability can strengthen community resilience by turning schools into centers of disaster awareness and risk reduction. The current global increase in natural hazards, combined with emerging threats such as pandemics and climate-related events, indicates the urgent need to prioritize disaster preparedness in education policies.⁽³⁶⁾ The consistent implementation of these programs can guide policymakers and public health authorities in designing strategies that reduce health impacts, foster community engagement, and build sustainable preparedness systems that benefit not only students but also the surrounding communities.

This study has several limitations. The analysis relies solely on data from the Scopus database, which may exclude relevant publications indexed in other sources (e.g., Web of Science, PubMed, or national repositories). Additionally, the quantitative nature of the bibliometric approach applied may not fully capture the contextual depth, quality, or practical impact of the research on school disaster preparedness. Differences in publication culture and citation practices across countries and academic disciplines may also affect interpretation of results. Therefore, future studies should incorporate qualitative methods, such as systematic literature reviews or case studies, to achieve a more comprehensive understanding of how disaster preparedness programs are implemented and evaluated in diverse local settings.

Conclusion

This study identifies the recent notable expansion in school disaster preparedness research, particularly following the COVID-19 pandemic. In total, 868 publications were identified, with the United States, Indonesia, and Japan being the most active contributors. Key themes emerging from the analysis include training, earthquake preparedness, and awareness, highlighting the necessity of a multidisciplinary approach for designing and implementing school-based disaster programs. The findings indicate that education and active community involvement are central to fostering disaster resilience among students and promoting proactive behaviors in response to potential hazards. Additionally, the integration of information on medical and public health considerations, such as injury prevention, infectious disease management, and mental health support, into school preparedness initiatives may enhance the overall effectiveness of these programs. Our findings suggest that continued interdisciplinary research and collaboration are essential to develop comprehensive strategies that strengthen both the safety and health of school communities.

Author contributions

MF contributed to the study's conceptualization, design, data collection, literature review, analysis, and manuscript drafting. MAH assisted in study design, data acquisition, and drafting. OW supported data collection, organization, and preliminary analysis. DIP focused on revising the manuscript, providing critical intellectual input, and editing for clarity and coherence. All authors reviewed and approved the final manuscript and take responsibility for its content.

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Conflicts of interest statement

The authors declare that there are no conflicts of interest related to this research.

Data sharing statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request through direct communication.

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