RESEARCH REPORT

Malaysian Disaster Medicine Research: A Bibliographic Study of Publication Trends

Mohd Syafwan Bin Adnan, MBBS;[1,2,3] Alexander Hart, MD;[1,3,4,5] Attila J. Hertelendy, PhD;[1,6] Derrick Tin, MD;[1,3] Sally-Mae Abelanes, MD;[1,3] Fadi Issa, MD;[1,3] Gregory R. Ciottone, MD[1,3]

1. BIDMC Disaster Medicine Fellowship, Department of Emergency Medicine, Beth Israel Deaconess Medical Center, Boston, Massachusetts USA
2. Kuliyyah of Medicine, International Islamic University Malaysia, Malaysia
3. Harvard Medical School, Boston, Massachusetts USA
4. Department of Emergency Medicine, Hartford Hospital, Hartford, Connecticut USA
5. University of Connecticut School of Medicine, Farmington, Connecticut USA
6. Department of Information Systems and Business Analytics, College of Business, Florida International University, Miami, Florida USA

Correspondence:
Mohd Syafwan Bin Adnan, MBBS, MMed
Disaster Fellow
Department of Emergency Medicine
Beth Israel Deaconess Medical Center
Boston, Massachusetts USA
E-mail: drsyafwan@iium.edu.my

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COVID-19: coronavirus disease 2019
DM: Disaster Medicine
DRR: Disaster Risk Reduction
USD: US dollar

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Abstract

Introduction: Despite the increasing risks and complexity of disasters, education for Malaysian health care providers in this domain is limited. This study aims to assess scholarly publications by Malaysian scholars on Disaster Medicine (DM)-related topics.

Methodology: An electronic search of five selected journals from 1991 through 2021 utilizing multiple keywords relevant to DM was conducted for review and analysis.

Results: A total of 154 articles were included for analysis. The mean number of publications per year from 1991 through 2021 was 5.1 publications. Short reports were the most common research type (53.2%), followed by original research (32.4%) and case reports (12.3%). Mean citations among the included articles were 12.4 citations. Most author collaborations were within the same agency or institution, and there was no correlation between the type of collaboration and the number of citations (P = .942). While a few clusters of scholars could build a strong network across institutions, most research currently conducted in DM was within small, isolated clusters.

Conclusion: Disaster Medicine in Malaysia is a growing medical subspecialty with a significant recent surge in research activity, likely due to the SARS-CoV-2/coronavirus disease 2019 (COVID-19) global pandemic. Since most publications in DM have been on infectious diseases, the need to expand DM-related research on other topics is essential.

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Introduction

The Burden of Disaster in Malaysia

Malaysia is prone to large-scale catastrophic events such as landslides, floods, cyclones, droughts, environmental degradation, and epidemics.[1,2] From 1998 through 2018, Malaysia suffered 51 disasters affecting nearly three million people and causing 281 fatalities, with an economic cost of approximately two billion US dollars (USD).[3]

Malaysia is at high risk for catastrophic floods and has two monsoon seasons: southwest monsoon, which occurs from May through September, and northeast monsoon from October through March, which define the country's drought and rainy seasons. The Department of Irrigation and Drainage (DID; Kuala Lumpur, Malaysia) identified 189 river basins, 85 of which had a high risk of recurrent flooding.[4] Floods are annually estimated to affect approximately 29,8000 square kilometers of Malaysia.[5] In 2014, massive floods ravaged northern and eastern Peninsular Malaysia, causing more than USD$300 million in damage.[4]

Apart from natural disasters, Malaysia is also impacted by man-made disasters, both intentional (terrorist attacks, conflicts, and war) and non-intentional (industrial and transportation accidents). The nation is also struggling with a large influx of refugees, which places a burden on the health care and transportation systems. As of August 2021, the United Nations High Commissioner for Refugees (UNHCR; Geneva, Switzerland) recorded 179,390 refugees and asylum seekers in Malaysia coming from Myanmar, Pakistan, Yemen, Syria, Somalia, Afghanistan, Sri Lanka, Iraq, and Palestine.[6]

Through Directive No. 20 by the National Security Council (NSC; Putrajaya, Malaysia), disasters are managed by the National Disaster Management Agency (NADMA; Putrajaya, Malaysia), which serves as the federal government's disaster management secretariat.[7]

Education in Disaster Medicine

Despite the increasing complexity and frequency of disasters, Malaysian health care providers have limited exposure to Disaster Medicine (DM) education. Algaali, et al identified 37 DM programs available in eleven countries around the world, one-half of them coming from the United States.[8] There are no DM post-graduate training programs currently available in Malaysia. Post-graduate training in Emergency Medicine provides exposure to some basic knowledge of disaster preparedness and response. Additionally, government hospitals provide training in DM and management for health care workers through various Continuous Medical Education (CME) programs and disaster drills.

The United Nations Office for Disaster Risk Reduction (UNDRR; Geneva, Switzerland) highlighted the need for improving disaster management and planning in Malaysia.[3] Research by Dorasamy, et al suggests that Malaysia lacks preparedness in multiple aspects, especially preparation and response.[9] The importance of disaster education should not be limited to selected medical professions, but should be extended to the entire medical community, especially those who work among vulnerable populations. This will ultimately lead to better community disaster resilience by providing health care workers with the knowledge and skills necessary to mitigate future disasters more effectively.[10]

Disaster Medicine Training

To date, there is a paucity of scholarly publications evaluating the effectiveness of DM training in Malaysia. At the time of publication, no higher education institutions in Malaysia offered DM training in any certification or executive program format. The only certified training program in the country is subspecialty training in Prehospital Care and Disaster, run by the Ministry of Health (MoH; Putrajaya, Malaysia), and available only to a small number of physicians. In recent years, through the DM special interest group, Basic Disaster Life Support (BDLS) and Advance Disaster Life Support (ADLS) have been introduced to interested Emergency Medicine physicians as exposure to disaster management. As with any fledgling field, academic research is essential to build maturity, to fill knowledge gaps, to share information, and to build credibility in the medical community. It helps frontline providers to understand the management of disaster events, make evidence-based decisions in survivor care, develop standards, and advocate for disaster-related legislation.[11]

This study aims to map the research published by Malaysian authors in health care-related disaster research and provide insight into Malaysian participation in DM scholarly publications.

Methodology

Study Design

This study is a literature review in the form of bibliographic research. Articles associated with DM topics authored or co-authored by Malaysian scholars, published within the studied period from January 1, 1991 through December 31, 2021, were collected for analysis. The journals involved in this study were:

1. Disasters;
2. Disaster Medicine and Public Health Preparedness;
3. Prehospital and Disaster Medicine;
4. Medical Journal of Malaysia; and
5. Malaysian Journal of Medical Science.

These five journals were selected from a preliminary search of PubMed (National Center for Biotechnology Information,

Disaster	Disaster Management
Flood	Flood*
CBRNE	Chemical
Biologic*	Biological
Radiologic*	Radiological
Terror*	Terrorism
Nuclear	Natural Disaster
Earthquake	Epidemic
Pandemic	Mass Casualty
Mass Casualties	Typhoon
Mudslides	Building Collapse
Outbreak	

Table 1. Search Terms Used for Studied Journals
*A wildcard for the root keywords searched.

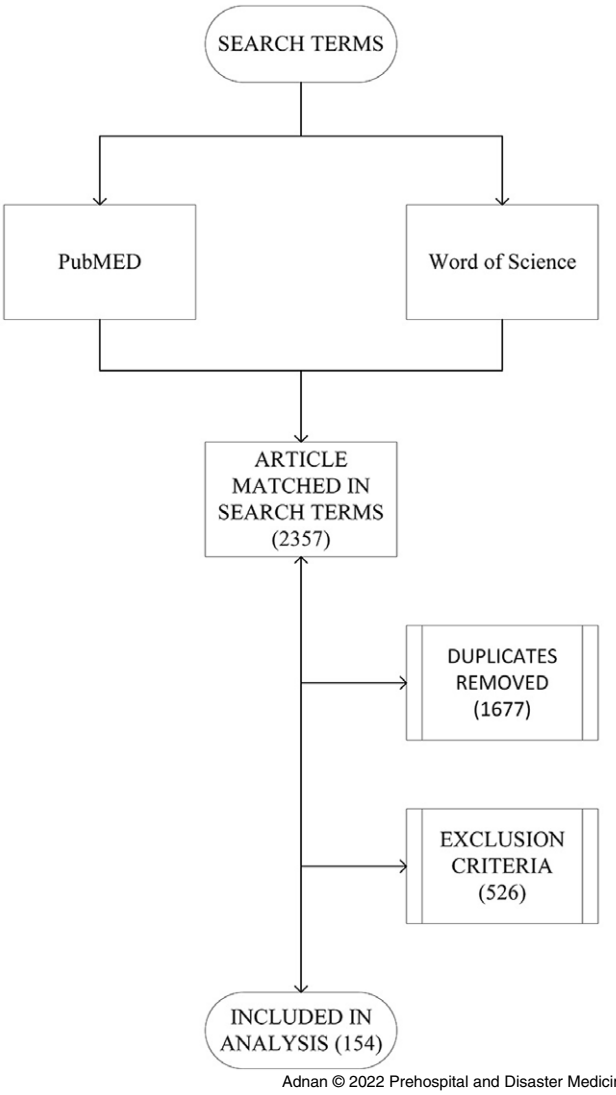

Figure 1. Data Search Flowchart.

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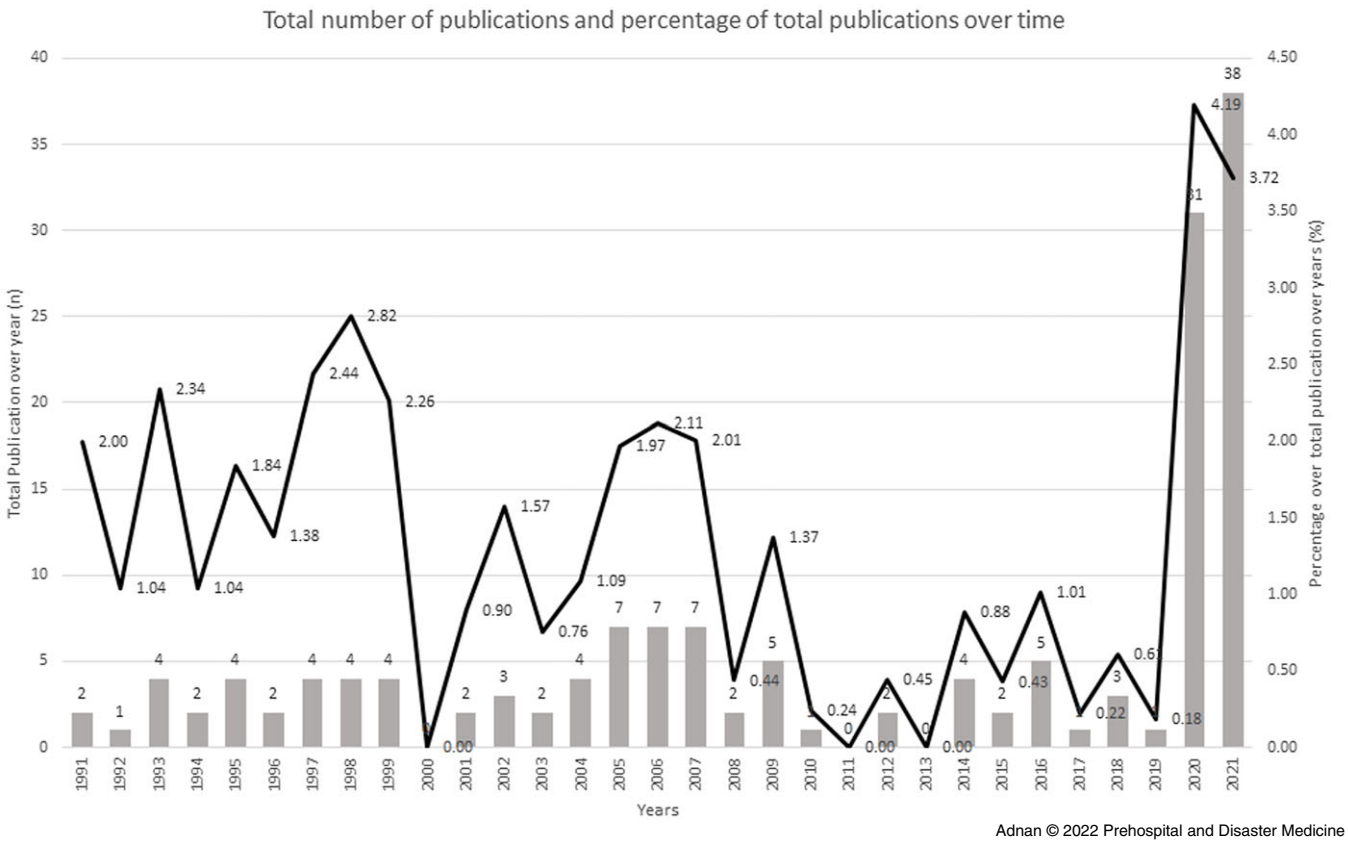

Figure 2. Number of Publications Related to Disaster Medicine per Year in Malaysia.

National Institutes of Health; Bethesda, Maryland USA) and Web of Science (Thomson Reuters; New York, New York USA) for "disaster medicine" AND "Malaysia." The study was then limited to the top three international journals and the top two local journals.

Data Collection

Individual journals were examined using their official journal website or a search engine recommended by the official journal website, such as PubMed or the Web of Science database. All articles published during the study period were screened and reviewed by multiple reviewers before being included in the analysis. The ten search terms that were used in the search are listed in Table 1. These search terms were paired with "Malaysia" [All field] using the "AND" Boolean operator.

Articles that met the criteria were imported into EndNote 20 (Clarivate Analytics Inc.; Philadelphia, Pennsylvania USA), and duplicates were removed. The exclusion criteria were applied, and 154 publications were included in the final analysis (Figure 1).

The exclusion criteria included: research outside of the studied journal; research that does not include any researchers from Malaysian agencies or institutions, or where the author affiliation cannot be confirmed; and research outside the study period (January 1, 1991 - December 31, 2021); as well as studies that are not related to medicine; published in a language other than English; and conference papers, abstracts, or posters.

Researchers were defined based on their affiliation with Malaysian institutions, such as universities, hospitals, or other government agencies. The final list with full-text articles was retrieved and examined for the final analysis.

Statistical Analysis

Data such as research methodology, authorship, author collaborations, and the number of citations were collected as of January 2, 2022. The data were then analyzed using two applications. SPSS version 28.0.1.0[142] (IBM Corp.; Armonk, New York USA) was used to analyze the demographics table, graphs, and charts, requiring simple analytic methods involving counting statistics and percentages.

For the author co-occurrence and keyword density, the data were analyzed using VosViewer version 1.6.17 (Leiden University's Centre for Science and Technology Studies [CWTS]; Leiden, The Netherlands). A distance-based map was generated for each analysis. The number of thresholds for co-authorship and co-occurrence keywords was set to one. Network visualization is generated for author co-authorship and density mapping for keyword co-occurrence.

The research methodologies were coded into categories: original research, short reports (including letters to editors), case studies, methodology, and review articles. Levels of authorship were coded as first author, corresponding author, and co-author. The type of collaboration was coded into individual (single author); within an agency, which categorizes research that was done only within a single agency; within local agencies, which categorizes multi agencies' involvement within Malaysia; and international collaboration.

Results

Figure 2 illustrates the number of DM publications by Malaysian scholars from 1990 through 2021. There were 154 publications associated with DM from the five selected journals. The

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Types of Journal Articles	Total (n)	Percentage (%)
Original Research	53	34.4
Short Reports	82	53.25
Case Studies	19	12.3
Methodology	0	0.0
Review Articles	0	0.0

Table 2. Methodology of Journal Articles Published

Citations	
Mean (SD)	12.41 (19.682)
Median	4.5
Interquartile Range	17
Mode	0
Minimum	0
Maximum	128

Table 3. Citations of Malaysian Disaster Medicine Publications

Collaboration and Citation Crosstabulation			
Collaboration	Total	Mean Citations	Standard Deviation
Individual	40	11.42	16.243
Within Agency	50	13.28	20.242
Local	44	13.09	24.511
International	20	10.70	12.933
Total	154	12.41	19.724

Table 4. Crosstabulation of Collaboration with Citation

Collaboration and Research Methodology Crosstabulation				
Collaboration	*Original Research*	*Short Reports*	*Case Studies*	Total
Individual	4	32	4	40
Within Agency	22	22	6	50
Local	19	16	9	44
International	8	12	0	19
Total	53	81	18	154

Table 5. Crosstabulation of Collaboration with Research Methodology

publications were consistently low until they increased dramatically in 2020 and 2021, owing mainly to the SARS-CoV-2/coronavirus disease 2019 (COVID-19) pandemic in late 2019. The yearly mean number of publications was 5.1, with the highest number of publications in 2021 at 37. The percentage of DM publications by Malaysian authors had gone down steadily over the years, with surges in 1998, 2004, and 2020. Over the previous three decades, there were three years when Malaysian researchers did not produce any work on DM-related themes.

Five types of journal articles were classified in this study: original research, short reports (including letters to editors), review articles, case studies, and methodological studies (Table 2). Most publications in DM by Malaysian scholars were short reports, accounting for more than one-half (53.25%; n = 82) of all publications. This was followed by original research (34.4%; n = 53) and case studies (12.3%; n = 19). This investigation did not find other research designs, such as review articles or methodological studies. Regarding the level of authorship, most of the publications had Malaysian first authors. Only one of the papers had a Malaysian author as the corresponding author but not the first author, two as a co-author, and the remaining studies (151) had a Malaysian author as the first author.

There were 1,911 total citations, for a mean of 12.41, the median was 4.5, and the mode was zero (Table 3). The maximum number of citations for a single journal was 128, and the minimum of citations was zero. The highest citation paper was "Deaths in children during an outbreak of hand, foot, and mouth disease in Peninsular Malaysia-clinical and pathological characteristics" by Shekhar, et al.[12] Forty-two (27.3%) publications received no citations at all. Cross-tabulation between mean citation and the collaboration type (Table 4) showed no statistically significant difference in mean citations: $F(3,150) = 0.131$; $P = .942$.

The majority of collaborations were within the same agency, and the results showed that both original research and case reports were the highest types of publications. The most common type of publication within the same agency was original research. Short reports were the most common study type for individuals, within an agency, and in international collaborations (Table 5).

Figure 3 illustrates the visualization analysis of co-authorship networks. A few clusters were shown to have formed a network among themselves, while the majority were isolated. The greater the diameter of the circle, the more significant the author's contribution to that topic in the cluster. Additionally, the closer the clusters are together, the more related the work of the two authors or clusters is.

In Figure 4, the keywords with the highest density were "human" and "Malaysia." Multiple high-density keywords in this study indicated topics relating to infectious diseases such as disease outbreak, melioidosis, pandemic, beta coronavirus, influenza, viral analysis, and COVID-19. Few keywords not related to infectious diseases were prominent.

Discussion

Disaster Medicine is a relatively nascent specialty of medicine, causing research in this field to be limited compared to other fields.[13] Additionally, best practices in disaster training programs are not yet well-defined.[14] However, education can be used to create a sustainable disaster management system that includes a variety of people and enhances disaster response in a nation.[15]

There are 67 universities in Malaysia, including both public and private; only a few offer DM training for undergraduates, and none offer any certification.[16,17] As a result, research in this field is limited, as evidenced by the 154 journals linked to DM that were discovered after a 30-year search of five journal databases (from 1991 through 2021). Chih-Hao Lin has published similar findings in regard to Taiwanese researchers.[18] It is also worth noting that DM research from Malaysian authors has been consistently modest, ranging from two to seven publications per year from 1991 through 2019, with a dramatic rise in 2020 and

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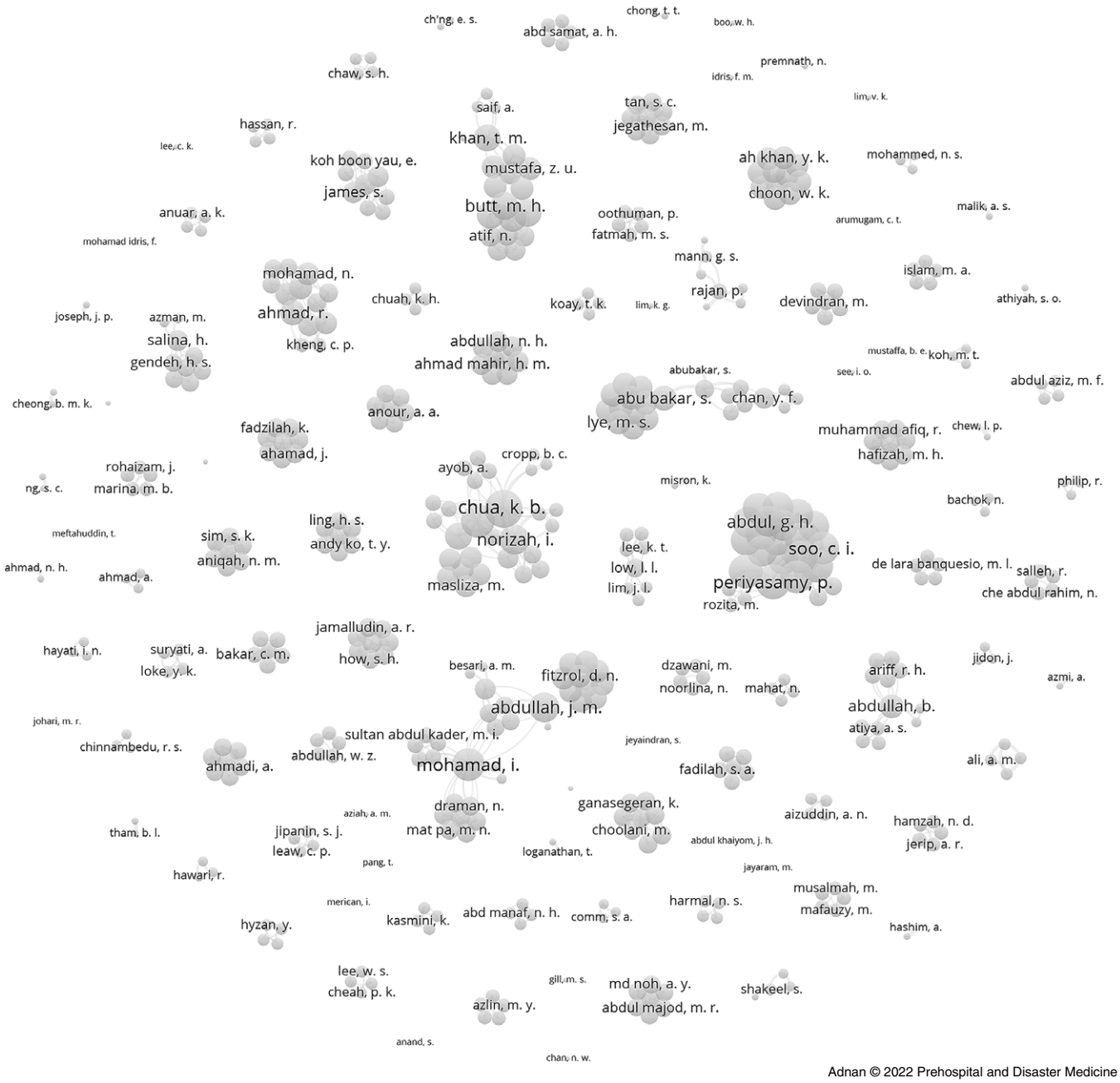

Figure 3. A Co-Authorship Network Visualization.

2021, owing primarily to publications on the response to the COVID-19 pandemic. Over the study period, the percentage of DM research which was published by Malaysian authors dropped. There were three research peaks in 1998, 2004, and 2020, most likely in response to disasters that affected Malaysia, such as the Japanese Encephalitis (JE) outbreak in 1998, the Indian Ocean tsunami in 2004, and the COVID-19 pandemic in 2020.

Education in Disaster Risk Reduction (DRR) has been initiated in Malaysia through multiple efforts by the government, especially for primary and secondary school students. The Safe School Program, ASEAN Safe School Initiative (ASSI), School Preparedness Program, and several others are designed to create resilience in the community. However, the continuation of DRR programs through higher education and the sustainability of these programs have been limited to date.[19]

Disaster research is difficult due to the unpredictable nature of the events studied. As a result, producing high-quality research, such as prospective, double-blinded controlled studies, is routinely challenging.[20,21] Patient safety, subject accessibility, data protection, informed consent, and ethics approval create a moral dilemma in conducting prospective research in a disaster event.[22] This study shows that more than one-half of the studies authored by Malaysian scholars are short reports. It may be explained not only by the moral challenges to conducting such research, but as well as the lack of resources, trained faculty, and research support staff to conduct original empirical research.[23] Attempts to develop a DM

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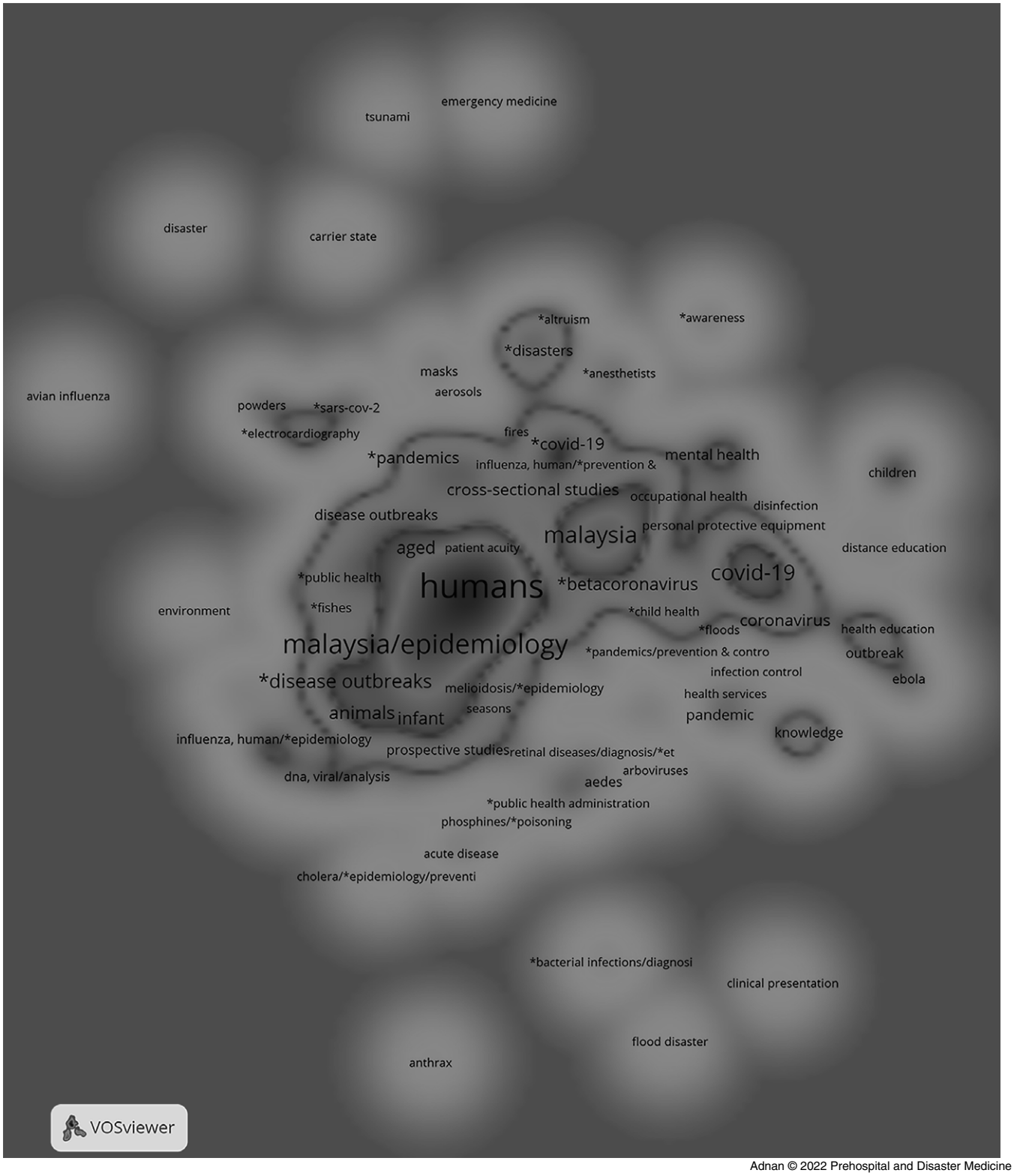

Figure 4. Keyword Density Analysis.
Note: Supplemented material available online.
*As the weight of a keyword increases, its color moves through a progression from blue-green-yellow-orange-red.

research template where the researcher gathers the research design and approval while waiting for the event to occur may be the solution for DM research.[20,24,25] From this study, it is worth emphasizing that Malaysian scholars have positioned themselves well, as the mass of the research within this study is led by Malaysian researchers.

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With the few research articles published, the number of citations shows a relatively small impact on DM-related topics. As well, with the median of 4.5 and mode of zero, it shows that most of the research has not been cited. The skew of the citations is 2.763, indicating a right-skewed distribution, while the kurtosis analysis reveals a value of 9.895, indicating the distribution is more heavily-tailed than a normal distribution. This shows that a few publications have made a large impact, while most of the studies remain uncited. It was found that the type of collaboration did not affect the mean number of citations ($P = .942$), indicating that the impact of DM research in Malaysia is unaffected by collaborative forms.

The network of co-authorship between the researched journals is depicted in Figure 2. The network shows multiple significant clusters that involved multiple researchers. This study shows the need for greater collaborative studies on DM-related subjects in which cross-institution collaboration is lacking and can be a crucial step to building a more robust DM response network. It is also essential to improve collaboration among DM researchers in Malaysia, not only among health care-related topics, but as well as other DRR efforts, in order to close the gap in disaster-related fields.

Due to the fact that Malaysia is relatively protected from many natural disasters, infectious diseases are the most common outbreaks and large-scale health-related issues, as shown in Figure 3. Additionally, this study demonstrates the critical importance of focusing on additional disaster-related problems in the future, such as floods, tsunamis, public health, and humanitarian relief, which are now lacking and contribute to a vulnerable area in Malaysia's DM.

Limitations

Due to the specifically selected journals in this study, future research may require exploring the effects of international and local journals on the number of citations, which has not been done here. This study aimed to focus on the journals which had published a substantial portion of the DM research performed by Malaysian authors and which are more frequently read by Malaysian DM practitioners. To this aim, a focused review of journals was felt to be more useful than a full systematic review. However, this may leave out some publications by Malaysian researchers in other journals.

Conclusions

While Malaysia is a nation used to responding to disasters, it is still under-represented in disaster publications. Increasing publication both in depth and breadth can lead to a better level of evidence and hopefully improve the effectiveness of the Malaysian disaster response. Investment in these efforts through grants and nation-wide educational programs is vital to move toward the ultimate goal of improving disaster resiliency in Malaysia.

Supplementary Materials

To view supplementary material for this article, please visit https://doi.org/10.1017/S1049023X22002187

References

1. Sarkar S, Begum RA, Pereira JJ, et al. Addressing disaster risk reduction in Malaysia: mechanisms and responds. Paper presented at: 2nd International Conference on Environment, Agriculture and Food Sciences; October 2015: Jatinangor, Sumedang, West Java, Indonesia.
2. Mohamed Shaluf I, Ahmadun FIR. Disaster types in Malaysia: an overview. *Disaster Prevention and Management.* 2006;15(2):286–298.
3. United Nations Office for Disaster Risk Reduction (UNDRR), Regional Office for Asia and the Pacific. Disaster Risk Reduction in Malaysia: Status Report 2020. https://www.undrr.org/publication/disaster-risk-reduction-malaysia-status-report-2020. Accessed February 1, 2022.
4. Taib ZM, Jaharuddin NS, Mansor Z. A review of flood disaster and disaster management in Malaysia. *International Journal of Accounting and Business Management.* 2016;4(2):97–105.
5. Chan NW. Impacts of disasters and disaster risk management in Malaysia: the case of floods. In: Aldrich DP, Sawada Y, (eds). *Resilience and Recovery in Asian Disasters*. New York USA: Springer; 2015: p239–265.
6. Figures at a Glance in Malaysia. UNCHR.https://www.unhcr.org/en-my/figures-at-a-glance-in-malaysia.html. Accessed February 12, 2022.
7. Shafiai S, Khalid MS. Flood disaster management in Malaysia: a review of issues of flood disaster relief during and post-disaster. Paper presented at: International Conference on Soft Science; April 11-13, 2016. Kedah, Malaysia.
8. Algaali KYA, Djalali A, Della Corte F, et al. Postgraduate education in disaster health and medicine. *Front Public Health.* 2015;3:185.
9. Dorasamy M, Raman M, Muthaiyah S, Kaliannan M. Disaster preparedness in Malaysia: an exploratory study. Paper presented at: Proceedings of 4th WSEAS Marketing and Management Conference; March 2010. Penang, Malaysia.
10. TEDex. How disaster resilience saves lives. Tin D. https://www.ted.com/talks/derrick_tin_how_disaster_resilience_saves_lives?language=en. Accessed January 15, 2022.
11. Ahayalimudin N, Osman NN. Disaster management: emergency nursing and medical personnel's knowledge, attitude and practices of the East Coast region hospitals of Malaysia. *Australas Emerg Nurs J.* 2016;19(4):203–209.
12. Shekhar K, Lye M, Norlijah O, et al. Deaths in children during an outbreak of hand, foot and mouth disease in Peninsular Malaysia–clinical and pathological characteristics. *Medical Journal of Malaysia.* 2005;60(3):297–304.
13. Ciottone GR. Introduction to disaster medicine. In: Ciottone GR, Fares S, (eds). *Ciottone's Disaster Medicine*. Amsterdam, The Netherlands: Elsevier; 2016: p2–5.
14. Williams J, Nocera M, Casteel C. The effectiveness of disaster training for health care workers: a systematic review. *Ann Emerg Med.* 2008;52(3):211–222.
15. Abas MA, Ibrahim NE, Wee ST, et al. Disaster resilience education (DRE) programs in schools: a case study in Kelantan, Malaysia. Paper presented at: IOP Conference Series: Earth and Environmental Science. Bristol, England.
16. Institut Pengajian Tinggi (IPT). JPT. https://jpt.mohe.gov.my/portal/index.php/ms/ipt. Accessed September 2, 2022.
17. Saiboon IM, Zahari F, Isa HM, et al. E-learning in teaching emergency disaster response among undergraduate medical students in Malaysia. *Front Public Health.* 2021;9:628178.
18. Lin CH. Disaster medicine in Taiwan. *J Acute Med.* 2019;9(3):83.
19. How V, Azmi ES, Rahman HA, et al. The way forward: opportunities and challenges of sustainable school disaster education in Malaysia. *International Journal of Academic Research in Business and Social Sciences.* 2020;10(15):315–324.
20. Yeskey K, Miller A. Science unpreparedness. *Disaster Med Public Health Prep.* 2015;9(4):444–445.
21. Miller A, Yeskey K, Garantziotis S, et al. Integrating health research into disaster response: the new NIH disaster research response program. *Int J Environ Res Public Health.* 2016;13(7):676.
22. Kelman I, Harris M. Linking disaster risk reduction and healthcare in locations with limited accessibility: challenges and opportunities of participatory research. *Int J Environ Res Public Health.* 2021;18(1):248.
23. Ghasemy M, Hussin S, Megat Daud MAK, et al. Issues in Malaysian higher education: a quantitative representation of the top five priorities, values, challenges, and solutions from the viewpoints of academic leaders. *SAGEOpen.* 2018;8(1):2158244018755839.
24. Benight CC, McFarlane AC. Challenges for disaster research: recommendations for planning and implementing disaster mental health studies. *Journal of Loss and Trauma.* 2007;12(5):419–434.
25. Debacker M, Hubloue I, Dhondt E, et al. Utstein-style template for uniform data reporting of acute medical response in disasters. *PLoS Curr.* 2012;4.