

The Role and Obstacles of Medical Personnel in the Mitigation Phase of Natural Disasters in Developing Countries: A Systematic Literature Review

Halim Rahmat Zhafran¹

¹Disaster Management, Indonesia Defense University, Bogor, Indonesia

Rachmat Setiawibawa²

²Disaster Management, Indonesia Defense University, Bogor, Indonesia

Anwar Kurniadi³

³Disaster Management, Indonesia Defense University, Bogor, Indonesia

Corresponding Author: halimrzhafran@gmail.com

Abstract

The escalation of global natural disaster threats demands resilience in health systems, particularly in developing countries (Low- and Middle-Income Countries/LMICs) that have high structural vulnerability. This study aims to systematically synthesize the latest literature on the ideal role and actual obstacles faced by medical personnel during the natural disaster mitigation phase in developing countries. This Systematic Literature Review (SLR) was conducted by adopting the PRISMA protocol. A comprehensive search was conducted through the Dimensions bibliographic database for publications published between 2023 and 2026. From a total of 194 documents identified through specific queries, a rigorous screening and eligibility evaluation process resulted in 20 key articles to be extracted and analyzed thematically. The literature synthesis identified a crucial transformation in the role of medical personnel from a curative response approach to proactive pre-disaster mitigation agents. However, the implementation of this ideal role is significantly reduced by three main types of obstacles: (1) structural obstacles in the form of the absence of a Disaster Master Plan and operational logistical limitations; (2) managerial barriers due to disorganized crisis leadership; and (3) psychological barriers, where the lack of protection guarantees reduces the willingness to respond of health workers. There is a sharp gap between mitigation expectations and actual capacity in the field. To bridge this gap, cost-effective innovative interventions are needed, such as the adoption of mobile health (mHealth)



technology and the formulation of evidence-based regulations. Strengthening the national medical defense architecture in developing countries absolutely requires the institutionalization of a sustainable disaster curriculum and the holistic integration of disciplines.

Keywords: *Disaster Mitigation, Medical Personnel, Developing Countries, Health System Resilience, Systematic Literature Review.*

INTRODUCTION

The escalation of the global climate crisis has triggered a massive increase in the frequency and intensity of natural disasters over the past decade. Extreme weather phenomena, anomalous weather shifts, and environmental degradation are no longer hypothetical threats, but destructive realities that disrupt social and economic order on a broad scale (Hay & Mimura, 2010). In this landscape of threats, developing countries or Low- and Middle-Income Countries (LMICs) bear a disproportionately heavy burden of impact. Compared to developed countries, developing countries have a much higher level of multidimensional vulnerability due to limited physical infrastructure, narrow fiscal space, and inadequate adaptive capacity (Brooks et al., 2005). This situation means that every natural disaster in developing countries not only causes direct loss of life, but also creates a domino effect that destroys livelihoods, paralyzes essential public services, and deepens inequality in the affected communities.

In facing the escalation of asymmetric disaster threats, a country's resilience greatly depends on the capacity of its health system. Medical facilities and health workers serve as the main backbone that determines the line between survival and collapse of the population when a crisis occurs (Goniewicz et al., 2023). Therefore, medical personnel—including doctors, nurses, and public health workers—should no longer be reduced to merely reactive elements that only spring into action after a disaster has occurred. Instead, they are essential subjects and the first line of defense that directly guarantees human security and minimizes mass morbidity and mortality rates. The existence of resilient, adaptive, and coordinated health human resources is an absolute prerequisite for critical care systems to avoid total paralysis when faced with an extreme surge in patients due to natural disasters (Petanidis et al., 2025).

Historically, the global disaster management paradigm, particularly in the health sector, has often been trapped in a reactive approach that focuses on allocating resources to the post-event emergency response phase. However, relying solely on curative interventions has proven inadequate, triggering operational inefficiencies and quickly depleting the often limited logistical



and financial capacities of countries (Yadav, 2015). Therefore, there is an urgent need to shift the epicenter of health crisis management strategies to the pre-disaster phase, particularly in strengthening integrated mitigation and preparedness. Medical interventions in the mitigation phase are not merely administrative preventive measures, but strategic investments that have been empirically proven to be highly cost-effective. Systemic preparedness built before a shock occurs is a crucial structural foundation for mitigating sudden spikes in morbidity, preventing the dysfunction of primary service facilities, and minimizing the severity of the crisis's impact holistically (Hertelendy et al., 2025).

Within this proactive mitigation framework, expectations regarding the competence and role of medical personnel go beyond the boundaries of conventional clinical services in emergency rooms. In the pre-disaster phase, healthcare professionals are ideally required to transform into active disaster risk reduction agents at the forefront of vulnerability mapping. This crucial role includes initiating community-based health risk education, formulating a precise Disaster Medical Contingency Plan, and conducting regular mass incident triage simulations (Torres-Agüero et al., 2025). Furthermore, medical personnel are expected to be able to lead pre-disaster epidemiological surveillance to mitigate the potential for secondary outbreaks after a disaster, as well as build a solid cross-sector communication architecture with security authorities and civil society. Optimizing these mitigative roles is the main catalyst that ensures the transition of the health system from normal conditions (business-as-usual) to a high-escalation emergency response can run synchronously and without significant operational obstacles.

However, theoretical expectations regarding this ideal role often clash diametrically with empirical reality in developing countries. Instead of acting as proactive mitigation agents, medical personnel in Low- and Middle-Income Countries (LMICs) are often trapped in systems that inherently limit their scope of action in the pre-disaster phase (Bhattarai et al., 2023). The obstacles faced are multidimensional, ranging from structural deficits such as the lack of a specific budget allocation for simulation training to the limited availability of disaster logistics equipment in primary health facilities (Bhattarai et al., 2023). Managerially, many health institutions in LMICs have not comprehensively integrated disaster emergency curricula into continuing medical education, resulting in health workers with low levels of mitigation literacy. Furthermore, extremely high daily clinical workloads (overcrowding) and a lack of institutional incentives create psychological barriers, where the mitigation phase is often seen as an additional administrative burden rather than a strategic priority (Petanidis et al., 2025).

Although discourse on disaster management in the health sector has seen an escalation in



global publications, a critical review of the existing literature reveals a significant epistemological gap. The majority of previous studies tend to focus their analysis on curative medical interventions in the emergency response or recovery phases, with a research locus that is heavily biased towards high-income countries that already have mature infrastructure (Hung et al., 2021). In contrast, literature that specifically examines the intersection between the role of medical personnel and the structural barriers they face exclusively in the “mitigation phase” in developing countries is still highly fragmented (Santi, 2025). Existing studies generally stand alone as small-scale local case studies and have not been synthesized holistically. The absence of a comprehensive literature map has resulted in stagnation in the formulation of adaptive and evidence-based policies to strengthen pre-disaster health resilience in LMICs.

Based on this literature gap, this study aims to systematically identify, evaluate, and synthesize the latest literature on the ideal role and actual obstacles experienced by medical personnel during the natural disaster mitigation phase in developing countries. The urgency of this Systematic Literature Review (SLR) lies in its ability to consolidate fragmented findings into a cohesive framework of understanding. The findings of this study are expected to make a dual contribution: theoretically, enriching the global health crisis management literature with a perspective specific to LMICs; and practically, providing an analytical foundation for policymakers, non-military defense authorities, and hospital management to design targeted interventions, curricula, and resource allocations to bridge the gap between the actual capacity and mitigation expectations of medical personnel.

METHODOLOGY

This study uses the Systematic Literature Review (SLR) method by adopting the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol to ensure that the literature selection process is transparent, structured, and replicable. The initial stage of the study, namely Identification, focused on searching for literature through the Dimensions digital bibliographic database with a publication range between 2023 and 2026. Using a combination of specific keywords: “medical personnel” AND ‘role’ AND “disaster mitigation” AND “developing countries”, the initial data extraction process collected 194 documents. Through initial validation of the list, 165 articles were deemed relevant for further review, while 29 other documents were excluded (Excluded Articles) because they were identified as duplicates or did not meet scientific publication format standards.

Entering the Screening stage, the 165 articles were further evaluated through the selection



of research publications focusing on the relevance of the title and abstract. At this stage, strict criteria filters were applied to separate general studies from literature that specifically examined the dynamics of pre-disaster medical personnel in developing countries. This screening process resulted in the exclusion of 145 documents (Excluded Documents) because they were deemed to be outside the scope of the mitigation phase, lacked relevant technical substance, or focused on high-income countries.

In the final stage, namely Eligibility, 20 documents were designated as Eligible Documents and underwent a full-text review process. After being evaluated based on methodological quality and significance of findings, these 20 pieces of literature were definitively selected as Selected Articles for Analysis. Data from this selected collection of articles was then extracted in depth to synthesize empirical formulations regarding the capacity, proactive role, and systemic challenges faced by medical personnel in supporting disaster management resilience in developing countries, as illustrated in the overall workflow in Figure 1.

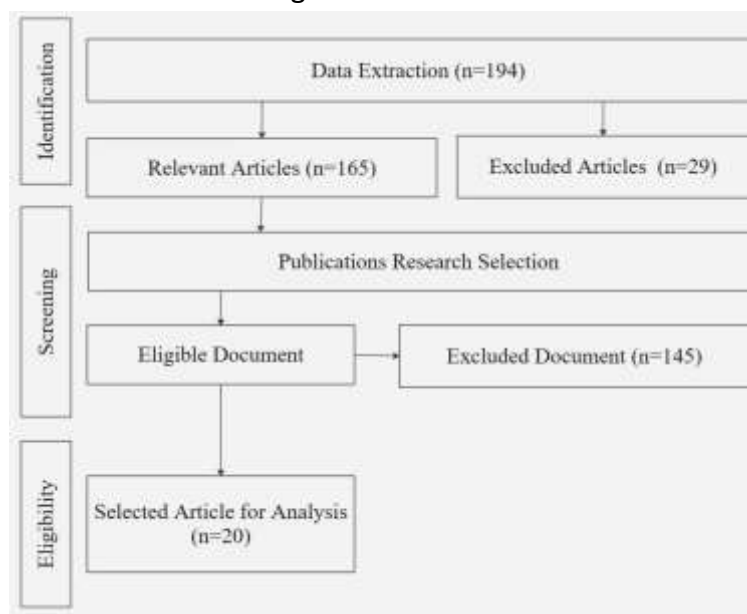


Figure 1. PRISMA Diagram Workflow

RESULT AND DISCUSSION

The Transformation of the Role of Medical Personnel: From Curative Intervention to Proactive Mitigation

A literature review shows a fundamental paradigm shift in the role of health workers in

the disaster management cycle, from an approach that focuses exclusively on reactive post-event responses to proactive pre-disaster mitigation strategies. This transformation of roles requires medical personnel to master various basic disaster management competencies that go beyond conventional clinical service standards, including expertise in mass incident triage, one-command communication, and ethical sensitivity in decision-making under crisis pressure (Bhattarai et al., 2023; Songwathana & Timalisina, 2021). At the primary healthcare level, mastery of these mitigation competencies has proven to have significant systemic implications. The level of self-efficacy and operational preparedness of medical personnel has a positive and direct correlation with the level of resilience of health facilities—such as Community Health Centers—especially when operating in areas with high geographical vulnerability (Morris et al., 2025)

Furthermore, the literature emphasizes that the holistic preparedness of medical personnel, which is an amalgamation of mental adaptability and technical expertise in disaster management, is an essential foundation for preventing total paralysis of the health system in developing countries. This adaptive capacity is considered increasingly crucial given the escalation of global climate threats and extreme weather anomalies that have drastically increased the frequency of natural disasters asymmetrically in these regions (Su et al., 2022). Various empirical assessments also consistently confirm that the level of pre-disaster mitigation literacy knowledge strongly dictates the attitudes, motivation, and operational preparedness of the entire spectrum of health professionals, from specialists and nurses to pre-hospital paramedics (Motsepe & Schmollgruber, 2025). Thus, the internalization of the pre-disaster mitigation role not only strengthens the capacity of individual medical personnel but also acts as a strategic instrument to ensure the continuity of the medical chain of command when large-scale disasters occur.

Systemic and Structural Barriers in Developing Countries (LMICs)

Despite the urgency of transforming the role of medical personnel towards mitigation, practical implementation in the field is often hampered by chronic structural deficits in low- and middle-income countries. One of the main obstacles consistently identified in the literature is the absence of a comprehensive Disaster Plan and acute disorganization in the pre-hospital emergency response system (Farokhzadian et al., 2024). The absence of standardized operational guidelines causes medical personnel to work in administrative uncertainty, which ultimately paralyzes the effectiveness of coordination in the pre-disaster phase. This condition is exacerbated by fundamental limitations in logistical infrastructure, such as the lack of availability of special disaster Personal Protective Equipment (PPE) and the instability of essential drug supplies



(Motsepe & Schmollgruber, 2025). This logistical deficit not only threatens the safety of health workers, but also triggers systemic vulnerability in ensuring the continuity of care for patients with chronic conditions who require continuous treatment in the midst of a crisis (Djalali et al., 2011).

Furthermore, empirical evidence from various case studies in disaster epicenters confirms that these structural barriers create massive operational disorganization. Weak institutional support from central health authorities often results in local health facilities losing direction in prioritizing resource allocation for mitigation (Mwangi et al., 2025; Zarei et al., 2024). In many cases, medical personnel are forced to improvise amid limited resources, which significantly increases the risk of medical errors and reduces the quality of emergency services. This systemic failure reflects a wide gap between macro-level policies and micro-level execution capacity, where medical personnel are often the most affected by the unpreparedness of the national health defense infrastructure (Ghazanchaei et al., 2023).

Psychological Barriers and Managerial Capacity

Based on a synthesis of selected literature, managerial barriers have been identified as critical obstacles that undermine the effectiveness of the mitigation phase in developing countries. Weaknesses in clear leadership and poor coordination between medical teams often lead to significant disorganization in disaster response (Farokhzadian et al., 2024). This is exacerbated by weak institutional support and a lack of disaster training simulations, which ultimately reduce the level of preparedness and resilience of emergency medical personnel (Sultan et al., 2020). These systemic obstacles are also evident in the absence of a Disaster Plan and chaos in the implementation of pre-hospital triage, as found in earthquake case studies (Ghazanchaei et al., 2023). The firsthand experience of medical personnel at the epicenter of the disaster confirms that without organized management and chain of command, field operations become chaotic and burdensome for personnel (Tolentino, 2025).

Simultaneously, these managerial failures transform into psychological burdens that hinder the active participation of medical personnel in preparedness efforts. Health workers' perceptions of personal safety risks, lack of personal protective equipment (PPE), and concerns about family safety drastically reduce their motivation and willingness to work during a crisis (Sultan et al., 2020). In addition, specific operational challenges—such as a shortage of experts and drug supplies when treating patients with chronic diseases in disaster zones—add to the moral burden and emotional exhaustion of health workers (Tolentino, 2025). Without strengthening leadership capacity and interventions to protect the psychological well-being of



personnel, the mitigation phase in the health system in developing countries will continue to stagnate.

Strategic Innovation and Implications for Medical Defense Policy

The complexity of operational and psychological barriers in developing countries has led the literature to offer a variety of innovative approaches that are adaptive to resource constraints. One of the most prominent strategies is the use of mobile health (mHealth) interventions. This digital approach has proven to be a comprehensive and cost-effective method for training medical staff in Low- and Middle-Income Countries (LMICs), which has been empirically shown to improve mitigation literacy while building the willingness of health workers to respond to public health emergencies (Vranada et al., 2024). In addition to technology adoption, human resource capacity development strategies for health in LMICs require comprehensive competency standardization. Collaborative approaches such as Delphi consensus studies are highly recommended for formulating adaptive workforce development strategies, while bridging the systemic approach gap between high-income and developing countries (Dg Sirata et al., 2025).

At the macro level, these innovative findings have crucial policy implications for the national medical defense architecture. Health authorities and policymakers are required to immediately formulate health workforce development regulations based on evidence-based recommendations, in order to ensure the integration of disaster risk management curricula into continuing medical education as a priority (Santi, 2025). Furthermore, pre-disaster resilience policies must begin to expand the definition and scope of “emergency medical personnel” by incorporating disciplines that have historically been overlooked. For example, the active involvement of medical rehabilitation personnel from the mitigation planning phase is considered essential to provide a new perspective in ensuring the sustainability of functional recovery of patients after disasters in countries with high vulnerability levels (Wijaya et al., 2022). Through the integration of smart technology, consensus-based competency standardization, and multidisciplinary expansion, health systems in developing countries can transform into more resilient entities in the face of future crises.

CONCLUSION

This Systematic Literature Review (SLR) emphasizes the urgency of shifting the disaster management paradigm in the health sector of developing countries, from a reactive-curative approach to a proactive-mitigative preparedness strategy. Ideally, medical personnel are required



to transform into key agents of mitigation, equipped with specific disaster management competencies, high self-efficacy, and crisis management skills. This holistic preparedness has been empirically proven to be the main foundation that determines the level of resilience of primary health care facilities in facing escalating climate crises and natural disaster threats.

However, expectations for this proactive role clash diametrically with the complexity of systemic barriers in Low- and Middle-Income Countries (LMICs). This study identifies that the effectiveness of the mitigation phase is greatly reduced by structural and managerial deficits, which manifest in the absence of a Disaster Plan, a lack of logistical infrastructure such as Personal Protective Equipment (PPE), and weak cross-sector leadership coordination. This systemic governance failure directly triggers a massive psychological burden on medical personnel. Concerns about personal and family safety amid the absence of institutional protection guarantees are dominant factors that reduce the motivation and willingness to respond of health workers in crisis zones.

To bridge the gap between mitigation expectations and actual capacity, innovative and adaptive strategic interventions are needed to address resource constraints. The use of digital interventions such as mobile health (mHealth) offers a cost-effective solution to accelerate pre-disaster disaster literacy. Furthermore, strengthening the national medical defense architecture absolutely requires evidence-based policy that mandates the integration of disaster risk management curriculum in continuing medical education, as well as expanding multidisciplinary involvement—including medical rehabilitation personnel—from the planning phase to ensure a resilient and holistic health system.

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