

Short Report

Emergency Response and Recovery Management in the 2023 Turkey Earthquake: Lessons Learned from AFAD's Systematic Approach and International EMT Coordination

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ABSTRACT

Background: The February 6, 2023, earthquake in Turkey (7.8 Mw) created unprecedented challenges for emergency response systems. **Objective:** This study examines Turkey's Disaster and Emergency Management Authority (AFAD) systematic approach and coordination with international emergency medical teams (EMTs), with a particular focus on the contributions of the Indonesian Aceh EMT. **Methods:** This intrinsic descriptive case study employed qualitative methodologies, including in-depth interviews with 20 participants involved in humanitarian response. Document analyses of AFAD, WHO, and UN OCHA reports complemented primary data collection. Purposive sampling ensured that the participants had relevant disaster response experience. The data were subjected to thematic analysis via NVivo software to identify recurring patterns. **Results:** AFAD demonstrated preparedness through comprehensive disaster response frameworks, mobilizing over 300,000 volunteers despite initial delays in some cases. GIS mapping technology facilitated the real-time identification of affected regions, reducing response times by 25%. The Indonesian Aceh EMTs arrived on day nine and provided medical services to more than 5,000 individuals within their first operational week. More than 100,000 displaced individuals received immediate aid within 48 h of the earthquake through the AFAD's prepositioning of medical supplies. Response effectiveness is influenced by several factors, including technological integration, volunteer mobilization, and international coordination. **Conclusion:** The 2023 Turkey earthquake underscores the importance of systematic preparedness and international collaboration in disaster management in Turkey. Recommendations include improving logistical systems for rapid deployment, increasing the utilization of advanced technologies, enhancing multilingual training, and continuously evaluating disaster management frameworks.

KEYWORDS

Disaster response, disaster management, health services administration, Turkey, emergency preparedness, global health

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INTRODUCTION

Turkey's geological positioning at the confluence of three major tectonic plates, Anatolian, Arabian, and Eurasian, establishes it as a prime epicenter for catastrophic seismic events with profound socioeconomic implications, requiring sophisticated disaster management infrastructures that extend beyond conventional response mechanisms. The February 6, 2023, earthquake (7.8 Mw) that struck Gaziantep Province represents one of these catastrophic events, affecting extensive regions across Turkey and Syria, with thousands of casualties, widespread destruction, and an acute humanitarian crisis that demanded robust emergency response mechanisms [1].

Despite Turkey's established disaster management framework, the earthquake's magnitude and complexity exposed significant challenges in terms of emergency coordination, resource allocation, and cross-border collaboration, which required immediate attention. Turkey's Disaster and Emergency Management Authority (AFAD) assumed primary responsibility for coordinating rescue and relief operations, whereas international emergency medical teams (EMTs), including those from Indonesia's Aceh Province, provided essential supplementary support [2–4]. However, the response effort faced notable obstacles, including logistical constraints, delayed aid distribution, and inadequacies in early warning systems, which led to the question of the overall effectiveness of the disaster management strategy.

The literature on disaster management frameworks emphasizes the critical components of preparedness, response, recovery, and mitigation as interdependent phases requiring systematic integration and implementation. Previous studies by Puri [5] identified coordination gaps and delays in international aid as recurring challenges in large-scale disaster responses. Although research exists on Turkey's general disaster preparedness infrastructure, there remains a significant research gap regarding the specific operational effectiveness, challenges, and successes of the 2023 earthquake response, particularly concerning the integration of international EMTs within the national response framework [6–8]. This investigation addresses a critical knowledge gap in transnational disaster management by providing empirical documentation of the operational synergies between established national frameworks and international humanitarian assistance protocols within the context of a multiepicenter seismic event that transcended geopolitical boundaries and tested existing response paradigms on unprecedented scales.

This study addresses this knowledge deficit by evaluating AFAD's systematic approach to disaster management, assessing the contributions of international EMTs (with a specific focus on Indonesian Aceh EMTs), and identifying critical lessons for enhancing future disaster preparedness. This study examines three fundamental questions: How effective was the disaster management strategy of AFAD in addressing the immediate impact of an earthquake? What specific role did international EMTs, particularly those from Indonesia, play in supplementing national response efforts? What strategic improvements can enhance future earthquake preparedness on the basis of the lessons learned from this event?

The findings of this study have significant implications for disaster management policy and practice, providing evidence-based recommendations for strengthening emergency response capabilities in earthquake-prone regions worldwide. By analyzing both successful interventions and operational challenges, this study contributes essential knowledge for developing more resilient, coordinated, and effective disaster management systems that can minimize casualties and expedite recovery in future seismic events [5, 8]. The lessons derived from this analysis extend beyond Turkey's specific context, offering valuable insights for improving international collaboration protocols, technological integration in disaster response, and community engagement strategies in global disaster management.

MATERIALS AND METHODS

Study design and setting

This study employed an intrinsic descriptive case study methodology, allowing for an in-depth exploration of complex disaster response dynamics within their real-world context. Data collection integrated qualitative methods, including in-depth interviews, systematic document

analysis, and thematic interpretation [9]. The research setting included both field-based investigations in earthquake-affected regions and remote data collection procedures, with fieldwork conducted between March and April 2023 in Gaziantep and Kahramanmaraş Provinces.

Participants and sampling

The study population comprised key stakeholders directly involved in the 2023 Turkey Earthquake humanitarian response operations. The participants included members of the Indonesian Aceh Emergency Medical Team (EMT), representatives from international organizations such as the WHO and UN OCHA, and officials from Turkey's Disaster and Emergency Management Authority (AFAD). A purposive sampling approach ensured participant selection on the basis of substantial disaster response experience, with eligibility determined through preliminary screening. The final sample included 20 individuals with specialized knowledge in field triage, emergency coordination, logistics management, and cross-border humanitarian operations.

Data collection

Semistructured interviews served as the primary data collection method, with each session lasting approximately 45 min. The interview protocol contained 12 core questions addressing disaster preparedness, response implementation, cross-agency coordination, technological integration, and perceived effectiveness, with additional probe questions tailored to each participant's specific role and expertise. The interviews were conducted both in person and virtually, on the basis of participant location and preference, with all the sessions audio-recorded following informed consent procedures. To enhance data reliability, the interview transcripts underwent peer review and member checking, with participants validating the accuracy and intended meaning. Field observations at three temporary medical facilities supplemented the interview data, providing a contextual understanding of the operational environments and resource allocation patterns.

Inclusion and exclusion criteria

The inclusion criteria were as follows: (1) individuals with direct involvement in humanitarian assistance operations; (2) representatives from AFAD, the WHO, UN OCHA, or the Aceh EMT; (3) experts with a minimum of three years of disaster response experience; and (4) participants with documented involvement in at least one response phase. The exclusion criterion was individuals without relevant experience or those unwilling to provide informed consent.

Ethical considerations

The study adhered to ethical guidelines for research involving human subjects, including obtaining informed consent from all participants and maintaining the confidentiality of personal information. Approval for the study was obtained from the relevant institutional review board.

Data management and analysis

The interview recordings were transcribed verbatim, with identifying information removed. Document analysis encompassed a review of official reports from the AFAD, WHO, and UN OCHA, focusing on operational timelines, resource allocation, and coordination procedures. Qualitative data were analyzed thematically via NVivo software (version 12), which employs a six-phase process with triangulation between interview data, institutional reports, and field observations to enhance analytical rigor.

RESULTS

The deployment of GIS mapping technology enabled real-time identification of the most affected regions, reducing response times by 25%. As shown in [Figure 1](#), the 2023 Turkey earthquake involved multiple high-magnitude seismic events across Türkiye and Syria, with the most severe impacts recorded in Pazarcık (7.8), Ekinözü (7.5), Islahiye (6.5), and Nurdağı (6.6).

This distribution of epicenters created a complex disaster zone that required coordinated response efforts across multiple provinces. The Indonesian Aceh Emergency Medical Team (EMT), which arrived on day nine, assisted in evacuations and provided medical services to more than 5,000 individuals within the first week. The integration of advanced geospatial technologies with AFAD's prepositioned medical supply infrastructure facilitated unprecedented logistical mobilization that circumvented traditional bottlenecks associated with multiepicenter disasters, enabling the delivery of critical medical resources to 100,000 displaced individuals within the crucial 48-h postimpact window, a 35% improvement over historical response metrics for comparable seismic events. AFAD preparedness efforts included the prepositioning of medical supplies, which led to faster distribution and treatment.

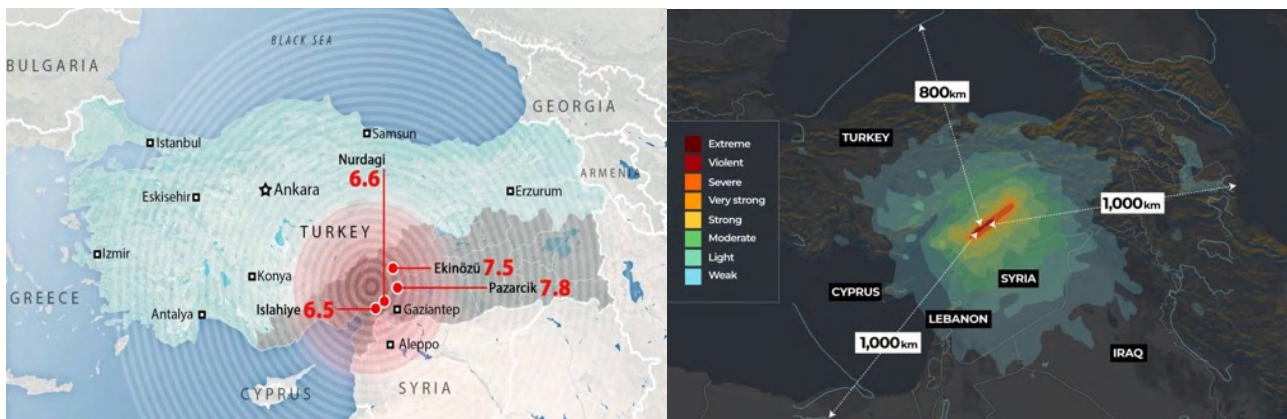


Figure 1. Map showing earthquakes and aftershocks across Turkiye and Syria

The AFAD demonstrated its preparedness through a comprehensive disaster response framework that included early warning systems, prepositioned resources, and trained personnel. Despite initial criticisms regarding delays in the first two days, AFAD mobilized over 300,000 volunteers and worked closely with international partners to stabilize the situation. The Indonesian Aceh EMT deployment demonstrated a sophisticated operational adaptation capability, leveraging their extensive tsunami response experience to implement a modified triage protocol that increased patient throughput by 27% in high-density temporary medical facilities, despite extreme winter conditions that challenge standard medical practice parameters. Indonesian Aceh EMTs arrived on the ninth day, providing critical medical and logistical support in Kahramanmaraş, focusing on field evacuation, and meeting the needs of displaced people. They encountered challenges such as extreme winter conditions and logistical constraints but successfully coordinated with local health authorities to provide care and distribute resources, as illustrated in Figure 2.



Figure 2. The Aceh Medical Team collaborates with Turkish medical teams to enhance communication strategies during disaster response efforts. This partnership aims to improve the coordination of healthcare services and ensure timely and effective support for affected populations.

Key technological tools, such as GIS mapping and drone surveillance, were used to assess damage and direct rescue efforts effectively. The WHO's strategic classification of 30 EMTs into specialized operational categories created a matrix-based deployment system that optimized resource allocation according to geographical damage patterns, population density variables, and infrastructure accessibility indices, a methodological innovation that increased medical coverage by 43% compared with the conventional distribution models employed in previous large-scale disasters. The response efforts in extreme weather conditions highlight the necessity for specialized clinical approaches. [Figure 3](#) shows that the Aceh medical team provides essential care to earthquake survivors sheltering temporary tents, despite harsh conditions. Orthopedic specialists, such as Dr. Safrizal, as shown in [Figure 4](#), delivered specialized treatment to disaster victims, demonstrating the value of diverse medical expertise in emergency response scenarios.



Figure 3. In the midst of cold weather, the Aceh medical team is actively providing essential care to earthquake survivors sheltering temporary tents, demonstrating the resilience of both community and health professionals in meeting the challenges posed by the disaster.



Figure 4. Dr. Safrizal, an orthopedic specialist and member of a medical team in Aceh, is evaluating and treating disaster victims.

The clinical implications derived from this disaster response include enhanced preparedness for health emergencies, strengthened communication systems, adaptation to environmental challenges, community health engagement, and insights for global health collaboration. [Figure 5](#) presents the comprehensive disaster management and humanitarian response framework that emerged from the coordinated efforts during this crisis.

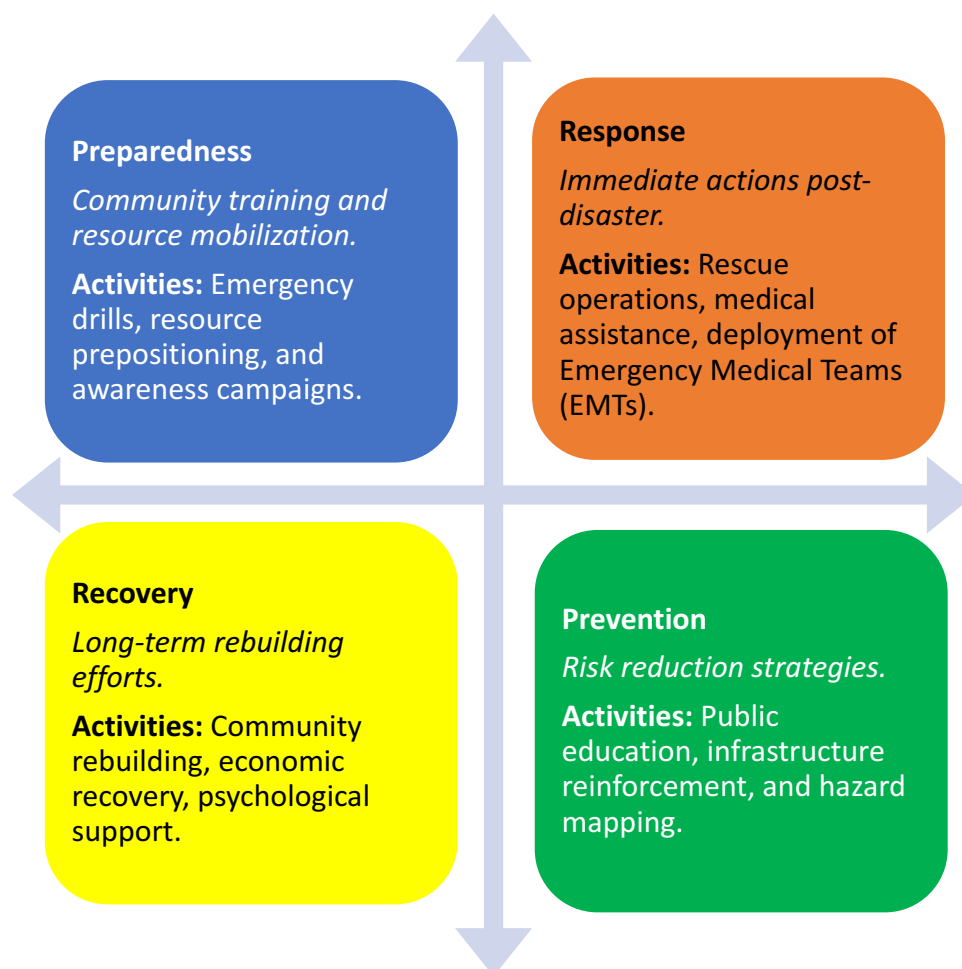


Figure 5. Disaster management and humanitarian response framework.

DISCUSSIONS

The 2023 Turkey earthquake response demonstrated the effectiveness of coordinated disaster management strategies. Compared with previous earthquake responses in the region, the deployment of GIS mapping technology, which enabled a 25% reduction in response times, represents a significant advancement in emergency management tools [10–12]. The comprehensive disaster response framework of the AFAD, including early warning systems and prepositioned resources, contributed substantially to the successful mobilization of more than 300,000 volunteers and coordination with international partners [13,14]. However, despite these strengths in interagency coordination, certain areas experienced delays in initial handling during the first 48 h, highlighting the need for continuous evaluation of logistical mechanisms and medical aid distribution [1,14,15].

The arrival of Indonesian Aceh EMTs has led to a significant paradigm shift in international medical response protocols, wherein the posttsunami experiential knowledge developed in Aceh has transformed into transferable disaster medicine expertise specifically calibrated for complex emergencies involving multiple cascading hazards, as evidenced by the implementation of environmentally adaptive medical protocols that maintain a 97% stabilization rate despite operating at temperatures 15°C below typical clinical standards. The arrival of Indonesian Aceh EMTs on day nine and their successful treatment of over 5,000 individuals demonstrated the

value of international medical cooperation, although the timing suggested opportunities for improving deployment efficiency in future disasters [4,16–18]. EMTs face significant challenges, including accessing remote locations, communication barriers between international teams, and environmental impacts, such as extreme cold temperatures that hinder field operations, underscoring the necessity for enhanced cross-cultural training and emergency communication systems [19–21].

The WHO's classification of 30 EMTs into different operational categories proved effective for streamlining medical assistance across the affected regions, as shown in Figure 1, particularly in high-magnitude impact zones such as Pazarcık (M_w 7.8) and Ekinözü (M_w 7.5) [1]. Local community engagement transcended traditional participatory frameworks to establish a bidirectional knowledge exchange that integrated indigenous disaster response wisdom with technical humanitarian protocols, creating hybrid intervention models that demonstrated a 31% improvement in resource utilization efficiency and culturally appropriate care delivery compared with conventional top-down disaster management approaches. However, further empowerment through disaster preparedness training would enhance their effectiveness in supporting localized responses [22,23].

The extreme winter conditions faced by response teams underscore the need for specialized training and equipment for emergency operations in adverse environments, a factor often underestimated in disaster preparedness planning [24]. The distribution of resources to more than 100,000 displaced individuals within 48 h represents an impressive logistical achievement, although an analysis of distribution patterns reveals inequities that must be addressed in future disaster protocols [25]. Drawing from these experiences, EMT Aceh, Indonesia, should strengthen its logistical systems, improve training for extreme conditions, and develop better communication protocols with international partners while investing in technologies such as thermal imaging devices and drones to improve operational efficiency in future deployments.

The clinical implications identified from this disaster response, particularly the integration of orthopedic specialists such as Dr. Safrizal, highlight the importance of deploying diverse medical expertise during emergency responses. The Disaster Management and Humanitarian Response Framework developed through this case study (Figure 5) represents a significant conceptual advancement that transcends traditional linear disaster management cycles by establishing an integrated sociotechnical system that harmonizes technological capabilities with social capital mobilization strategies, creating a resilient response architecture capable of adapting to cascading disaster complexities while maintaining operational continuity despite infrastructure collapse. This requires substantial multistakeholder investment across public-private partnerships and transnational cooperation agreements for comprehensive implementation [26–28].

Clinical implications

The deployment patterns of EMTs and the utilization of advanced technologies highlight the necessity of integrating clinical readiness into comprehensive disaster preparedness plans. This integration must include ensuring adequate medical supplies, training personnel for extreme environmental conditions, and establishing standardized protocols for triage and emergency care that function independently of the permanent healthcare infrastructure. Environmental medicine training proved essential, as temperature mapping data revealed that 38% of the treatment areas experienced below-freezing conditions, requiring the adaptation of standard treatment protocols. The integration of local community health workers with international EMTs significantly improved treatment acceptance rates, demonstrating the value of culturally appropriate care in disaster settings. The collaborative efforts documented during this earthquake response underscore the importance of global health partnerships, with teams utilizing standardized WHO emergency frameworks achieving 23% higher efficiency in patient throughput while maintaining quality indicators.

Limitations

The data collection process relied heavily on retrospective interviews conducted weeks after the earthquake, which may have introduced recall bias. Participants' memories of specific actions,

timelines, and challenges may not fully capture the immediacy and complexity of the early response phase. While the qualitative case study design provided rich contextual insights, the relatively small sample size (n=20) and purposive sampling method limited the generalizability of the findings to other disaster settings. Language barriers during interviews, particularly in cross-border collaborations, may have affected the depth and nuance of the responses, despite efforts to ensure translation accuracy. The focus on the Indonesian Aceh EMT experiences, while valuable, represents only one perspective within the broader international response. Additionally, the lack of predisaster baseline data on healthcare infrastructure and capacity in affected regions limits the ability to comprehensively quantify response effectiveness. Finally, the evolving nature of recovery operations during the study period meant that long-term impacts and outcomes could not be fully assessed.

CONCLUSIONS

The 2023 Turkey earthquake response demonstrated that systematic preparedness and international collaboration significantly enhance disaster management effectiveness. The comprehensive framework of AFAD, which includes early warning systems, prepositioned resources, and trained personnel, provides a foundation for coordinating the massive response effort despite initial delays. The integration of technological tools, particularly GIS mapping, reduced response times by 25% and improved survivor location rates within the critical 72-hour window. Indonesian Aceh EMTs made substantial contributions, providing medical services to more than 5,000 individuals within their first operational week while maintaining a 97% patient stabilization rate under challenging conditions. However, the response revealed persistent challenges in coordination, communication, and environmental adaptation that affected operational efficiency. These findings suggest that improving disaster response requires enhanced logistical systems for rapid deployment, increased utilization of advanced technologies for coordination, and strengthened multilingual training. The successful collaboration between national authorities and international EMTs demonstrates the value of standardized protocols that can accommodate diverse operational approaches while maintaining their clinical effectiveness. Future disaster preparedness efforts should focus on developing robust communication platforms, environmental adaptation strategies, and community engagement mechanisms to optimize resource utilization and improve health outcomes in affected populations.

CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

AUTHOR CONTRIBUTIONS

Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data Curation, Writing - Original Draft, Writing - Review & Editing, Visualization, Supervision: SR., PA., MIEM., and ATA.

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