Preparedness of Hospital Health Practitioners for Human-Induced Mass Casualty Incidents in Lanao del Sur: A Mixed-Methods Study

Namera T. Datumanong*

[1*]*Mindanao State University, Marawi City, Lanao Del Sur, 9700, Philippine*
Email: namera.datumanong@msumain.edu.ph

KEYWORDS

Disaster Preparedness, Mass Casualty Incidents, Human-Induced Disaster, Hospital Health Practitioners, Lanao del Sur

ABSTRACT

Background: Mass casualty incidents (MCIs) caused by human-induced disasters, such as armed conflicts and terrorism, demand immediate, organized, and large-scale responses from healthcare institutions. In conflict-prone regions like Lanao del Sur in the southern Philippines, hospital health practitioners—especially nurses and physicians—play critical roles in reducing mortality and morbidity during such emergencies. Assessing their preparedness is essential for improving hospital emergency response systems and community resilience.

Objectives: This study assessed the level of preparedness of hospital health practitioners in Lanao del Sur in responding to human-induced MCIs and examined the relationships between preparedness and selected personal, professional, and institutional factors**.**

Methods: A mixed-methods research design was employed, incorporating both descriptive and inferential approaches. Quantitative data were collected from 212 licensed nurses and doctors employed in Amai Pakpak Medical Center and selected district hospitals in Lanao del Sur. A structured, validated, and pre-tested questionnaire measured preparedness across five domains: emergency assessment needs, disaster planning, information systems, institutional frameworks, and response systems. Variables such as personal demographics, professional profiles, and contextual institutional factors (e.g., facility accessibility, manpower availability, and resource adequacy) were analyzed for potential relationships using correlation statistics. Qualitative inputs gathered through informal interviews supplemented the findings.

Results: The majority of respondents reported being "always prepared" in terms of their confidence and ability to respond to human-induced MCIs across all five domains. Significant relationships were found between certain demographic variables (e.g., age, sex, and religion) and perceived preparedness. Likewise, professional characteristics such as training attendance, length of service, and educational attainment were significantly associated with preparedness scores. Among institutional factors, the availability of resources, presence of adequate manpower, and facility accessibility emerged as strong influencers of preparedness levels. Notably, hospital health practitioners assigned to more centralized facilities with permanent employment status demonstrated higher preparedness scores compared to those in remote assignments or temporary positions**.**

Conclusion: Hospital health practitioners in Lanao del Sur perceive themselves to be generally prepared to respond to MCIs caused by human-

induced disasters. However, preparedness is significantly influenced by personal, professional, and systemic factors. The findings suggest the need for continuous education and simulation-based training, equitable resource allocation, and capacity strengthening of decentralized hospitals. Local government units and hospital administrators are urged to develop contextualized disaster response frameworks and integrate preparedness standards into regular hospital operations.

INTRODUCTION

Mass casualty incidents (MCIs) caused by human-induced disasters—such as terrorism, armed conflict, and political violence—continue to disrupt healthcare systems worldwide. These events often result in large numbers of injured individuals requiring immediate and coordinated emergency care, thus testing the capacity of hospitals and healthcare workers to respond effectively (Khan et al., 2021). The complexity and unpredictability of human-induced disasters make them particularly challenging in regions with limited resources and fragile infrastructures. In such contexts, the preparedness of hospital health practitioners becomes a critical factor in mitigating deaths and disabilities associated with MCIs (Pangandaman et al., 2024; Poudel et al., 2022).

In the Philippines, the southern region of Mindanao, especially Lanao del Sur, has been a hotspot for armed insurgencies and terrorism. The 2017 Marawi Siege, one of the most significant human-induced disasters in recent Philippine history, exposed severe gaps in emergency healthcare delivery in conflict zones (Castillo-Carandang et al., 2022). During this event, the influx of casualties and internally displaced persons overwhelmed local hospitals, many of which lacked the personnel, equipment, and protocols needed to manage complex emergencies. This underscores the necessity of evaluating and strengthening the readiness of healthcare institutions in such conflict-prone areas.

Hospital preparedness for MCIs encompasses institutional readiness, response systems, coordination mechanisms, and the capacity of individual health professionals. It includes clear disaster response protocols, rapid communication systems, sufficient training, and access to emergency supplies (Lehane et al., 2021). The World Health Organization (WHO, 2021) emphasizes that healthcare facilities must be designed not only to withstand disaster impacts but also to continue functioning during and after the crisis. Preparedness is particularly important for frontline workers such as nurses and physicians, who must make quick decisions under pressure while dealing with limited resources (World Health Organization, 2021).

Despite increasing global awareness of disaster preparedness, research and policy in the Philippines remain heavily focused on natural calamities like typhoons and earthquakes (Delos Santos & Pascual, 2021). Studies on preparedness for human-induced disasters, especially in rural or conflict-affected areas, are rare. Moreover, little is known about how frontline hospital personnel perceive their own preparedness, and what contextual factors influence their ability to respond to crises. These knowledge gaps hinder the development of localized and responsive emergency management plans.

Emerging research suggests that preparedness is influenced by multiple dimensions, including health workers' access to training, length of service, employment status, and even personal variables such as age, gender, and faith-based perspectives (Camua et al., 2021; Isnani-Asak & Pangandaman, 2024; Mohd Hairon et al., 2020). Institutions with strong leadership and adequate support systems are more likely to empower health professionals with the knowledge, skills, and confidence to manage large-scale emergencies. However, conflict-affected areas such as Lanao del Sur operate under unique social, political, and religious dynamics that require more tailored strategies and evidence-based planning (Pangandaman et al., 2019).

In light of these gaps, this study investigates the preparedness of hospital health practitioners in Lanao del Sur to respond to mass casualty incidents caused by human-induced disasters. The research focuses on five preparedness dimensions: emergency assessment, disaster planning, health information systems,

institutional capacity, and response frameworks. Findings from this study aim to provide context-specific insights that can inform policy development and improve hospital-based disaster response strategies in conflict-affected regions.

METHODS

Study Design

This study employed a convergent parallel mixed-methods design, combining quantitative and qualitative data to explore the preparedness of hospital health practitioners in responding to human-induced mass casualty incidents (MCIs) in Lanao del Sur, Philippines. This design was chosen to enable the triangulation of findings, thereby providing a more comprehensive understanding of both the measurable levels of preparedness and the contextual factors influencing them.

Study Site and Population

Sampling and Sample Size

A total enumeration approach was used for the quantitative phase, targeting all available and eligible nurses and physicians working during the study period. A total of 212 respondents participated in the quantitative survey.

For the qualitative component, purposive sampling was applied to select 10 key informants from among the hospital staff, including those in supervisory roles and those with prior experience in managing MCIs. These informants participated in in-depth interviews that explored personal, institutional, and cultural factors affecting disaster preparedness.

Research Instruments

The quantitative instrument used in this study was a structured, self-administered questionnaire adapted and validated from previously established tools designed for assessing healthcare disaster preparedness. To ensure its relevance and clarity in the local context, the instrument was reviewed by experts in public health and disaster response, and subsequently pilot-tested with 15 hospital staff from a neighboring province. The finalized version of the questionnaire comprised five major domains: (1) Emergency Needs Assessment, (2) Disaster Planning, (3) Health Information Systems, (4) Institutional Support and Coordination, and (5) Response Systems. Each domain was represented by five indicators, with responses measured using a 5-point Likert scale ranging from 1 (“Never Prepared”) to 5 (“Always Prepared”), allowing for a comprehensive evaluation of perceived preparedness among respondents.

The qualitative instrument was a semi-structured interview guide developed based on the same five preparedness domains, but with open-ended prompts to allow for narrative responses. Interviews were conducted in either English or Filipino, depending on the respondent’s preference, and were audio-recorded with consent.

Data Collection Procedure

Data collection was conducted over a three-week period in March 2024. Surveys were distributed and retrieved in person during hospital duty hours, with the assistance of designated focal persons. Key informant interviews were scheduled at convenient times for participants and conducted in private hospital areas to ensure confidentiality.

Interview recordings were transcribed verbatim and translated when necessary. Field notes were also taken to document non-verbal cues and context.

Data Analysis

Quantitative data were encoded in Microsoft Excel and analyzed using SPSS Version 26. Descriptive statistics (means, frequencies, standard deviations) were computed to determine levels of preparedness. Pearson correlation and Chi-square tests were employed to assess the relationships between preparedness and selected variables such as age, sex, religion, length of service, training exposure, and institutional factors.

Qualitative data were analyzed using thematic analysis, following Braun and Clarke's (2006) six-step framework. Initial codes were derived from the interview transcripts and then grouped into themes corresponding to the five preparedness domains. Triangulation was achieved by comparing qualitative findings with quantitative results for consistency and deeper interpretation.

Ethical Considerations

The study received ethics clearance from the College of Health Sciences Research Ethics Committee (CHS-REC) of Mindanao State University. Written informed consent was obtained from all participants. Data confidentiality, voluntary participation, and the right to withdraw were upheld throughout the study. Identifiable information was anonymized during transcription and data reporting.

RESULTS Quantitative Findings

Demographic and Professional Profile of Respondents

A total of 212 hospital health practitioners participated in the study, representing various hospitals across Lanao del Sur. The respondents were predominantly female (67.9%), single (67.0%), and Muslim (90.1%). The majority were within the 26–30 years age group (39.2%) and assigned to Amai Pakpak Medical Center (43.9%), which is the province's primary government hospital. Professionally, most had 1–3 years of service (43.4%), were college graduates (82.5%), and held permanent employment status (50.5%). Only a minority had attended any disaster preparedness training (39.2%).

Table 1: Demographic and Professional Characteristics of Respondents (N = 212)

Variable	Category	f	%
Sex	Male	68	32.1%
	Female	144	67.9%
Age	20–25	50	23.6%
	26–30	83	39.2%
	31–35	48	22.6%
	36 and above	31	14.6%
Civil Status	Single	142	67.0%
	Married	64	30.2%
	Widowed/Separated	6	2.8%
Religion	Muslim	191	90.1%
	Christian/Others	21	9.9%
Area of Assignment	Amai Pakpak Medical Center	93	43.9%
	District Hospital 1	45	21.2%
	District Hospital 2	39	18.4%
	District Hospital 3	35	16.5%
Employment Status	Permanent	107	50.5%
	Contractual	105	49.5%

Length of Service	Less than 1 year	30	14.2%
	1–3 years	92	43.4%
	4–6 years	56	26.4%
	More than 6 years	34	16.0%
Educational Attainment	College Graduate	175	82.5%
	Postgraduate	24	11.3%
	Vocational/Associate	13	6.1%
Training Attendance	Yes	83	39.2%
	No	129	60.8%

Preparedness Level Across Five Domains

Respondents' preparedness to respond to human-induced mass casualty incidents was assessed across five domains: Emergency Assessment Needs, Disaster Planning, Information Systems, Institutional Framework, and Response Systems. As shown in Table 2, the overall preparedness rating across all domains ranged from "Always Prepared" to "Excellently Prepared".

Notably, the highest domain mean was for Emergency Assessment Needs, indicating strong individual readiness in personal protective equipment usage, triage, and emergency client care. Meanwhile, domains requiring broader institutional input, such as resource allocation and coordination, scored slightly lower, though still within the "always prepared" category

Table 2: Summary of Perceived Preparedness Levels Across Domains

Domain	Mean	SD	Interpretation
Emergency Assessment Needs	3.27	0.623	Excellently Prepared
Disaster Planning	3.10	0.679	Always Prepared
Information Systems	3.14	0.694	Always Prepared
Institutional Framework	3.12	0.728	Always Prepared
Response Systems	3.05	0.713	Always Prepared
Overall Average	3.14	—	Always Prepared

Correlation Between Demographics and Preparedness

Analysis using Cramer's V and Pearson r revealed significant associations between preparedness and several personal and professional variables. As summarized in Table 3, variables such as sex, civil status, religion, area of assignment, and employment status demonstrated statistically significant relationships ($p < 0.05$) with preparedness in areas such as disaster planning and institutional framework. Conversely, age and profession were not significantly associated with preparedness scores in most domains, suggesting these factors had less predictive value in this context.

Table 3: Summary of Perceived Preparedness Levels Across Domains

Variable	Correlated Domain	p-value	Interpretation
Sex	Disaster Planning	0.038	Significant
Civil Status	Disaster Planning	0.003	Significant
Religion	Disaster Planning	0.005	Significant
Area of Assignment	Multiple Domains	0.000	Highly Significant
Employment Status	Multiple Domains	0.029	Significant

Correlation Between Demographics and Preparedness

As shown in the table 4, training attendance demonstrated statistically significant associations across all preparedness domains, confirming its vital role in equipping healthcare workers with necessary competencies for responding to mass casualty incidents. Meanwhile, the insignificance of other institutional and demographic variables further reinforces the argument that readiness is not merely a function of professional maturity or academic standing, but a direct result of active engagement in preparedness training and exercises.

Table 4: Correlation Between Institutional/Professional Factors and Preparedness

Variable	Correlated Domain(s)	p-value	Interpretation
Training Attendance	Information Systems	0.000	Highly Significant
	Emergency Assessment	0.000	Highly Significant
	Disaster Planning	0.001	Highly Significant
	Institutional Framework	0.001	Highly Significant
	Response System	0.007	Significant
Educational Background	All Domains	> 0.05	Not Significant
Length of Service	All Domains	> 0.05	Not Significant
Educational Attainment	All Domains	> 0.05	Not Significant

Qualitative Findings

To complement the quantitative data, in-depth interviews were conducted with ten key informants from selected hospitals in Lanao del Sur. These informants included emergency nurses, attending physicians, and hospital administrative staff who had direct experience in hospital-based disaster response. Through thematic analysis, five major themes emerged, each aligned with the conceptual domains of the study: preparedness in emergency assessment, disaster planning, institutional frameworks, communication systems, and response mechanisms.

Theme 1: Adaptive Emergency Knowledge and Confidence

Many respondents demonstrated a strong sense of confidence in their ability to perform triage and provide initial patient care during mass casualty incidents. This confidence often stemmed from firsthand experiences during the Marawi Siege in 2017, where practitioners were exposed to high-stress environments with limited resources. Such exposure, though traumatic, served as informal but powerful training. One emergency nurse shared, “We had to learn fast. The experience forced us to adapt and act swiftly even with limited supplies. It made us tougher.”

In a similar vein, an attending physician recounted how adaptability became second nature during the siege: “I didn’t rely on manuals. We improvised every day—using torn bedsheets as slings, or flashlights when the lights went out. It was survival and service all at once.” This theme underscores that while formal training may be lacking, experiential learning during real emergencies has equipped many with practical and situational knowledge. However, reliance on past experiences alone is not sustainable without ongoing formal preparedness initiatives.

Theme 2: Inconsistent Institutional Support and Planning

Despite the personal initiative demonstrated by healthcare workers, a lack of clear and consistent institutional planning was a recurring concern. While some administrators mentioned that disaster contingency plans existed, these were often not widely disseminated, poorly rehearsed, or outdated. A hospital administrator admitted, “We do have protocols, but the problem is they’re not regularly updated or practiced. When emergencies happen, it’s almost always an improvised effort.”

This concern was echoed by a nurse, who reflected, “There is a plan, yes—but it's not actively practiced.

We rely more on personal initiative when chaos happens." The limited institutional support diminishes the effectiveness of even the most skilled practitioners. As a result, during high-pressure events, staff tend to operate in silos, relying on instinct and past experience rather than a unified institutional framework. This lack of coordinated planning poses serious risks to operational efficiency and patient safety.

Theme 3: Communication Gaps in Health Information Systems

Communication barriers emerged as a major theme, particularly concerning coordination during mass influxes of patients and interdepartmental referrals. Practitioners frequently noted confusion about who leads during crises and how information should flow. One attending physician stated, "Sometimes we don't even know who's in charge or who to report to when the surge of patients begins. The command chain isn't always clear."

Similarly, an administrative staff member acknowledged the issue, saying, "The radios or internal messaging systems aren't always working. In emergencies, we have to send messengers room to room, which wastes time." These communication challenges contribute to disorganized responses and delays in critical decision-making, making the establishment of reliable information systems an urgent institutional priority.

Theme 4: Cultural and Religious Context as a Barrier and Facilitator

The interviews highlighted that cultural and religious beliefs both inspire service and, at times, restrict participation. On the one hand, faith serves as a motivating force. An emergency nurse reflected, "In our culture, service is a form of worship. So even in fear, we show up." This spiritual grounding fosters resilience and community-oriented behavior in the face of danger.

However, some participants acknowledged that certain cultural expectations—especially gender roles—could be limiting. A female physician shared, "There are families who prefer male doctors during emergencies, even if I'm the most available. It's not about skill, but perception." These social constructs may limit the efficiency of a fully mobilized healthcare response. It calls for culturally sensitive disaster plans that respect local values while promoting inclusive practice.

Theme 5: Training Disparities and Dependence on Volunteerism

One of the most persistent gaps identified was the lack of formal and inclusive disaster preparedness training. Many frontline workers indicated that only selected staff—often supervisors or management—receive training, leaving the rest to rely on informal mentoring or self-directed learning. A junior emergency nurse voiced frustration: "If you're not part of management, you wait for someone to teach you. And sometimes, no one does."

An administrative personnel also admitted, "We only get updates when there's already an incident. Trainings happen, but they're not consistent or open to everyone." This uneven distribution of knowledge perpetuates vulnerability among lower-ranked staff and undermines institutional readiness. A shift toward more equitable, department-wide training approaches could bridge this preparedness gap and improve overall disaster response capability.

DISCUSSION

The findings of this study suggest that while hospital health practitioners in Lanao del Sur generally perceive themselves as adequately prepared for human-induced mass casualty incidents (MCIs), this preparedness is deeply nuanced by factors related to individual experience, institutional dynamics, and cultural context. The highest ratings in the domain of emergency assessment indicate that frontline practitioners possess strong procedural knowledge, particularly in triage, patient handling, and use of

protective equipment. This is consistent with prior research emphasizing the capacity of health workers to perform well under pressure, particularly in low-resource and high-conflict settings where adaptation is often necessary for survival (Camua et al., 2021; Datukali & Pangandaman, 2024; Dean et al., 2020; Harrell et al., 2020).

This perceived readiness, however, appears to be shaped more by experiential learning than by structured training programs. The qualitative data highlight that events like the Marawi Siege served as de facto training grounds, instilling in many a sense of resilience and improvisational skill. This type of real-life exposure aligns with studies that emphasize how past emergencies increase practitioner confidence (Mattheus et al., 2023; Poudel et al., 2022). Nonetheless, while these insights reinforce the idea that exposure fosters competence, the absence of formal reinforcement through drills and continuing education raises concerns about sustainability. Relying solely on tacit knowledge may undermine institutional capacity to respond effectively in varied and complex scenarios (Hanif et al., 2020; Poudel et al., 2022; Sumbal et al., 2025).

Institutional preparedness was notably weaker than individual readiness, as reflected in the domains of disaster planning, information systems, and organizational coordination. Practitioners consistently reported that contingency plans were either not well-disseminated or irregularly practiced. This gap between policy and practice is consistent with findings that show facilities lacking routine simulations and protocol familiarization tend to exhibit poorer response cohesion (Anderson et al., 2021; Casimiro et al., 2021; Lehane et al., 2021). Our findings indicate that institutional protocols are often perceived as static documents rather than dynamic tools that guide real-time operations—suggesting a disconnect that could hinder effective response during large-scale emergencies.

Training attendance emerged as the only institutional variable with statistically significant associations across all preparedness domains, underscoring the centrality of capacity-building programs. Practitioners who had participated in formal disaster response training were notably more confident and rated themselves higher across preparedness metrics. This finding is supported by literature on the positive effect of scenario-based training on response performance (Pikoulis et al., 2022; Said et al., 2020). Yet, as the qualitative data reveal, access to training was often restricted to senior staff or those based in central facilities. Such exclusivity may create knowledge hierarchies within hospitals, inadvertently marginalizing younger or contract-based practitioners, and weakening overall team readiness.

The study also reveals important social dimensions of preparedness, particularly as shaped by gender, religion, and employment status. Respondents noted how cultural expectations sometimes limited the roles that female practitioners could play during MCIs, especially in communities that prefer male responders. This dynamic complicates assumptions about role neutrality in disaster response and has also been documented in conflict-prone contexts (Brewer et al., 2020; Castillo-Carandang et al., 2022; Ekşi et al., 2022). At the same time, many practitioners reported that their faith was a source of motivation and ethical guidance, helping them to persevere under pressure. Such dual influences—both restrictive and empowering—highlight the importance of culturally grounded preparedness planning (Abu-Ras et al., 2022; McKinley, 2024).

A striking insight from the qualitative data is the persistence of communication breakdowns within hospital information systems during emergencies. Practitioners described confusion over leadership roles, inconsistent access to updates, and the need to rely on ad hoc communication strategies such as messengers. These deficiencies mirror broader systemic challenges and remain a critical bottleneck in many emergency settings (Abdulmalik & Pangandaman, 2024; Barten et al., 2021; Humphrey et al., 2022; Khan et al., 2021). Without streamlined communication channels, even the best-prepared practitioners may find themselves unable to coordinate effectively, potentially jeopardizing both patient outcomes and worker safety.

Additionally, the findings challenge assumptions about the protective role of tenure or academic attainment. Variables such as years of service and educational level were not significantly correlated

with preparedness, suggesting that without active and continuous exposure to disaster-related content, static credentials have limited value in emergency contexts. This observation is echoed in studies showing that up-to-date, context-specific training is more predictive of emergency performance than generic qualifications (Garavan et al., 2021; Häske et al., 2022; Kurata et al., 2023; Yang et al., 2020). Consequently, preparedness strategies should emphasize applied learning over academic benchmarks and prioritize equitable access to training for all health personnel.

Finally, the recurring theme of volunteerism and self-reliance among staff underscores a broader systemic fragility. Participants consistently noted that in the absence of strong institutional leadership, practitioners often default to their own initiative to ensure patient care during crises. While commendable, this mode of response is not scalable or sustainable. Emergency preparedness must be institutionally embedded, not left to the discretion of frontline staff (Amberson et al., 2020; Gowing et al., 2023; World Health Organization, 2021). The absence of structured logistics, clear protocols, and inclusive coordination frameworks places undue pressure on individuals and increases the likelihood of system collapse during high-volume emergencies.

Together, these findings point to the critical need for holistic preparedness strategies that integrate individual skill development with organizational reform. Hospitals in Lanao del Sur and similarly conflict-prone areas must move beyond surface-level compliance with disaster policies and commit to institutionalizing training, improving communication systems, and ensuring cultural inclusivity. Resilience in healthcare systems emerges not just from individual heroism but from coherent and collaborative structures that support collective action during crises (Dean et al., 2020; Harrell et al., 2020).

CONCLUSION

The preparedness of hospital health practitioners in Lanao del Sur reflects a tension between individual capability and systemic limitations. While frontline workers show admirable initiative and resilience, institutional structures need substantial reinforcement. Bridging this gap requires commitment from both health administrators and policymakers to foster a culture of preparedness grounded in regular training, inclusive planning, and culturally sensitive practices. Only through this can hospitals in conflict-affected areas truly build resilient, responsive systems capable of managing the unpredictable demands of human-induced mass casualty events.

Conflict of Interest
Nil.

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