



Analysis of Clinical Preparedness in Facing Disasters: A Descriptive Study of 17 Clinics in Makassar City

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Abstract. Background: Clinics are essential primary healthcare facilities for maintaining lifesaving and routine services during disasters. Preparedness assessment is necessary to identify the capacity and gaps of each facility. Objective: This study analyzed and compared disaster preparedness across 17 clinics. Methods: A quantitative descriptive observational study with a multisite cross-sectional design was conducted in May 2026. Data were obtained through direct observation, interviews, document review, and facility documentation. The instrument included 30 indicators across six domains: policy and management, human resources, infrastructure, logistics, communication, and services. Each indicator was scored from 0 to 2, yielding a maximum score of 60. Results: Mean preparedness was 83.43%, with a median of 88.33%, a standard deviation of 12.42%, and a range of 56.67% to 100%. Thirteen clinics (76.47%) were categorized as highly prepared and four (23.53%) as moderately prepared. Major gaps concerned emergency alarms, evacuation maps, drills, disaster-response teams, emergency procedures, triage, emergency areas, backup power, referral coordination, and mass-casualty management. Conclusion: Most clinics demonstrated high preparedness; however, operational readiness requires stronger infrastructure, standardized procedures, recurring training, and simulation exercises. Addressing these gaps may contribute to SDG 3 by supporting continuity of essential health services, SDG 11 by strengthening urban disaster resilience, and SDG 13 by improving institutional adaptive capacity for disaster-risk management.

Keywords: Disaster Preparedness; Clinics; Healthcare Facilities; Disaster Management; Makassar

1. Introduction

Natural, non-natural, and social disasters can abruptly increase the demand for health services while simultaneously disrupting the capacity of health facilities to deliver care. In such situations, health facilities must not only protect patients, healthcare workers, visitors, and infrastructure, but also maintain essential health services during and after disasters. The World Health Organization and the United Nations Office for Disaster Risk Reduction emphasize that safe and disaster-ready health facilities are important community assets because they must remain functional and provide lifesaving services during emergencies (1).

Health-facility preparedness refers to an organization's capacity to anticipate threats, reduce risk levels, respond to emergencies, maintain service functions, and recover after disasters. Such preparedness encompasses interrelated structural, nonstructural, functional, and managerial components. The systematic review by Munasinghe et al. indicates that health-facility preparedness assessments can be organized within the 4S framework, namely *space*, *stuff*, *staff*, and *systems*. Infrastructure, logistics, healthcare workforce capacity development, and communication are important themes within these domains. However,

previous studies have not consistently used uniform assessment instruments and have often overlooked several critical aspects, such as transportation, backup electricity, volunteer management, mortuary facilities, and management of the deceased (2).

One instrument commonly used to evaluate the safety and preparedness of health facilities is the *Hospital Safety Index* (HSI). This instrument assesses the likelihood that a health facility will remain safe and functional during emergencies based on hazard type, structural safety, nonstructural safety, and emergency and disaster management. Lestari et al. applied the HSI to assess nine hospitals in four Indonesian provinces and obtained an overall safety index of 0.673, corresponding to Level A. These findings indicate that the assessed facilities were likely to maintain their functions during emergencies, although certain components still required improvement (3).

Similar findings were reported by Goniewicz et al., who conducted a comprehensive evaluation of disaster preparedness using the HSI. The study identified strengths in infrastructure and interfacility cooperation, but also revealed weaknesses in compliance with safety procedures, crisis communication, and the frequency of evacuation drills. The study emphasizes that achieving a high preparedness category does not necessarily mean that all components have been optimally fulfilled. Periodic evaluation and continuous improvement remain necessary to address changes in hazard types, facility capacity, human resources, and service needs (4).

Most studies on disaster preparedness have been conducted in hospitals, although first-level health facilities also play an important role in providing initial care, conducting triage, maintaining disease surveillance, stabilizing patients, and coordinating referrals. A study involving 14 community health centers in disaster-prone areas of North Sumatra demonstrated substantial variation in readiness indices, ranging from 23.94% to 72.34%. Functional readiness was the weakest component in most of the assessed facilities. These findings highlight the importance of integrating disaster preparedness into routine healthcare management, rather than addressing it only when disasters occur or are anticipated (5).

The importance of resilience among first-level health facilities is also evident from the disaster experience in Central Sulawesi. Wahidin et al. found that the 2018 earthquake, tsunami, and liquefaction disrupted community health centers in Palu City, Sigi Regency, and Donggala Regency. These disruptions involved management, budgeting, human resources, medicine supplies, early warning and disease response systems, facility damage, and access to healthcare services. Service disruption lasted between one and two months in several areas and required varying recovery periods. These findings indicate that pre-disaster preparedness strongly determines the ability of primary healthcare facilities to sustain services and accelerate recovery (6).

In addition to building safety and equipment availability, disaster preparedness is strongly influenced by leadership, governance, human resources, communication, and coordination. Samei et al. identified ten factors affecting the functional preparedness of health facilities: leadership and command systems, risk assessment, development of protocols and plans, logistics availability, human resource management, education and training, access to vital facilities, communication, site security, and control of underlying disaster risk factors. These factors demonstrate that preparedness cannot be measured solely by the existence of resources but must also assess whether the organizational system is capable of operating those resources effectively during emergencies (7).

Healthcare workers' competence is an important element of operational preparedness. Goniewicz and Goniewicz (8) found that healthcare workers tended to rate their individual preparedness for mass-casualty incidents more highly than the preparedness of their institutions. This finding suggests a possible gap between individual competence and organizational capacity. Therefore, trained healthcare workers still require support in the form of command structures, task allocation, operational procedures, communication mechanisms, equipment, and clear coordination systems.

In practice, different approaches are used to organize human resources for disaster management. The first approach emphasizes the establishment of a dedicated team with formal structures, duties, authority, and chains of command. The second approach integrates disaster-management responsibilities into the duties of all trained personnel. An integrated approach may enhance flexibility and broaden healthcare-worker involvement. However, without organizational formalization, it may create ambiguity in command, overlapping responsibilities, and difficulties in ensuring accountability during emergencies. The findings of Samei et al. and Goniewicz and Goniewicz support the need to balance individual competence development with organizational system strengthening (7,8).

Training and simulation are also important instruments for developing healthcare workers' capacity to respond to disasters. Sofyana et al. demonstrated that disaster-risk-reduction preparedness requires training models capable of improving the knowledge, attitudes, and skills of communities and healthcare workers. Training should also be adapted to the social and cultural characteristics of the population served so that preparedness materials and procedures can be applied effectively (9). Studies among healthcare workers in primary care facilities also show that disaster-management training, disaster-response experience, knowledge, attitudes, and involvement in rapid response teams are associated with personnel preparedness. Involvement in rapid response teams was identified as a dominant factor in healthcare-worker preparedness (10).

Preparedness becomes increasingly important when health facilities face incidents involving numbers of casualties that exceed normal service capacity. Such conditions require *surge capacity*, namely the ability of facilities to rapidly increase service capacity through the addition or reorganization of human resources, space, equipment, logistics, and service systems. Hasan et al. emphasized that medical surge-capacity preparedness plays an important role in reducing mortality and supporting the management of severely injured casualties during disasters and emergencies. Without surge-capacity planning and mass-casualty procedures, health facilities risk experiencing an imbalance between patient needs and available resources (11).

Assessing clinic preparedness is also related to the achievement of Sustainable Development Goal 3, particularly the strengthening of capacity for early warning, risk reduction, and health-risk management. Furthermore, the resilience of health facilities supports SDG 11 on safe and resilient cities and communities and SDG 13 on strengthening human and institutional capacity to address disaster risks (12-14).

Based on this context, this study aimed to analyze and compare the level of clinic preparedness for disasters across six domains: policy and management, human resources, facilities and infrastructure, logistics, communication, and services. This study also sought to identify gaps between actual conditions and the preparedness components that should be available, and to formulate management-based recommendations for improvement.

2. Methods

2.1. Study Design and Setting

This quantitative descriptive observational study used a multisite cross-sectional design. It was conducted in 17 clinics in Makassar City and surrounding areas in May 2026. The unit of analysis was the preparedness of each clinic to manage disasters.

The 17 clinics were recruited using non-probability convenience sampling based on accessibility, willingness to participate, and the availability of clinic managers or authorized personnel during data collection. Eligible clinics were active outpatient facilities in Makassar City or its surrounding service area that permitted observation, interviews, and document review. Clinics were excluded if they declined participation, were temporarily closed, or could not provide sufficient preparedness-related information. Because the sample was not randomly drawn from a complete clinic registry, the findings describe the participating clinics and should not be generalized to all clinics in Makassar without caution.

2.2. Data Collection

Data were collected through direct observation, interviews with clinic managers or authorized personnel, document review, and facility documentation. The assessment covered preparedness policies, personnel competence, safety infrastructure, emergency logistics, communication systems, and service delivery during disasters. Interviews explored disaster plans, task allocation, training and drills, emergency staffing, referral coordination, and crisis-service procedures. Reviewed documents included standard operating procedures, emergency-team structures, contact lists, training records, referral pathways, and other verifiable records. No patients were recruited, and no personal identifiers, medical records, or clinical patient data were collected.

2.3. Instrument and Scoring

The checklist comprised 30 indicators across six domains: policy and management, human resources, infrastructure, logistics, communication, and services. The instrument was adapted from disaster-preparedness domains described in the Hospital Safety Index and related health-facility preparedness literature, with contextual adjustments for outpatient clinics. The draft checklist was reviewed by the research team and health-administration experts to assess relevance, clarity, and feasibility before field implementation. No separate pilot testing was conducted; therefore, feasibility was assessed through expert review and field implementation. Each indicator was scored as 0 (unavailable), 1 (available but incomplete or not fully functional), or 2 (complete and functional), producing a maximum score of 60. Scores were assigned by triangulating direct observation, interviews, and documentary evidence. When assessors identified inconsistent evidence or different interpretations, the final score was determined through discussion and consensus based on the strongest available field and documentary evidence.

The 30 indicators covered the following components: written disaster policy, disaster plan, external coordination, emergency task allocation, standard operating procedures, trained personnel, disaster-response team, emergency-shift arrangement, training records, simulation or drills, emergency alarm, evacuation map, marked evacuation route, assembly point, emergency-care area, emergency medicines, emergency equipment, emergency kit, water availability, backup power, internal communication mechanism, emergency contact

list, referral contact, documentation system, information updates, triage procedure, crisis-care procedure, referral procedure, mass-casualty procedure, and continuity of essential services.

2.4. Data Analysis

Preparedness scores were summarized descriptively. The preparedness percentage was calculated as follows:

$$\text{Preparedness percentage} = (\text{score obtained} / \text{maximum score}) \times 100\%$$

Preparedness was classified as low (0-40%), moderate (41-70%), or high (71-100%). Any indicator scoring below 2 was treated as a gap for improvement planning.

3. Results and Discussion

3.1. Disaster Preparedness

The mean preparedness score was 50.06 of 60, equivalent to 83.43%. The median was 88.33%, the standard deviation was 12.42%, and clinic scores ranged from 56.67% to 100%.

Table 1. Disaster Preparedness Levels across 17 Clinics

No.	Healthcare facility	Score	Percentage	Category
1	Klinik Pratama BKIA Rakyat Makassar	60/60	100.00%	High
2	Klinik Sehat	57/60	95.00%	High
3	Klinik Farida Sehat Makassar	56/60	93.33%	High
4	Klinik Rufaidah Medika	55/60	91.67%	High
5	Klinik Pratama Kimia Farma Pettarani	55/60	91.67%	High
6	Klinik Kimia Farma Ratulangi	54/60	90.00%	High
7	Wihdatul Ummah Medical Center	54/60	90.00%	High
8	Klinik dr. Sahardjo Rutan Makassar	54/60	90.00%	High
9	Ratulangi Medical Center	53/60	88.33%	High
10	Klinik Karya Abadi Medika	52/60	86.67%	High
11	Klinik Aktiv Energi Physio	52/60	86.67%	High
12	Klinik Kiddy Farma Antang	50/60	83.33%	High
13	Mapala Medical Clinic	44/60	73.33%	High
14	Klinik dan Apotek Nur Asy Syifaa	42/60	70.00%	Moderate
15	Klinik Nina	42/60	70.00%	Moderate
16	HK Medical Center	37/60	61.67%	Moderate
17	Klinik Arteri Medika	34/60	56.67%	Moderate

Thirteen clinics (76.47%) were classified as highly prepared and four (23.53%) as moderately prepared; none were in the low category. Although the distribution suggests that most clinics had foundational policies, staff arrangements, safety resources, logistics, communication, and service systems, a high total score did not necessarily indicate full operational capability. Some highly rated facilities still lacked alarms, evacuation maps, dedicated emergency space, formal triage, or mass-casualty procedures. Preparedness categories should therefore be interpreted together with indicator-level gaps rather than as stand-alone evidence of real-world performance (3,4).

Table 2. Distribution of Preparedness Categories

Category	Number of clinics	Percentage
Low	0	0.00%
Moderate	4	23.53%
High	13	76.47%
Total	17	100.00%

3.2. Comparison among Clinics

Klinik Pratama BKIA Rakyat Makassar achieved the highest score, 60 of 60 (100%), indicating that all assessed components were reported as available and functional. Nevertheless, simulation remains necessary to verify activation time, command, communication, evacuation, equipment use, and referral coordination. Klinik Sehat scored 95%, with gaps in emergency-shift arrangements, standardized triage, and referral documentation. Klinik Farida Sehat Makassar scored 93.33%, with missing evacuation mapping and mass-casualty protocols. Klinik Rufaidah Medika and Klinik Pratama Kimia Farma Pettarani each scored 91.67%, but their gaps differed, illustrating that identical aggregate scores may require different interventions.

Three clinics scored 90%, but their needs also varied. Remaining issues included drills, training, backup electricity, standard operating procedures, alarms, formal team structures, referral coordination, and mass-casualty management. Klinik Arteri Medika had the lowest score at 56.67%, followed by HK Medical Center at 61.67%. The 43.33-percentage-point gap between the highest and lowest scores indicates substantial heterogeneity that may reflect differences in organizational capacity, budgets, leadership support, workforce competence, facilities, documentation, and emergency experience.

3.3. Policy, Management, and Human Resources

Most highly prepared clinics had basic disaster plans, emergency task allocation, external coordination, and procedures. However, some lacked written procedures, formally appointed disaster teams, or scheduled drills. These deficits can produce inconsistent actions and unclear command, authority, accountability, and staff replacement during emergencies. This finding supports evidence that leadership, incident command, workforce management, coordination, training, and protocols are central determinants of functional preparedness (7).

Training and simulation were not consistently conducted. Individual competence cannot substitute for organizational readiness, because trained personnel still require command arrangements, role descriptions, communication mechanisms, equipment, and referral systems (8). Priority actions include recurring disaster-management and triage training, formal appointment of disaster teams, emergency-shift planning, interprofessional simulation, and post-exercise competency evaluation. Simulation exercises should test and improve plans and identify communication, coordination, equipment, and decision-making failures that remain hidden during document review (15).

3.4. Infrastructure and Logistics

Emergency alarms and evacuation maps were the most frequent infrastructure gaps. Several clinics also lacked marked evacuation routes, clear assembly points, or designated emergency areas. Alarm systems should be audible throughout the facility, linked to activation procedures, and tested periodically. Evacuation maps should indicate the user

location, exits, alternative routes, assembly points, fire extinguishers, and emergency equipment, including arrangements for patients with reduced mobility.

Logistics were generally stronger, with most clinics reporting emergency medicines, medical equipment, kits, water, and backup power. However, some did not have generators or complete emergency equipment. Operational checks should cover medicine expiry dates, emergency-kit seals, fire-extinguisher pressure and maintenance, generator fuel and load testing, water adequacy, and accessibility of supplies. These results reinforce the 4S framework: space and supplies become effective only when supported by trained staff and functioning systems (2).

3.5. Communication and Emergency Services

Most clinics had internal communication mechanisms, emergency contacts, and referral relationships, but contact updating, emergency documentation, internal alerts, and referral coordination were not always optimal. Communication must support activation, staff recall, evacuation, ambulance requests, referral notification, patient documentation, and interagency coordination. Coalition building can improve system resilience and the management of patient surges (16).

Common service gaps included nonformalized triage, lack of emergency areas, incomplete crisis-care procedures, absence of mass-casualty plans, and limited surge capacity. Surge capacity requires rapid reorganization of staff, space, supplies, equipment, and systems (11). Clinics should define activation criteria, incident command, triage methods, care zones, space expansion, staff mobilization, emergency-stock use, transport, referral, patient tracking, demobilization, and recovery. Because no single mass-casualty triage system is superior in every context, each clinic should select a system suited to its capacity and referral network and use it consistently in procedures and training (17).

3.6. Gap Analysis, Practical Implications, and the SDGs

Table 3. Gaps and Improvement Priorities

Gap	Potential impact	Priority action
Emergency alarm unavailable	Delayed warning and evacuation	Install alarms and test them periodically
Evacuation maps or routes unclear	Confusion among patients and visitors	Display maps and signs in strategic locations
Drills not routine	Personnel unfamiliar with procedures	Conduct drills and after-action reviews
Disaster team not formalized	Unclear command and accountability	Issue formal appointment, structure, and duties
Procedures incomplete	Inconsistent emergency response	Develop, authorize, and disseminate procedures
Triage not formalized	Inconsistent prioritization	Adopt a triage method and provide identifiers
Emergency area unavailable	Limited surge capacity	Designate a temporary emergency zone
Mass-casualty procedure unavailable	Uncoordinated resources and referral	Develop and test an MCI procedure

Gap	Potential impact	Priority action
Backup generator unavailable	Service interruption during outages	Provide and load-test backup power
Referral coordination suboptimal	Delayed patient transfer	Update contacts and test coordination
Emergency documentation incomplete	Weak patient tracking and evaluation	Provide emergency forms and records

Table 3 presents a qualitative synthesis of key preparedness gaps identified across the participating clinics and should not be interpreted as a frequency-based ranking because complete indicator-level frequency data were not available for all gap categories. Therefore, the table is intended to guide practical improvement priorities rather than estimate the prevalence of each gap across all clinics.

The observed gaps were interconnected: alarms initiate response, disaster teams operate command structures, procedures standardize action, communication connects internal and external actors, and triage and emergency zones organize patient flow. Improvements can be staged through organizational formalization and contact updating, acquisition of critical infrastructure and triage resources, and recurring joint simulations followed by audit and corrective action.

From an SDG perspective, the mean score of 83.43% and the predominance of high preparedness indicate that many clinics already provide a platform for SDG 3.d by maintaining institutional capacity for early warning, risk reduction, and health-risk management (12). However, missing alarms, incomplete communication mechanisms, limited drills, and weak mass-casualty arrangements reveal that this contribution remains uneven. Administrative availability should therefore be converted into measurable operational capacity, including activation time, continuity of essential services, referral performance, and recovery.

The findings are also relevant to SDG 11.5 and 11.b because clinics are part of the critical urban service infrastructure needed to reduce disaster-related deaths, affected populations, and service disruption and to operationalize local disaster-risk-reduction strategies (13). The large variation between clinics suggests that city resilience cannot be inferred from a high average alone: lower-scoring facilities may become local points of failure during a widespread emergency. Standardized minimum preparedness requirements, coordinated referral networks, and city-level multisectoral exercises are therefore warranted.

The gaps in backup power, emergency space, training, early warning, and institutional procedures further intersect with SDG 13.1 and 13.3, which emphasize resilience and adaptive capacity to climate-related hazards and stronger education, awareness, and institutional capability (14). In Makassar, clinic preparedness should consequently be incorporated into local climate adaptation and disaster-risk planning. Regular drills based on plausible climate-related scenarios, resilient electricity and water arrangements, and continuity plans would strengthen both health-system adaptation and community resilience. The WHO Health Emergency and Disaster Risk Management framework likewise emphasizes coordination, human and financial resources, risk communication, infrastructure, logistics, and monitoring as components that protect sustainable development and universal health coverage (18).

3.7. Interpretation and Limitations

Most clinics demonstrated strong administrative preparedness and resource availability, but a high score cannot guarantee continuity under every hazard. The instrument emphasized the presence of components rather than their effectiveness. In addition, all 30 indicators were weighted equally, although some elements such as triage systems, emergency alarms, mass-casualty procedures, and backup power may have greater operational importance than others. Consequently, a clinic could achieve a high overall preparedness score despite lacking certain critical response functions. A procedure may exist but remain poorly understood; a generator may be present but unable to carry the clinical load; and a triage system may be documented but untested in a mass-casualty exercise.

The study describes only the assessed clinics and cannot be generalized to all clinics in Makassar. Because recruitment used convenience sampling based on access and willingness to participate, participating clinics may differ from non-participating clinics in governance, documentation, infrastructure, staffing, and openness to external assessment. Documentation quality may also have inflated scores because better-governed facilities were more likely to provide complete evidence. In addition, the high category spanned 71-100%, grouping facilities with materially different levels of completeness. Future assessments should use defined sampling frames, standardized operational definitions, assessor training, documentary verification, inter-rater reliability testing, and simulation-based indicators such as activation time, evacuation time, triage accuracy, referral time, communication function, power continuity, and supply adequacy.

Conclusions

Most clinics had basic disaster-preparedness components, particularly in policy and management, human resources, logistics, and communication. Nevertheless, gaps remained in alarms, evacuation maps and routes, drills, formal disaster teams, emergency procedures, triage, emergency areas, backup electricity, referral coordination, and mass-casualty management. These results show that administrative completeness and resource availability do not necessarily ensure comprehensive operational readiness.

Interventions should be tailored to each clinic's domain-specific weaknesses rather than based solely on rank or overall category. Priorities include installing and testing alarms, displaying evacuation maps, formally establishing disaster teams, standardizing crisis and mass-casualty procedures, strengthening triage, designating emergency zones, securing backup power, and improving referral coordination. These actions would support SDGs 3, 11, and 13 by strengthening health-risk management, resilient urban services, and adaptive institutional capacity. Regular simulation and documented after-action improvement are required to ensure that personnel, infrastructure, logistics, communication, and service systems function as an integrated response.

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Conflicts of Interest

The authors declare no conflict of interest.

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