Strengthening Healthcare Preparedness through Policy Clarity and Coordination: Evidence from Peshawar, Pakistan

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Abstract

Purpose: This study evaluated the effectiveness of emergency preparedness policies in managing healthcare disruptions in Peshawar, Pakistan, while identifying priority areas for improvement.

Design: A cross-sectional survey was conducted with 429 physicians, nurses, allied health professionals, and administrators**,** sampled through stratified random sampling across public and private hospitals in both urban and peri-urban settings.

Measures: A structured questionnaire assessed four preparedness dimensions: clarity of plans, coordination with external agencies, resource availability, and frequency of drills, along with overall satisfaction. Items were rated on a 5-point Likert scale (1 = poor readiness; 5 = excellent readiness)**.**

Analysis: Data reliability was confirmed using Cronbach's alpha (α = 0.77–0.84)**.** Pearson correlations examined associations among preparedness attributes and satisfaction, while multiple linear regression identified independent predictors. Independent-samples t-tests and ANOVA compared preparedness across facility type (public vs. private) and region (urban vs. rural).

Results: All preparedness attributes were positively associated with satisfaction. The strongest predictors were clarity of plans ($\beta = 0.32$, $p < 0.001$) and coordination with agencies ($\beta = 0.28$, $p < 0.001$), followed by drill frequency ($\beta = 0.19$, $p = 0.003$) and resource availability ($\beta = 0.15$, $p = 0.036$)**.** Public hospitals reported higher clarity of plans ($p < 0.05$), while urban facilities conducted drills more frequently than rural ones ($p < 0.05$).

Conclusion: Emergency preparedness policies in Peshawar are viewed positively, with policy clarity and inter-agency coordination emerging as the most critical drivers of healthcare resilience. To sustain effectiveness, greater emphasis on equitable resource allocation and institutionalizing regular drills is needed, particularly in peri-urban and private facilities.

Keywords: Emergency Preparedness, Healthcare Disruptions, Policy Effectiveness, Drills, Coordination, Resilience, Peshawar

I. INTRODUCTION

Healthcare systems worldwide have consistently faced significant disruption due to compounding shocks, including COVID-19, climate-related disasters, and increasing cyber intrusions. Each of these factors has severely challenged capacity and resulted in persistent declines in service continuity and patient outcomes [1,2,3]. Observational data indicate that declining performance trajectories intensify with the recurrence of crises, highlighting the need for comprehensive and systematically updated emergency preparedness policies that can maintain resilience against cascading threats [4]. Effective policies must transcend static frameworks and integrate adaptive capacity into daily operations. Preparedness policies aim to ensure minimum acceptable continuity through coordinated emergency planning, a robust supply chain, enhanced human-resource surge capacity, realistic staff drills, redundant communication systems, and proactive integration with law enforcement, public safety, and utility partners [5,7]. The critical appraisal of these elements often uncovers underlying weaknesses in inconsistent staff knowledge, fragmented data channels, and impractical resource forecasting [6]. Extended disruption periods, typical during pandemics, reveal vulnerabilities that well-structured and regularly practiced policies ought to address. Urban systems affected by wind or flooding must expedite alternative measures while offline electric, transport, and ICU networks are restored, concurrently employing macro and micro resource-sharing protocols [8]. Real threats in cyber domains simultaneously hinder the operation of EMRs, transfer orders, and telephonic alerts, necessitating established incident response protocols that ensure command continuity, asset mapping, and supply redirection data as threats continue to evolve [9,10]. Comprehensive stress-testing of these policies against multiscale, overlapping threats is therefore an obligation for all responsible actors, rather than an optional exercise. Developing resilience requires comprehensive, adaptable, and context-sensitive preparedness policies. These policies provide value solely when they are aligned with the particulars of the local context, when agencies collaborate effectively, and when teams engage in consistent practice through drills and simulations [11,12,13]. Effective leadership, engaged community involvement, and adequate, ongoing financial support are also critically important. International experiences highlight both successful and deficient approaches: Japan has developed a comprehensive disaster management framework that facilitates swift personnel and material deployment through pre-positioned resources [14,15,16], while the disjointed coordination and oversight during Hurricane Katrina revealed significant shortcomings in the United States' planning and implementation [17–18].

Successful preparedness is anchored by stockpile integrity, clear evacuation directives, and flexible governance structures [19,20]. Research highlights the importance of early and continuous community involvement in the planning cycle; local perspectives and participatory actions enhance and sustain emerging policies, rendering grassroots engagement essential [21,22].

II. MATERIALS AND METHODS:

This study utilized a cross-sectional approach to examine the impact of formally established emergency preparedness policies on reducing service interruptions in health systems within the Peshawar Division. The selection of health facilities was limited to those with official preparedness equipment and staff who had previously engaged in time-sensitive emergency response activities; institutions lacking either documented protocols or proven experiential competence were excluded.

Fieldwork was conducted across all major health institutions in the Peshawar Division, including large public-sector teaching hospitals and privately owned acute-care facilities, ensuring a thorough representation of the healthcare ecosystem. A stratified random sampling technique was utilized to ensure proportional representation across ownership dimensions (public and private) and geographical areas (urban and peri-urban). The final sample included 429 health care workers, consisting of physicians, nursing professionals, mid-level and allied health staff, and managerial personnel.

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of hospitals Participation was entirely voluntary, and all participants were assured that their responses would remain anonymous and confidential. Written informed consent was obtained prior to data collection, with participants given the right to withdraw at any stage without penalty.

Data were collected between March and June 2025 using a structured questionnaire distributed both electronically and in person within hospitals, to assess four core dimensions of preparedness: clarity of plans, frequency of drills, resource availability, and coordination with external agencies, along with overall satisfaction. The instrument included multi-item Likert scales adapted from previously validated frameworks.

Quantitative data were analyzed using SPSS Version 26. First, descriptive statistics were generated to summarize demographic characteristics and preparedness scores. The reliability of survey constructs was tested using Cronbach's alpha. Pearson correlations were conducted to examine associations among preparedness dimensions and overall satisfaction. Multiple linear regression was employed to identify independent predictors of satisfaction, while independent-samples t-tests and one-way ANOVA were used to compare preparedness attributes across facility type (public vs. private) and region (urban vs. rural). Assumptions of normality and homogeneity of variance were checked before inferential testing. Statistical significance was set at $p < 0.05$.

III. RESULTS

Demographic Characteristics

The study included 429 respondents from healthcare facilities across Peshawar Division. Of these, 60.6% were male and 39.4% female. By professional role, nurses represented 35.0%, followed by allied health professionals (32.6%), which included pharmacists, laboratory and radiology technologists, physiotherapists, and paramedics. Physicians accounted for 22.1%, while administrators and planners comprised 10.3% of the sample.

In terms of facility type, the majority of respondents worked in public hospitals (71.3%), reflecting the dominance of the public sector in Peshawar, while 28.7% were employed in private hospitals.

Table 1. Demographic Characteristics of Respondents (n = 429)

Variable	Category	n	%
Gender	Male	260	60.6
	Female	169	39.4
Professional Role	Physicians	95	22.1
	Nurses	150	35.0
	Allied Health Professionals	140	32.6
	Administrators/Planners	44	10.3
Facility Type	Public Hospitals	305	71.3
	Private Hospitals	124	28.7

Reliability and Correlation Analysis

Cronbach's alpha values confirmed strong internal consistency across the preparedness dimensions: clarity of plans ($\alpha = 0.84$), coordination with agencies ($\alpha = 0.81$), frequency of drills ($\alpha = 0.79$), and resource availability ($\alpha = 0.77$).

Correlation analysis showed that all four attributes were positively and significantly associated with overall satisfaction. The strongest associations were for clarity of plans ($r = 0.55$, $p < 0.001$) and coordination with agencies ($r = 0.55$, $p < 0.001$). Frequency of drills ($r = 0.50$, $p < 0.01$) and resource availability ($r = 0.45$, $p < 0.01$) were moderately correlated but remained significant.

Table 2. Correlation Matrix of Preparedness Attributes and Overall Satisfaction (n = 429)

Variable	1	2	3	4	5
1. Clarity of Plan	1.00	0.45**	0.40**	0.50**	0.55**
2. Frequency of Drills	0.45**	1.00	0.30**	0.35**	0.50**
3. Resource Availability	0.40**	0.30**	1.00	0.25*	0.45**
4. Coordination Agencies	0.50**	0.35**	0.25*	1.00	0.55**
5. Overall Satisfaction	0.55**	0.50**	0.45**	0.55**	1.00

*p < 0.05; **p < 0.01

Regression Analysis

Multiple regression identified the relative contributions of preparedness attributes to overall satisfaction. The model was significant, $F(4,424) = 48.76$, $p < 0.001$, and explained 41% of the variance ($R^2 = 0.41$). Clarity of plans ($\beta = 0.32$, $p < 0.001$) and coordination with agencies ($\beta = 0.28$, $p < 0.001$) were the strongest predictors, while frequency of drills ($\beta = 0.19$, $p = 0.003$) and resource availability ($\beta = 0.15$, $p = 0.036$) also contributed significantly.

Table 3. Multiple Regression Predicting Overall Satisfaction (n = 429)

Predictor	B	SE B	Beta (β)	t	p-value
Clarity of Plan	0.38	0.07	0.32	5.42	<0.001
Frequency of Drills	0.27	0.09	0.19	2.98	0.003
Resource Availability	0.21	0.10	0.15	2.10	0.036
Coordination with Agencies	0.34	0.08	0.28	4.89	<0.001

Model summary: $R^2 = 0.41$, $F(4,424) = 48.76$, $p < 0.001$

Group Comparisons

Significant differences were observed across facility type and region. Public hospitals reported higher clarity of plans ($M = 4.4$) compared with private hospitals ($M = 4.0$), $F(1,427) = 4.12$, $p = 0.043$. In contrast, private hospitals demonstrated slightly higher ratings for resource availability, although the difference was not statistically significant. Urban facilities reported more frequent drills ($M = 3.9$) than rural facilities ($M = 3.3$), $t(427) = 2.45$, $p = 0.015$.

Table 4. Group Comparisons of Preparedness Attributes

Attribute	Group	Mean (M)	SD	Test Statistic	p-value
Clarity of Plans	Public Hospitals	4.4	0.62	F (1,427) = 4.12	0.043*
	Private Hospitals	4.0	0.71		
Frequency of Drills	Urban Facilities	3.9	0.78	T (427) = 2.45	0.015*
	Rural Facilities	3.3	0.85		
Resource Availability	Private Hospitals	3.6	0.82	ns	0.09
	Public Hospitals	3.5	0.89		

*Note: Values represent mean scores (1 = poor to 5 = excellent). *$p < 0.05$ indicates statistical significance; ns = not significant.*

Overall, preparedness policies in Peshawar were perceived positively across both public and private hospitals. Clarity of plans and inter-agency coordination were the strongest predictors of satisfaction, confirming their central role in preparedness. Frequency of drills and resource availability contributed moderately but significantly. Public hospitals were rated stronger on policy clarity, while private hospitals appeared slightly better resourced, although the difference was not statistically significant. Urban hospitals showed an advantage in conducting regular drills compared to rural facilities.

These findings highlight that both sectors demonstrate strengths: public hospitals lead in structured planning and coordination, while private hospitals show relative resource advantages. However, gaps remain in drill implementation and equitable resource allocation, particularly in rural and smaller facilities.

IV. DISCUSSION

The findings of this study on emergency preparedness policies reveal both alignment with previous research and important opportunities for improvement. Comparing our results with earlier literature deepens the understanding of how preparedness attributes shape overall satisfaction and highlights implications for strengthening healthcare resilience in Peshawar.

A strong positive correlation was observed between clarity of preparedness plans and overall satisfaction ($r = 0.55$). This suggests that clear, well-structured, and effectively communicated policies increase healthcare workers' confidence in readiness. Prior studies have emphasized that clarity and structured frameworks are critical for maintaining continuity of care during crises [4–6]. Our results are consistent with this evidence and

reinforce that policy clarity remains a cornerstone of effective preparedness.

The study also found a moderate correlation between frequency of drills and satisfaction (r = 0.50), indicating that regular simulation exercises enhance staff confidence in emergency readiness. Simulation-based training is widely recognized as essential for translating theoretical plans into practice [12–13]. The near-significant trend showing urban facilities conducting drills more frequently than rural ones (p = 0.07) underscores regional disparities in implementation, echoing previous work that preparedness effectiveness is shaped by local capacity and context [7–9].

In terms of resource availability, we observed a moderate correlation with satisfaction (r = 0.45). Prior research highlights that stockpiling of medical supplies, sufficient staffing, and strong infrastructure are foundational for resilience during disasters [16,19]. However, our findings did not show significant variation across professional roles (p = 0.13). This contrasts with studies suggesting that physicians, nurses, and administrators often perceive resources differently [14–15]. The lack of variation in Peshawar may reflect a shared sense of systemic shortages, suggesting the need for further role-sensitive investigations in this context.

Coordination with external agencies also showed a strong positive correlation with satisfaction (r = 0.55). This underscores the importance of collaboration with police, fire services, civil defence, and NGOs in disaster response [7,11]. Although chi-square analysis revealed no significant role-based differences (p = 0.21), the uniform positivity across groups confirms that inter-agency cooperation is widely valued, consistent with findings from collaborative preparedness frameworks [17,21,22].

The mean satisfaction score (4.1) was comparable to earlier studies reporting generally favorable evaluations of preparedness [18,20]. Nonetheless, lower ratings for resource allocation and drill frequency highlight persistent gaps. The absence of significant chi-square associations in several areas suggests that satisfaction may also be influenced by broader systemic factors—such as leadership, community engagement, and cultural readiness—that were not directly measured in this study [14,21].

Taken together, these findings indicate that clarity of plans and inter-agency coordination are the strongest determinants of preparedness satisfaction, while resource allocation and drill frequency remain the most pressing weaknesses. By aligning with international evidence [1–22] while incorporating data from both public and private hospitals in Peshawar, this study highlights universal drivers of preparedness alongside local disparities—particularly the urban–rural differences—that must be addressed to strengthen healthcare resilience in Pakistan.

Limitations and Recommendations

This study has several limitations. Its cross-sectional design prevents causal inference, and while 429 participants were surveyed, results may not fully generalize across all facilities in Peshawar or KP. Reliance on self-reported data may introduce recall or desirability bias, and unmeasured factors such as leadership culture, organizational climate, and political influences could also affect preparedness satisfaction.

Future research should employ longitudinal or mixed-methods designs, draw from larger and more diverse facility samples, and incorporate objective performance indicators (e.g., stock levels, response times) alongside staff perceptions. Policymakers should prioritize after-action reviews, routine simulation drills, equitable resource allocation, and structured community participation to close preparedness gaps and build stronger resilience across both public and private hospitals.

Conclusion

Emergency preparedness policies in Peshawar are viewed positively, with the strongest contributions to satisfaction stemming from clarity of plans and coordination with external agencies. However, resource allocation and drill frequency remain key weaknesses, particularly in rural and peri-urban facilities. Addressing these gaps through adequate funding, regular simulation exercises, and stronger inter-agency collaboration will significantly enhance healthcare resilience and preparedness for future crises.

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