

Disaster Response Preparedness and Timely Crisis Action Among Nurses in King Faisal Hospital in Makkah: A Cross-Sectional Study

1) Huda Ali Alshehri, RN, MSN, OPD Head Nurse, King Faisal Hospital, Makkah Health Care Cluster, Saudi Arabia. E-mail: alshehrihuda1@gmail.com

2) Jawaher Bin Jumah, RN, PhD, Assistant Professor, Assistant Vice Dean for Graduate Studies and Scientific Research, College of Nursing, King Saud University, Saudi Arabia. ORCID ID "0000-0002-5130-275x" E-mail jjumah@ksu.edu.sa

Corresponding Author

Jawaher Bin Jumah, RN, PhD, Assistant Professor; Vice Dean for Graduate Studies and Scientific Research, College of Nursing, King Saud University, Saudi Arabia ; ORCID ID "0000-0002-5130-275x" jjumah@ksu.edu.sa

Abstract

Background: Incidents and disasters are sudden, unpredictable events that often occur without warning. Timely disaster response is essential in any healthcare setting to ensure the effectiveness of patient care and minimize casualties. The aim of this study was to evaluate the processes and factors that influence the effectiveness of nursing disaster response and timely action in crisis management among nurses at King Faisal Hospital in Makkah.

Aim: The present study evaluates the relationship between disaster response preparedness and timely crisis action among nurses in King Faisal Hospital in the Makkah Region.

Methods: A descriptive cross-sectional design was conducted with a purposeful sample that included 220 nurses working in critical care departments at King Faisal Hospital in the Makkah Region. Data collected through an electronic structured questionnaire included six items of demographic data and the Disaster Response Essentials (disaster response and *Timely Action in crisis*) questionnaire.

Results: The results revealed that around (75.9%) nurses were female, aged 20–30 years (44.5%) with 2 to 5 years of experience (32.3%), (45.0%) of them worked in the Emergency Department, and (70.9%) were Staff Nurses. There was a strong, positive, and statistically significant relationship between disaster response and *Timely Action in crisis* (.000). Factors such as specialized disaster response training, prior experience during Hajj and Umrah seasons, and gender showed statistically significant associations with disaster response levels and timely action among nurses ($P \leq 0.01$).

Conclusion: The study concludes that a high level of preparedness and capability, along with timely action in crisis situations, is essential for nurses. Well-structured disaster preparedness programs and continuous professional development directly contribute to improved readiness and performance among nurses in crisis conditions.

Keywords: Crisis management, disaster preparedness, disaster response, mass gathering healthcare, Makkah Region, nursing preparedness, timely action.

Introduction

Disasters are sudden, unpredictable events that can severely disrupt healthcare systems and exceed the capacity and resources needed to manage patient care effectively. In recent years, the frequency and severity of disasters have increased globally, creating major public health challenges and increasing the demand for effective disaster preparedness and response systems within healthcare settings.¹

Hospitals are expected to maintain disaster preparedness plans and ensure rapid, coordinated emergency responses to minimize casualties and maintain continuity of care.² Nurses play a critical frontline role during disasters through preparedness activities, rapid assessment, communication, resource mobilization, response operations, and recovery efforts.³ In the Makkah Region, disaster preparedness is particularly important because of the annual Hajj and Umrah seasons, which draw massive gatherings of pilgrims and create unique healthcare and emergency response challenges.

Previous studies have shown that disaster preparedness training, simulation exercises, and prior disaster experience have significantly improved nurses' confidence, competencies, and emergency response performance.³ Studies conducted in Saudi Arabia reported that nurses who participated in disaster drills and specialized training demonstrated better preparedness and more effective crisis management skills.² Furthermore, nurses working in mass-gathering settings require additional competencies, including cultural sensitivity, rapid triage, multilingual communication, and management of high patient volumes.^{4,5} Existing literature also emphasizes that effective communication systems, adequate staffing, and sufficient emergency resources are essential for improving nursing disaster response and timely crisis action.^{2,6}

Despite growing global attention to disaster nursing, significant gaps remain in understanding how disaster response preparedness relates to timely crisis action among nurses in mass-gathering healthcare settings. Previous studies in Saudi Arabia have primarily focused on general disaster preparedness, educational needs, or emergency department readiness. To date, limited research has examined how disaster preparedness competencies directly influence timely nursing actions during crises in Makkah healthcare settings.^{4,6} This makes the current study novel because it specifically evaluates the association between disaster response preparedness and timely crisis action among nurses at a tertiary hospital in one of the world's largest mass-gathering settings.

Accordingly, this study evaluates the association between disaster response preparedness and timely crisis action among nurses at King Faisal Hospital in the Makkah Region.

Methodology

Study Design & Setting

This descriptive cross-sectional study was conducted at King Faisal Hospital in the Makkah Region to evaluate processes and factors influencing the effectiveness of nursing disaster response and the timeliness of action in crisis management.

Study Sample: Purposive sampling was employed to identify nurses with relevant disaster response experience.

Inclusion criteria:

1. Nurses working in critical care departments such as Emergency, ICU, Operating Room, Disaster Unit, Medical-Surgical Units, or any department involved in crisis response.
2. Minimum of one year of clinical experience in the hospital.
3. Nurses who have previously participated in disaster drills, emergency training, or are aware of hospital disaster protocols.
4. Willing to participate voluntarily and provide informed consent.

Exclusion criteria

1. Nurses who are new employees with less than one year of experience at King Faisal Hospital.
2. Nurses who are on leave, internship, or training outside the hospital during the period of data collection.
3. Student nurses or trainees who are not licensed practitioners.

Sample Size

The sample size was determined using the Raosoft sample size calculator, applying a 95% confidence level and a 5% margin of error, resulting in a required sample of 220 nurses.

Instruments: In the present descriptive study, data were collected using a questionnaire that was prepared based on a review of literature and international disaster preparedness standards (e.g., WHO and Saudi Ministry of Health guidelines). The Questionnaire measured domains such as preparedness, communication, rapid assessment, resource mobilization, and response operations.

The questionnaire included:

Section 1 - Socio-demographic Data Sheet: developed by the researcher, including: Age, gender, years of experience as a nurse in Makkah, Current department at KFH, receipt of specialized disaster response training, and Experience with mass-gathering healthcare during Hajj/Umrah seasons.

Section 2 - Disaster Response Essentials: This section was vital for disaster response (preparedness, rapid assessment, resource mobilization) and for timeliness in a disaster (how decisions are made, the level of response, and the execution of time-sensitive operations). Elements on the questionnaire are rated on a 5-point Likert scale, representing strongly disagree (score of 1) to strongly agree (score of 5).

Pilot study

A pilot study was conducted with 10 nurses from King Faisal Hospital to assess clarity, comprehensibility, and reliability. Participants were selected through convenience sampling and were not included in the final study sample.

Method of Data Collection

Phase one: Data collection commenced after obtaining ethical approval. An online questionnaire was created using Google Forms, and the link was distributed to the target sample via participants' WhatsApp or email. Upon accessing the link, participants received additional information about the study and the ethical procedures, including data confidentiality and voluntary participation.

Phase three: After collecting the completed questionnaires, all responses were analyzed for completeness. Incomplete questionnaires and duplicate submissions were excluded. Once the required sample size was reached, the survey link was closed to prevent further responses.

Ethical Considerations:

Ethical clearance was obtained from the Ethics Committee at the affiliated university and the Institutional Review Board (MOH) at Makkah City. Subjects were informed that participation was voluntary, and informed consent was obtained from all participants at the beginning of the online questionnaire.

Data Analysis:

Data gathered from the questionnaire were exported from Google Forms into the Statistical Package for Social Sciences (SPSS) version 28 for analysis. The mean, median, and standard deviation were used to summarise demographic characteristics and knowledge data. The chi-square test, one-way ANOVA, and linear regression were applied to assess relationships between socio-demographic variables and timely disaster response. A p -value < 0.05 was considered statistically significant.

Results

Table 1 shows the socio-demographic characteristics of the participants. Most participants were female (75.9%), while males accounted for 24.1%. The majority were aged 20–30 years (44.5%), followed by 31–40 years (40.9%). Most participants had 2–5 years of experience (32.3%) or 6–10 years (29.1%). Nearly half worked in the Emergency Department (45.0%), followed by Medical/Surgical Units (20.9%). Most participants were Staff Nurses (70.9%), followed by Charge Nurses, Nursing Supervisors, Nurse Managers, and Nurse Educators.

Table 1: Distribution of Participants according to their socio-demographic Data

	Variables	Variables	Frequency	Percentage
1	Gender	Male	53	24.1
1	Gender	Female	167	75.9
2	Age	20-30	98	44.5

2	Age	31-40	90	40.9
2	Age	41-50	28	12.7
2	Age	51-60	4	1.8
3	Years of Experience	2-5	71	32.3
3	Years of Experience	6-10	64	29.1
3	Years of Experience	11-15	47	21.4
3	Years of Experience	16-20	30	13.6
3	Years of Experience	Above 20	8	3.6
4	Current Department at King Faisal Hospital	Emergency Dept.	99	45.0
4	Current Department at King Faisal Hospital	ICU	21	9.5
4	Current Department at King Faisal Hospital	Medical/Surgical Units	46	20.9
4	Current Department at King Faisal Hospital	Operating Room	26	11.8
4	Current Department at King Faisal Hospital	OPD	23	10.5
4	Current Department at King Faisal Hospital	Disaster Response Team	5	2.3
5	Nursing Position	Staff Nurse	156	70.9
5	Nursing Position	Charge Nurse	39	17.7
5	Nursing Position	Nursing Supervisor	13	5.9
5	Nursing Position	Nurse Manager	8	3.6
5	Nursing Position	Nurse Educator	4	1.8

Table 2 presents the descriptive statistics for nurses' disaster response across six domains. Overall, nurses demonstrated a high level of disaster response competence, with a mean total score of 120.10 ± 16.340 . The highest mean scores were observed in preparedness, rapid

assessment, and recovery, indicating strong abilities in disaster planning, rapid assessment, and post-disaster support. Slightly lower scores were found in response operations and resource mobilization, while communication had the lowest mean score.

Table 2. Descriptive statistics for nurses' Disaster Response

Statistics	Statistics	Statistics	Statistics
	Preparedness	Rapid Assessment	Resource Mobilization
Valid	220	220	220
Missing	0	0	0
Mean	20.47	20.31	19.84
Std. Deviation	3.308	3.311	3.211
Minimum	5	5	8
Maximum	25	25	25

Table 3 presents descriptive statistics on nurses' timely actions during crises across decision-making, response implementation, and time-critical operations. Nurses performed well across all domains, with the highest mean score in time-critical operations, followed by response implementation and decision-making. The overall mean score was 60.42 ± 8.434 , indicating a strong ability to respond quickly and effectively during emergencies.

Table 3. Descriptive statistics for nurses Timely Action in Crisis

Statistics	Statistics	Statistics	Statistics	Statistics
		Decision Making	Response Implementation	Time- critical Operation
N	Valid	220	220	220
N	Missing	0	0	0
Mean	Mean	20.05	20.15	20.22
Std. Deviation	Std. Deviation	3.083	3.011	3.046
Minimum	Minimum	10	10	12
Maximum	Maximum	25	25	25

Table 4 presents the relationship between nurses' socio-demographic characteristics and disaster response levels using the Chi-square test. Significant associations were identified for gender ($p = .012$), specialized disaster-response training ($p = .001$), and experience during the Hajj/Umrah seasons ($p = .020$). Female nurses, those who received specialized training, and those with Hajj/Umrah experience demonstrated higher levels of disaster response. In contrast, age, years of experience, working department, and nursing position showed no significant association with disaster response levels.

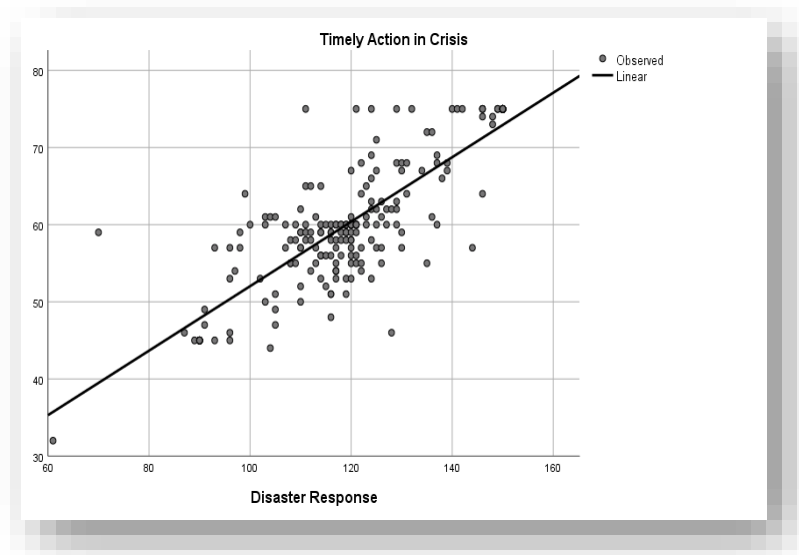
Table 4. Relationship of Socio-demographic characteristics with nurses' Disaster Response

		Total Score	Total Score	Total Score	Total			
		low	Moderate	High	Total	χ^2	P value	P value
Gender	Male	0	22	31	53	.012	.012	.012
Gender	Female	2	105	60	167	.012	.012	.012
Total	Total	2	127	91	220	.012	.012	.012
Have you received specialized disaster response training?	Have you received specialized disaster response training?	Yes	1	113	84	198	.120	.001
Have you received specialized disaster response training?	Have you received specialized disaster response training?	No	1	14	7	22	.120	.001
Total	Total	Total	2	127	91	220	.120	.001
Experience with mass gathering healthcare during Hajj/Umrah seasons	Limited (1-2 seasons)	2	37	18	57	.012	.020	

Experience with mass gathering healthcare during Hajj/Umrah seasons	Moderate (3-5 seasons)	0	52	30	82	.012	.020
Experience with mass gathering healthcare during Hajj/Umrah seasons	Extensive (6+ seasons)	0	38	43	81	.012	.020
Total	Total	2	127	91	220	.012	.020

Figure 1 illustrates a strong, positive, and statistically significant relationship between nurses' disaster response and timely action during crisis situations ($p = .000$). The findings indicate that nurses with higher disaster response competencies were more capable of making quick decisions, implementing effective responses, and managing time-critical operations during emergencies.

Figure 1. *Relationship of Timely Action in Crisis with Nurses' Disaster Response*



Discussion

The present study demonstrated high levels of disaster preparedness and timely crisis action among nurses at King Faisal Hospital in the Makkah Region. A significant positive relationship was found between disaster preparedness competencies and timely nursing action during

emergencies, indicating that nurses with higher preparedness levels were more capable of rapid decision-making, effective response implementation, and time-critical operations management. Moreover, these findings support previous evidence emphasizing that preparedness training and practical exposure are essential determinants of effective disaster nursing performance.^{1,6} Skelton et al.¹ highlighted that healthcare preparedness is fundamental for maintaining continuity of care and reducing disaster-related morbidity during emergencies. Similarly, Alruwaili et al.² reported that hospitals with stronger preparedness systems demonstrated better emergency coordination and response efficiency during disasters.

Most participants reported receiving specialized disaster preparedness training, reflecting the hospital's strong emphasis on disaster readiness. Nurses who had received specialized training demonstrated significantly higher disaster response competencies than those without training. Similar findings were reported by Al Harthi et al.³ and Brinjee et al.,⁸ who observed that structured disaster preparedness programs and simulation-based training improved nurses' confidence, practical disaster management skills, and emergency response readiness. Al Thobaity et al.⁶ also reported that nurses with prior disaster education demonstrated stronger knowledge and preparedness in disaster management than those without formal training. Labrague et al.⁹ concluded that continuing education, simulation exercises, and continuous professional development significantly strengthen nurses' preparedness competencies and emergency response performance.

The majority of nurses in the present study had prior experience providing healthcare to pilgrims during the Hajj and Umrah seasons. This repeated exposure to mass-gathering healthcare environments may explain the high preparedness levels observed across disaster response domains. Nurses working during the Hajj are frequently exposed to overcrowding, trauma, infectious disease threats, and mass-casualty incidents, which likely enhance their practical disaster management skills and emergency response performance. Similar observations were reported by Alzahrani and Kyratsis⁴, who found that emergency nurses in Makkah hospitals demonstrated stronger disaster management competencies due to repeated exposure to mass-gathering emergencies. Memish et al.¹⁰ and Alrabie T¹¹ also highlighted that Hajj healthcare settings require rapid triage, multidisciplinary coordination, and efficient emergency management because of the complexity and scale of mass-casualty situations during pilgrimage seasons.

The present study identified high scores across the preparedness, rapid assessment, and recovery domains, indicating that nurses possessed strong abilities in disaster planning, emergency assessment, and post-disaster management. These findings are consistent with previous studies conducted in Saudi Arabia and internationally.^{3,8,12} However, Khan et al.¹² and Setyawati et al.¹³ reported only moderate disaster preparedness among nurses and healthcare institutions, suggesting that preparedness may vary by institutional resources, training opportunities, and disaster management systems.

The findings also showed that nurses with prior Hajj and Umrah healthcare experience had significantly higher disaster response competencies. Mass-gathering healthcare settings

provide nurses with practical experience in crowd management, emergency triage, and infectious disease control. Al-Tawfiq and Memish¹⁴ emphasized that healthcare professionals working during Hajj require advanced preparedness because of the increased risk of infectious disease outbreaks and large-scale emergencies associated with mass gatherings. Similar findings were reported by Al-Wathinani et al.¹⁵, who observed that healthcare providers with prior disaster experience demonstrated stronger emergency response competencies and greater confidence during crises.

The current study identified a strong positive relationship between disaster preparedness and timely crisis action. Nurses with higher preparedness competencies demonstrated better decision-making, faster response implementation, and improved performance during time-sensitive operations. Similar findings were reported by Nofal et al.¹⁶ and Zhang et al.¹⁷, who observed that healthcare professionals participating in disaster preparedness programs and simulation exercises demonstrated significantly better emergency response performance. Disaster preparedness training improves situational awareness, communication, confidence, and coordination, enabling nurses to respond more effectively in crisis situations.^{18,19,20}

In addition, the findings of the present study have important implications for disaster preparedness in mass-gathering healthcare settings. Regular disaster preparedness programs, simulation-based training, multidisciplinary drills, and competency assessments are necessary to strengthen nurses' emergency response performance. Emerging technologies, such as artificial intelligence, may further improve disaster management systems, communication, and emergency decision-making. In previous studies, authors highlighted the growing role of artificial intelligence in improving clinical decision support, healthcare coordination, and emergency management within healthcare systems.^{25,26,27}

Despite these positive findings, several studies reported conflicting evidence on nurses' disaster preparedness. Said and Chiang²¹ found that many nurses still showed only moderate psychological preparedness despite disaster education and training programs. Similarly, Baack and Alfred²² reported that nurses frequently perceived themselves as inadequately prepared to manage large-scale disasters despite prior educational exposure. Al Khalaileh et al.²³ also observed variability in preparedness levels based on institutional support, continuing education opportunities, and practical disaster exposure. Nilsson et al.²⁴ reported only moderate preparedness levels among healthcare institutions in Saudi Arabia, suggesting that preparedness varies with organizational resources and disaster management systems. Likewise, Alim et al.²⁵ found that nurses working in disaster-prone settings still reported insufficient preparedness because of inadequate training opportunities and institutional limitations.

Further, the authors argued that disaster drills alone may not substantially improve real-world disaster performance unless training is continuous, multidisciplinary, and regularly evaluated. These contrasting findings indicate that disaster preparedness requires sustained institutional support, repeated practical exposure, simulation-based education, and competency evaluation to effectively improve real-world emergency response performance.^{26,27}

The findings of the current study have important implications for healthcare institutions managing disasters and mass-gathering events. Regular simulation-based training, disaster drills, competency assessments, and continuing education programs are necessary to strengthen nurses' preparedness and enable timely crisis action. Emerging technologies, such as artificial intelligence, may further support emergency preparedness systems and clinical decision-making during disasters. Aryuwat et al. ²⁸ and Veenema et al. ²⁹ highlighted the growing role of artificial intelligence in improving healthcare coordination, clinical decision support, and emergency management systems within healthcare settings.

Overall, the findings underscore the need to strengthen disaster preparedness programs, communication systems, teamwork, and organizational support within healthcare institutions. The results suggest that regular disaster preparedness programs, simulation-based training, multidisciplinary drills, and competency assessments are necessary to improve nurses' emergency response performance. In high-risk healthcare systems such as Makkah, these measures will improve patient outcomes during mass casualty incidents and public health emergencies.

Several limitations should be considered when interpreting the findings of this study. The study was conducted at a single tertiary hospital, and the cross-sectional design captures preparedness at a single point in time. Self-administered questionnaires may also introduce response bias and overestimate preparedness levels.

Future research should prioritize multicenter studies across diverse healthcare settings in Saudi Arabia to provide a broader evaluation of nursing disaster preparedness. Longitudinal studies are also recommended to examine the long-term impact of simulation-based training and disaster education on actual emergency performance. Qualitative studies, such as exploring nurses' firsthand experiences during the Hajj and Umrah emergencies, may provide a deeper understanding of the operational and psychological challenges faced during disaster response. Research evaluating technology-assisted communication systems, digital triage tools, and artificial intelligence applications in disaster nursing may also strengthen emergency preparedness frameworks in mass-gathering healthcare settings.

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Declaration of Conflicting Interest

The authors confirm that there are no conflicts of interest to declare regarding this article.

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