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Perceived preparedness for disaster and emergency situations among nursing students in Saudi Arabia: The role of educational training and simulation

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Abstract:
Nurses play a critical role in disaster and emergency response, making preparedness training an essential component of undergraduate nursing education. Therefore, it is of interest to assess the perceived preparedness among 188 undergraduate nursing students in Levels 5–8 at the College of Nursing–Jeddah, King Saud bin Abdulaziz University for Health Sciences. Overall preparedness was moderate, with students reporting greater confidence in theoretical emergency knowledge (3.74 ± 0.81) than in managing trauma cases (3.48 ± 0.94). Students exposed to hospital-based emergency education, formal emergency courses and simulation-based disaster training reported greater preparedness than students without such training. Thus, data shows that integrating more simulation exercises, hands-on trauma training and disaster-response education into undergraduate nursing curricula.

Keywords: Nursing education, knowledge, disaster preparedness; emergency preparedness; nursing students; nursing education; simulation-based learning

Background:
Disaster preparedness education has become a critical component of nursing curricula worldwide **[1]**. The ANA pays much attention to the idea that disaster preparedness is a fundamental nursing role and promotes it in nursing education. To make sure that future nurses will gain the necessary emergency skills, it is necessary to include disaster training in nursing programs, both in terms of theoretical teaching and practice **[2]**. The future frontline is comprised of nursing students, but what they truly go through during training directly influences their readiness level rather than what is reflected in course descriptions **[3]**. The importance of perceived preparedness is that confidence and perceived competence are related to willingness to respond, protocol compliance, teamwork behavior and pressure-based decision-making **[4]**. In case students experience a feeling of unpreparedness, we can probably expect the following results: avoidance and hesitance, worse performance when faced with high-acuity situations and high stress and burnout risk levels at the real events. Simultaneously, the lack of competence and overconfidence are also harmful and it is essential to learn how students rate their preparedness and what training aspects influence that view **[5]**. Simulation-based training is one of the widely accepted ways of teaching and it enables students to practice emergency responses in a realistic, risk-free setting. An example of such practice is the Hertfordshire Intensive Care and Emergency Simulation Centre (HICESC) in the UK, where the immersive simulations have been proven to be very helpful in terms of preparing students and increasing their confidence **[6]**. The use of simulation has been effective in other parts of the world and the studies have affirmed its application on the enhancement of triage skills, decision-making and team communication **[7]**. Tabletop and Virtual simulations also allow the students to convert abstract knowledge into action in real-time in the clinical setting. Disaster training is also becoming more and more dependent on online learning. Courses such as the Sigma Marketplace, Disaster Preparedness and Response and Nursing CE, CE courses can teach nurses how to prepare or respond to a disaster and the principles of triage, which helps strengthen professional preparedness. Nevertheless, as many studies show, in many cases, there is still a lack of practice in the disaster response of nursing students, despite their theoretical knowledge **[8, 9]**. Therefore, it is of interest to describe the nursing students' perceived preparedness for disaster and emergency situations in Saudi Arabia and to show how educational training and simulation-based learning are associated with their confidence and readiness to respond.

Methodology:
This quantitative cross-sectional survey study was conducted at the College of Nursing, Jeddah (CON-J), King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), Jeddah, Saudi Arabia. The study population consisted of undergraduate nursing students enrolled in Levels 5 through 8 of the Bachelor of Nursing programs at CON-J, KSAU-HS. The target population comprised approximately 300 nursing students enrolled in Levels 5–8. Sample size was calculated using Cochran's formula for finite populations, assuming a 95% confidence level, a 5% margin of error and a response distribution of 50% to maximize sample size estimation. The calculated sample size was 169 students. After adjusting for an anticipated non-response rate of 10%, the final required sample

size was increased to 188 students. A stratified random sampling technique was employed to ensure proportional representation of students from each academic level (Levels 5–8).

Inclusion criteria:

[1] Nursing students enrolled in the BSN program at CON-J
[2] Students registered in academic Levels 5 to 8
[3] Students who voluntarily agreed to participate
[4] Students who were available during the data collection period

Exclusion criteria:

[1] Students enrolled in Levels 1 to 4
[2] Students from other KSAU-HS campuses or external institutions
[3] Students who did not provide informed consent
[4] Students on academic leave or absent during the study period

Data collection:

Ethical approval was obtained from the King Abdullah International Medical Research Center and the Institutional Review Board of the College of Nursing, Jeddah, KSAU-HS. The college administration was also given permission. Stratified random sampling was employed in recruiting eligible participants. The purpose of the study, voluntary participation, confidentiality and right to discontinue at any point were communicated to all students extensively. Informed consent was taken before participation due to written consent. The questionnaire was to be conducted electronically through safe online platforms or paper format where necessary. The process of data collection was conducted in around four to six weeks with reminder notifications being sent to enhance response rates. No personal data were gathered and information was kept locked up and had limited access. The structured, self-administered questionnaire was used in data collection as the questionnaire included closed-ended items, which were measured on a 5-point Likert scale. The survey consisted of the demographic data, perceived disaster and emergency preparedness, exposure to educational training on disaster response, involvement in disaster management learning activities using simulation and confidence in dealing with real life emergencies. The tool was created on the foundation of the existing disaster preparedness models and the former surveys that are proven in the nursing education setting. The content validity was confirmed by matching the questionnaire items to accepted standards of disaster nursing education as well as the review conducted by three nursing education and disaster preparedness experts. Cronbach alpha was used to measure internal consistency reliability and the values above 0.70 were taken as acceptable. A pilot test was done on 15 nursing students who were not to be included in the final analysis to measure the instrument factuality, relevance and feasibility. The pilot testing and professional input were used to make minor refinements to the study objectives.

Data analysis:

Completed questionnaires were reviewed for completeness and accuracy before data entry into Microsoft Excel and analysis using IBM SPSS Statistics v25.0. Descriptive statistics, including frequencies, percentages, means and standard deviations, were used to summarize demographic characteristics and preparedness scores. Internal consistency reliability was evaluated using Cronbach's alpha. Inferential analyses included chi-square tests for associations between categorical variables, independent-samples t-tests for group comparisons and one-way analysis of variance to assess differences across academic levels. All statistical tests were two-tailed, with statistical significance set at $p < 0.05$.

Results:

Data were collected from 188 nursing students; the majority were female (66.0%), while males constituted 34.0%. More than half of the participants were aged 18–22 years (52.1%), followed by those aged 23–27 years (38.3%), with a smaller proportion aged 28 years or above (9.6%). Students were relatively evenly distributed across academic levels, with Level 6 students forming the largest group (26.6%), followed closely by Level 7 (25.0%), Level 5 (24.5%) and Level 8 (23.9%). Slightly over half of the participants reported having participated in hospital-based emergency training (55.3%) and 59.6% had received formal emergency preparedness training such as BLS, ACLS, or trauma response (**Table 1**). Regarding training duration, 36.1% had completed more than 10 hours of emergency training, while 33.0% reported less than 5 hours and 30.9% reported 5–10 hours. Overall, students reported moderate to high agreement across preparedness domains. Confidence in responding to emergencies had a mean score of 3.62 ± 0.89, while perceived sufficiency of theoretical knowledge scored slightly higher at 3.74 ± 0.81. Familiarity with hospital emergency protocols showed a mean of 3.58 ± 0.92. Lower mean scores were observed for perceptions of curriculum adequacy in disaster preparedness (3.21 ± 1.01) and preparedness for disaster scenarios outside the hospital setting (3.34 ± 0.96), indicating areas where students felt comparatively less prepared (**Table 2**). A majority of students reported being comfortable or very comfortable performing adult CPR (62.8%), whereas fewer students expressed similar comfort with pediatric CPR (43.6%). Confidence in handling trauma cases was moderate, with a mean score of 3.48 ± 0.94. Slightly more than half of the participants had received hands-on trauma care training (52.1%), while only 40.4% had been trained to respond to mass casualty incidents. Students demonstrated strong understanding of the nursing role in disaster response (3.88 ± 0.79) but reported moderate comfort working in high-stress disaster environments (3.42 ± 0.91). Simulation-based disaster training was reported by exactly half of the participants. Commonly identified barriers included limited hands-on practice (64.9%), lack of time due to academic workload (55.3%) and insufficient institutional training opportunities (51.1%). Perceived adequacy of institutional resources was modest (3.09 ± 1.03) (**Table 3**).

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Table 1: Demographic characteristics and emergency training background of participants (n = 188)

Variable	Category	n (%)
Gender	Male	64 (34.0)
	Female	124 (66.0)
Age Group (years)	18–22	98 (52.1)
	23–27	72 (38.3)
	≥28	18 (9.6)
Level of Study	Level 5	46 (24.5)
	Level 6	50 (26.6)
	Level 7	47 (25.0)
	Level 8	45 (23.9)
Hospital-based emergency training	Yes	104 (55.3)
	No	84 (44.7)
Formal emergency training (BLS/ACLS/Trauma)	Yes	112 (59.6)
	No	76 (40.4)
Hours of emergency training	< 5 hours	62 (33.0)
	5–10 hours	58 (30.9)
	> 10 hours	68 (36.1)

Table 2: Perceived general emergency preparedness among nursing students

Statement	Mean ± SD
Confidence in responding to emergencies	3.62 ± 0.89
Sufficient theoretical knowledge to manage emergencies	3.74 ± 0.81
Familiarity with hospital emergency protocols	3.58 ± 0.92
Curriculum provides sufficient disaster preparedness	3.21 ± 1.01
Preparedness for disaster scenarios outside hospital	3.34 ± 0.96

(Likert scale: 1 = Strongly Disagree, 5 = Strongly Agree)

Table 3: CPR and trauma response readiness

Variable	Category	n (%) / Mean ± SD
Comfort performing adult CPR	Comfortable / Very comfortable	118 (62.8)
	Neutral	42 (22.3)
	Not comfortable	28 (14.9)
Comfort performing pediatric CPR	Comfortable / Very comfortable	82 (43.6)
	Neutral	56 (29.8)
	Not comfortable	50 (26.6)
Confidence handling trauma cases	—	3.48 ± 0.94
Hands-on trauma care training	Yes	98 (52.1)
	No	90 (47.9)
Training for mass casualty incidents	Yes	76 (40.4)
	No	112 (59.6)
Understanding nurse's role in disaster response	—	3.88 ± 0.79
Comfort working in high-stress disaster environments	—	3.42 ± 0.91
Institution provides simulation-based disaster training	Yes	94 (50.0)
	No	94 (50.0)
Limited hands-on practice	—	122 (64.9)
Lack of time due to academic workload	—	104 (55.3)
Insufficient institutional training opportunities	—	96 (51.1)
Lack of confidence in emergency procedures	—	78 (41.5)
The institution provides sufficient resources	—	3.09 ± 1.03
Need to integrate more training into curriculum	Yes	164 (87.2)
	No	24 (12.8)

Discussion:

This study evaluated the perceived preparedness of nursing students in Saudi Arabia for disasters and emergencies, with particular emphasis on the role of educational training and simulation-based learning. All in all, the results show that among students of nursing, the perceived preparedness was moderate, with greater confidence in theoretical knowledge compared to practical and disaster-specific ability. The given trend indicates that although the existing nursing programs offer a general idea of emergency care, there are still areas of weakness in terms of learning-by-doing and practice. The students who were reported to have had exposure to hospital-based emergency training, formal certification, exercises like BLS or ACLS and the use of simulation-based training in disaster training had a high score on preparedness. These results are consistent with the findings of past studies that indicated that structured emergency education and simulation exercises have a substantial positive impact on nursing students in terms of their confidence, clinical decision-making and preparedness to act in a stressful setting. Specifically, the simulation-based learning enables students to train in the unlikely yet high-risk situations within a safe setting and develop not only technical but also non-technical competencies, including communication, leadership and stress management **[10]**. Although there was moderate confidence in clinical emergency response, the preparedness in the case of disaster in the environment other than the hospital was relatively less. This observation is indicative of a long-standing gap in disaster nursing education,

where it is common to teach about disasters occurring in hospitals instead of systematic, community-based events. Similar findings have been documented in previous studies, which lacked student confidence in mass casualty and disaster response, which is usually due to a lack of exposure to mass casualty and disaster exercises of a realistic nature and interprofessional exercises **[11]**. The fact that the percentage of students who receive training on the management of mass casualties is the lowest in this study is another indication that disaster-oriented modules should be included in the undergraduate nursing curriculum as such modules. CPR and trauma response preparedness showed significant differences and students reported being more comfortable using adult CPR compared to their preparedness to use pediatric CPR **[12]**. This difference could be attributed to a decreased opportunity to get exposed to pediatric emergencies in clinical training. Also, approximately half of the participants said that they did not undergo practical training on trauma care and this could have been a factor in their lack of confidence in handling cases of trauma. Previous research has pointed out that exposure and repeated skills-based training are crucial in the achievement of competence in emergency procedures, especially those demanding speeded decision-making and intervention **[13]**. The obstacles to emergency preparedness training identified in this study included a lack of practical training, academic overload, institutional training barriers and a lack of confidence in emergency preparedness. These issues are like the observations of past studies regarding the same educational environment, where the overcrowding of the curricular content and scarcity of simulation facilities inhibited successful emergency preparedness training **[14]**. This research has some limitations which must be acknowledged. The cross-sectional methodology does not allow for defining any causal relationships between educational training, exposure to simulation and perceived preparedness. The data were self-reported and this might result in response and social desirability bias, which may not represent real clinical competence during real emergencies. Since the research was done in one nursing institution, it might not be possible to generalize the findings to other nursing colleges in Saudi Arabia or even in other countries **[15]**. Despite the use of stratified random sampling, the bias of non-response cannot be eliminated because, most likely, students who were more interested or confident in emergency preparedness might have better chances to be selected. Also, the lack of objective measurement, including, but not limited to, practical tests or observed simulation performance, limits the possibility to compare perceived preparedness with actual skills.

Conclusion:

Nursing students showed moderate disaster and emergency preparedness, with stronger theoretical knowledge than practical readiness. Simulation, formal emergency education and hospital-based training were associated with greater confidence and preparedness. Nursing curricula should therefore prioritize hands-on trauma care, pediatric resuscitation and mass-casualty simulation to strengthen real-world response competence.

Advancement to knowledge:

This study provides current evidence on perceived disaster and emergency preparedness among undergraduate nursing students in Saudi Arabia. It identifies a gap between students' theoretical knowledge and their confidence in practical, trauma-related, pediatric CPR and mass-casualty response skills. The findings also demonstrate the importance of hospital-based education, formal emergency training and simulation-based learning in strengthening perceived preparedness. These results support greater integration of practical simulation and disaster-specific training into undergraduate nursing curricula.

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