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Perceived disaster-response self-efficacy among emergency medicine residents

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Background: Emergency medicine (EM) residents play a frontline role in disaster and mass-casualty incident (MCI) response; however, few studies have examined their perceived self-efficacy and familiarity with key disaster-management protocols. This study evaluated whether a structured four-week course could enhance EM residents' self-efficacy, disaster knowledge, and preparedness. Specifically, we asked: (1) Does a structured disaster-medicine course improve EM residents' perceived self-efficacy in disaster response? and (2) Does it improve their knowledge of core preparedness concepts? We hypothesized that the course would yield a significant increase in self-efficacy and at least a 10% improvement in knowledge.

Methods: A single-center pre-test/post-test intervention was conducted among 30 EM residents enrolled in a four-week disaster-management course structured using the ADDIE (Analysis, Design, Development, Implementation, Evaluation) framework. The course integrated didactic sessions, online lectures by international faculty, and scenario-based tabletop exercises simulating MCI decision-making under time pressure. A validated questionnaire, adapted from the Emergency Preparedness Information Questionnaire, assessed self-efficacy, knowledge, and familiarity with hospital protocols before and after the course. Data were analyzed using descriptive statistics, paired *t*-tests, and correlation analyses in IBM SPSS (Version 21.0)

Results: Among the 30 participants (76.7% female), most were in their first or second postgraduate year. Baseline self-efficacy was low (mean = 2.4/5) but improved significantly post-course (mean = 3.6; $p < 0.001$). Participants demonstrated notable gains in knowledge of the Hospital Incident Command System, surge management, and disaster-plan activation triggers. While triage accuracy remained high (94.9% → 95.2%; $p = 0.88$), mean cycle time improved from 6.9 to 3.2 min—a nearly 50% reduction that, although not statistically significant ($p = 0.08$), represents an operationally meaningful improvement.

Conclusions: A focused, simulation-enhanced disaster management course significantly improved EM residents' perceived self-efficacy and familiarity with critical disaster protocols. These findings support integrating structured disaster-medicine curricula into residency programs and justify longitudinal follow-up to evaluate knowledge retention and real-world performance.

KEYWORDS

emergency medicine, disaster medicine, curriculum design, tabletop exercise (TTX), mass-casualty incident (MCI), resident, medical education

Introduction

Disasters, ranging from natural catastrophes to mass casualty incidents, pose complex challenges to healthcare systems worldwide. Recent global events have underscored the need for robust, multifaceted preparedness plans and well-trained clinicians capable of managing rapid patient surges with limited resources (1). Emergency departments (EDs) are often the initial point of clinical contact for disaster victims, placing emergency medicine teams at the forefront of acute crisis response. This frontline role not only requires mastery of core technical competencies such as triage, Field stabilization and decontamination, but also necessitates adaptive leadership, efficient team coordination, and psychological resilience (2, 3).

Within EDs, emergency medicine residents represent a critical component of the workforce. These physicians in training are typically responsible for stabilizing critically ill patients and assisting with care coordination under the supervision of attending physicians. In disaster scenarios, however, protocols can rapidly evolve, and resources may become severely constrained. Residents may find themselves performing at a higher level of independence or assuming additional responsibilities typically outside their usual scope of practice. Ensuring that these trainees possess the confidence driven by a perceived self-efficacy to perform effectively is a key determinant of successful disaster response (4–6). Some studies have demonstrated strong links between higher self-efficacy in disaster medicine and improved preparedness behaviors, enhanced leadership capabilities, and more positive patient outcomes (7, 8).

Despite such evidence, disaster medicine training remains inconsistently integrated into emergency medicine curricula (9–11). Sandifer et al. highlight that only 37% of EM residency programs in the U.S. include core disaster medicine topics recommended by SAEM, with significant variation in depth and delivery. A 2023 global review echoed these findings, observing wide variability in the use and format of disaster preparedness simulations, including tabletop, functional, and full-scale exercises across healthcare systems (12).

Several studies have evaluated the disaster-preparedness levels of EM residents internationally [e.g., (11, 13)], but comparable data from the Middle East are scarce. This study therefore provides new regional evidence and practical insight into how structured simulation-based interventions affect perceived preparedness and knowledge among EM trainees.

Many residents receive only sporadic exposure to disaster-management concepts, often through short workshops or infrequent drills (14). The present study therefore sought to examine the effect of a structured four-week disaster-medicine course, explicitly guided by the ADDIE instructional-design framework, on residents' perceived self-efficacy and knowledge. The research questions were:

- Does a structured disaster-medicine course improve EM residents' perceived self-efficacy in disaster response?
- Does it improve their knowledge of core preparedness concepts?

We hypothesized that the course would result in a statistically significant increase in self-efficacy and at least a 10% improvement in knowledge scores.

Methods

Study design and setting

A pre-test–post-test intervention study was conducted at a tertiary-care teaching hospital affiliated with the Mohammed Bin Rashid University (MBRU) residency training program in Dubai, United Arab Emirates. Data were collected from all eligible EM residents across postgraduate years 1–4 to capture varying levels of clinical experience. A control group could not be incorporated because of program size and scheduling constraints; however, future iterations will include a comparison group to enhance internal validity.

Participants and eligibility

All 30 currently enrolled EM residents were invited to participate. Inclusion criteria:

- Active registration in the MBRU EM program;
- Provision of informed consent; and
- Completion of both pre- and post-intervention surveys.

Residents who declined consent or failed to complete both surveys were excluded.

Intervention: disaster management education course

The four-week structured course was developed using the **ADDIE** (Analysis, Design, Development, Implementation, Evaluation) framework (29) and delivered in three modules:

- **General disaster-medicine concepts**—basic terminology and classification, hazard-vulnerability analysis, and surge-capacity principles.
- **Mass-Casualty-Incident (MCI) management**—incident-command-system fundamentals, S.T.A.R.T. triage, treatment priorities, and crisis standards of care.
- **Disaster-simulation module**—two tabletop exercises simulating pre-hospital and in-hospital MCIs emphasizing command coordination, resource allocation, and ethical decision-making under pressure.

Instruction combined face-to-face lectures, online sessions with international faculty, and immersive gamified tabletop simulations.

Data collection instruments

A validated questionnaire, adapted from the **Emergency Preparedness Information Questionnaire** (EPIQ) (15, 28), was used to assess self-efficacy, familiarity, and knowledge.

It comprised six domains: demographic data; perceived self-efficacy; prior disaster-training experience; attitudes toward disaster medicine; objective knowledge; and familiarity with institutional procedures. Each item used a five-point Likert scale (1 = strongly disagree → 5 = strongly agree).

The instrument's internal consistency and content validity were confirmed through expert review and pilot testing among four EM residents.

Procedure

Pre-course (week 0)

Participants received a link to the electronic pre-course questionnaire via the official residency WhatsApp group. They were instructed to complete it anonymously before attending any course sessions. This served as the baseline (pre-intervention) dataset.

Educational intervention (weeks 1–4)

Participants attended the three modules described above, with sessions delivered by local and international faculty experts. Key competencies were reinforced through scenario-based gamified exercises and real-time group discussions. The simulation component consisted of a structured, gamified tabletop exercise where residents assumed operational roles in a fictional MCI, navigating real-time challenges and decision-making under time constraints.

Post-course (week 4)

One week after the final session, participants received the same questionnaire to measure changes in self-efficacy, knowledge, and attitudes. They were also asked to evaluate the overall course quality and provide feedback on teaching methods and content relevance.

Participants were explicitly informed that responses would be confidential and unrelated to program evaluation to minimize social-desirability bias. To further mitigate self-reporting bias, all responses were anonymized and participation was voluntary. The data were anonymized and securely kept, ensuring no direct identifiers of individual performance. Furthermore, objective metrics such as triage accuracy and cycle duration were incorporated to corroborate the findings on perceived self-efficacy.

Outcome measures

Primary outcome: change in perceived disaster-management self-efficacy between pre-and post-tests.

Secondary outcomes: change in knowledge, attitudes, and procedural familiarity (including hospital codes, activation triggers, and key command roles).

TABLE 1 Participant demographics and background characteristics (pre and post-intervention).

Variable/category	Count (%)
Gender	
Female	23 (76.67%)
Male	7 (23.33%)
Age category	
21–29	28 (93.33%)
30–39	2 (6.67%)
Training year	
Other	1 (3.33%)
PGY1	9 (30.0%)
PGY2	9 (30.0%)
PGY3	6 (20.0%)
PGY4	5 (16.67%)
Nationality	
African	1 (3.33%)
Emirati	9 (30.0%)
Other Arab	14 (46.67%)
South Asian	6 (20.0%)
Disaster experience	
No	23 (76.67%)
Yes	7 (23.33%)
Disaster training (exposure)	
No	13 (43.33%)
Yes	17 (56.67%)
Previous training/exposure	
No training/exposure	15 (50.0%)
Conference/workshops	3 (10.0%)
Simulation training	3 (10.0%)
Academic lectures	7 (23.3%)
Residency programs	1 (3.3%)
Field experience	1 (3.3%)

Statistical analysis

Data were extracted from the secure questionnaire platform (KoBoToolbox) and entered into IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp., 2021). Descriptive statistics (frequencies, means, standard deviations) were calculated for demographic and outcome variables. Paired t-tests assessed pre-to-post changes in continuous outcomes (e.g., self-efficacy, knowledge scores), and a 2-sided $p < 0.05$ was considered statistically significant. Ninety-five-percent confidence intervals were calculated for key outcomes. ANOVA and Pearson correlation analyses were employed to examine potential relationships among training year, gender, prior disaster experience, and changes in outcome variables. Missing

TABLE 2 Pre-intervention self-efficacy and knowledge/attitude variables.

Variable	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Wtd. average
I consider myself prepared for disaster (self-efficacy)	3 (10.00%)	13 (43.33%)	13 (43.33%)	1 (3.33%)	0 (0.00%)	2.4
I am interested in disaster medicine (DM interest)	0 (0.00%)	1 (3.33%)	3 (10.00%)	14 (46.67%)	12 (40.00%)	4.23
I know the Hospital Incident Command System (HICS)	2 (6.67%)	13 (43.33%)	9 (30.00%)	/6 (20.00%)	0 (0.00%)	2.63
I know the principles of disaster triage	0 (0.00%)	4 (13.33%)	7 (23.33%)	15 (50.00%)	4 (13.33%)	3.63
I know the treatment and standards of care during a disaster or an MCI	1 (3.33%)	7 (23.33%)	13 (43.33%)	8 (26.67%)	1 (3.33%)	3.03
I know the pre-hospital scene management (scale-up)	1 (3.33%)	12 (40.00%)	9 (30.00%)	8 (26.67%)	0 (0.00%)	2.8
I am willing to attend a disaster medicine program (curriculum interest)	0 (0.00%)	0 (0.00%)	1 (3.33%)	8 (26.67%)	21 (70.00%)	4.67
I am familiar with disaster response procedures (familiarity)	1 (3.33%)	14 (46.67%)	11 (36.67%)	4 (13.33%)	0 (0.00%)	2.6
I can describe my role in disaster response (role clarity)	2 (6.67%)	14 (46.67%)	8 (26.67%)	6 (20.00%)	0 (0.00%)	2.6
I know the different disaster codes in my hospital (hospital codes)	1 (3.33%)	8 (26.67%)	13 (43.33%)	8 (26.67%)	0 (0.00%)	2.93
I know the key person in charge during a disaster (key person)	2 (6.67%)	11 (36.67%)	11 (36.67%)	5 (16.67%)	1 (3.33%)	2.73
I know the triggers for hospital disaster plan activation (triggers)	3 (10.00%)	11 (36.67%)	9 (30.00%)	6 (20.00%)	1 (3.33%)	2.7
I know the location of the disaster plan (plan location)	4 (13.33%)	13 (43.33%)	9 (30.00%)	4 (13.33%)	0 (0.00%)	2.43
I know the procedure for surge management (surge management)	4 (13.33%)	11 (36.67%)	10 (33.33%)	5 (16.67%)	0 (0.00%)	2.53
I know disaster terminology and classification (terminology)	2 (6.67%)	7 (23.33%)	13 (43.33%)	8 (26.67%)	0 (0.00%)	2.9
I know the concepts of hazard vulnerability and risk analysis (HVA)	1 (3.33%)	18 (60.00%)	5 (16.67%)	6 (20.00%)	0 (0.00%)	2.53

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TABLE 3 Post-Intervention self-efficacy and knowledge/attitude variables.

Variable	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Weighted average
I consider myself prepared for disasters (self-efficacy)	1 (3.33%)	2 (6.67%)	10 (33.33%)	12 (40.00%)	5 (16.67%)	3.6
I am interested in disaster medicine (DM interest)	0 (0.00%)	1 (3.33%)	2 (6.67%)	14 (46.67%)	13 (43.33%)	4.3
I know the Hospital Incident Command System (HICS)	0 (0.00%)	3 (10.00%)	6 (20.00%)	15 (50.00%)	6 (20.00%)	3.8
I know the principles of disaster triage	0 (0.00%)	1 (3.33%)	3 (10.00%)	18 (60.00%)	8 (26.67%)	4.1
I know the treatment and standards of care during a disaster or an MCI	0 (0.00%)	2 (6.67%)	8 (26.67%)	15 (50.00%)	5 (16.67%)	3.77
I know the pre-hospital scene management (scale-up)	0 (0.00%)	2 (6.67%)	4 (13.33%)	17 (56.67%)	7 (23.33%)	3.97
I am willing to attend a disaster medicine program (curriculum interest)	0 (0.00%)	1 (3.33%)	3 (10.00%)	12 (40.00%)	14 (46.67%)	4.3
I am familiar with disaster response procedures (familiarity)	1 (3.33%)	2 (6.67%)	7 (23.33%)	14 (46.67%)	6 (20.00%)	3.73
I can describe my role in disaster response (role clarity)	1 (3.33%)	3 (10.00%)	6 (20.00%)	13 (43.33%)	7 (23.33%)	3.73
I know the different disaster codes in my hospital (hospital codes)	0 (0.00%)	1 (3.33%)	7 (23.33%)	16 (53.33%)	6 (20.00%)	3.9
I know the key person in charge during a disaster (key person)	0 (0.00%)	2 (6.67%)	4 (13.33%)	17 (56.67%)	7 (23.33%)	3.97
I know the triggers for hospital disaster plan activation (triggers)	0 (0.00%)	3 (10.00%)	7 (23.33%)	13 (43.33%)	7 (23.33%)	3.8
I know the location of the disaster plan (plan location)	0 (0.00%)	2 (6.67%)	10 (33.33%)	13 (43.33%)	5 (16.67%)	3.7
I know the procedure for surge management (surge management)	0 (0.00%)	1 (3.33%)	10 (33.33%)	14 (46.67%)	5 (16.67%)	3.77
I know disaster terminology and classification (terminology)	0 (0.00%)	2 (6.67%)	9 (30.00%)	15 (50.00%)	4 (13.33%)	3.7
I know the concepts of hazard vulnerability and risk analysis (HVA)	0 (0.00%)	1 (3.33%)	8 (26.67%)	16 (53.33%)	5 (16.67%)	3.83

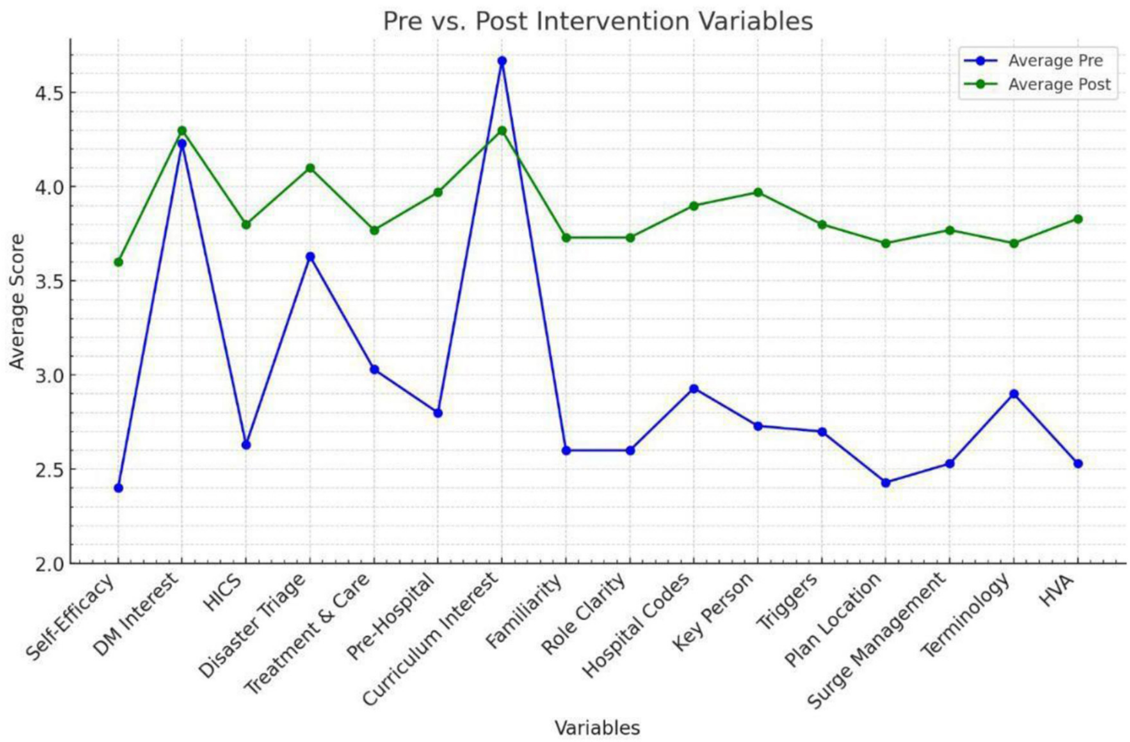

FIGURE 1
Pre vs. post intervention variables.

data were managed using pairwise deletion, ensuring that only participants with valid responses for both time points were included in final analyses.

The small sample size was acknowledged as a limitation, but a census approach ensured full program representation.

Ethical considerations

Institutional Review Board approval was obtained from the Dubai Scientific Research Ethics Committee (DSREC-GL20-2024). Electronic informed consent was secured from all participants. To protect anonymity, only coded identifiers were used, and data were stored on encrypted servers for 15 years in accordance with UAE Federal Law No. 34 of 2021.

Results

A total of 30 Emergency Medicine residents participated in the study. Table 1 shows demographic and background characteristics. Most participants were female (76.67%), and the majority (93.33%) were between 21 and 29 years of age. Nearly two-thirds were in postgraduate year 1 or 2 of training. Fewer than one-fourth of respondents had prior disaster experience (23.33%), and just over half (56.67%) reported previous exposure to disaster-related training at baseline.

Tables 2, 3 present the distribution of responses to self-efficacy and knowledge/attitude items before and after the intervention, respectively. Overall pre- and post-intervention changes across all measured variables are illustrated in Figure 1.

At baseline, participants' average perceived preparedness for disasters was **2.4 ± 0.8** on a 5-point scale, with 43% selecting "disagree" (Table 2). After the course, the mean increased to 3.6 ± 0.7 ($p < 0.001$), with 57% selecting "agree" or "strongly agree" (Table 3). This represents a substantial improvement of 1.2 points (95% CI = 0.9–1.5).

Significant gains also occurred in familiarity with the **Hospital Incident Command System**, **pre-hospital management**, **role clarity**, **hospital codes**, and **surge management** (all $p < 0.01$).

Interest in disaster medicine remained high both before and after the intervention (mean = 4.3, p = 0.97) (Table 4). Interest in disaster medicine remained high both before and after the intervention (mean = 4.2, $p = 0.97$).

No statistically significant gender differences were found in the magnitude of change for any variable ($p > 0.05$) (Table 5). Gender-stratified changes in disaster-preparedness domains are shown in Figure 2.

Differences in pre- and post-intervention scores across postgraduate training years are summarized in Figure 3. There was no clear difference between Pre training scores according to years of training, except in Plan location and HVA where there w No clear differences were observed among the pre-training scores for the various training years, except for Plan Location and HVA, where Years 5 and 2 differed from the others. As for the post-training scores, there were no significant differences across the training years.as a

TABLE 4 *P* value for change between pre and post variables mean.

Variable	Pre distribution mean	Post distribution mean	*p*-value
Self-efficacy	2.4	3.6	<0.001
DM interest	4.23	4.3	**0.97**
HICS	2.63	3.8	0.001
Disaster triage	3.63	4.1	**0.17**
Treatment and care	3.03	3.77	0.045
Pre-hospital	2.8	3.97	<0.001
Curriculum interest	4.67	4.3	**0.24**
Familiarity	2.6	3.73	<0.001
Role clarity	2.6	3.73	0.002
Hospital codes	2.93	3.9	0.002
Key person	2.73	3.97	<0.001
Triggers	2.7	3.8	0.005
Plan location	2.43	3.7	<0.001
Surge management	2.53	3.77	<0.001
Terminology	2.9	3.7	0.02
HVA	2.53	3.83	<0.0001

Bold values indicate statistically significant differences between pre- and post-intervention scores ($p < 0.05$).

TABLE 5 Comparison of pre–post training by gender: mean change scores and *P*-values.

Variable	Delta male	Delta female	*P*-value
Self-efficacy	2.21	1.57	0.14
DM interest	0.46	0.03	0.39
HICS	1.76	1.77	0.99
Disaster triage	1.07	0.92	0.69
Treatment and care	1.33	1.34	0.98
Pre-hospital	1.46	1.42	0.95
Curriculum interest	0.07	−0.12	0.57
Familiarity	1.43	1.64	0.67
Role clarity	1.29	1.6	0.49
Hospital codes	1.46	1.62	0.73
Key person	1.31	1.84	0.39
Triggers	1.29	1.8	0.4
Plan location	1.38	1.56	0.69
Surge management	1.1	1.81	0.26
Terminology	1.88	1.37	0.22
HVA	1.71	1.64	0.88

difference between year 5 and 2 compared to other years. All post training scores have no significant difference according to year.

Table 6 details triage accuracy and cycle time using a color-coded mass-casualty incident framework.

Participants maintained a high level of triage accuracy (pre = 94.9%, post = 95.2%, $p = 0.88$). Mean cycle time decreased from **6.88 ± 9.82 min** to **3.24 ± 0.87 min** ($p = 0.08$). Although not statistically significant, this nearly 50% reduction indicates a meaningful operational improvement in time-pressured MCI decision-making.

The color-coded framework corresponds to standard S.T.A.R.T. categories: Red = Immediate, Yellow = Delayed, Green = Minor, Black = Deceased. Cycle time represents the mean duration required per participant to complete triage of all victims during the simulation.

Summary of findings

Self-efficacy and knowledge scores improved significantly in nearly all measured domains. Gender and year of training showed no differential effect on improvement magnitude. These results confirm that even short, structured educational interventions can produce measurable gains in preparedness among early-career EM residents.

Discussion

This study investigated the perceived disaster-response self-efficacy, familiarity, and attitudes of emergency-medicine residents before and after a structured disaster-management course. Overall, the results show significant pre-to-post improvements in perceived preparedness, knowledge, and familiarity with hospital protocols. These findings underscore the educational benefit of simulation-based, structured disaster training in residency programs.

Comparison with previous literature

Low baseline preparedness but high interest

The relatively low baseline scores in certain knowledge areas (e.g., Hospital Incident Command System, triggers for plan activation, and familiarity with surge management) mirror previous international research indicating limited exposure to disaster-medicine topics within routine medical curricula Participants demonstrated strong interest in disaster medicine despite low initial familiarity, consistent with earlier surveys of trainees (15, 23, 28).

Effective use of targeted education

Our intervention combined didactic and simulation elements designed through the ADDIE framework. Similar blended designs have been shown to improve learners' confidence and enhance familiarity with key concepts in disaster response (16, 17, 25). Substantial gains were observed in domains requiring operational understanding such as role clarity, surge management, and familiarity with disaster codes reflecting the value of experiential learning in improving practical readiness (18, 27).

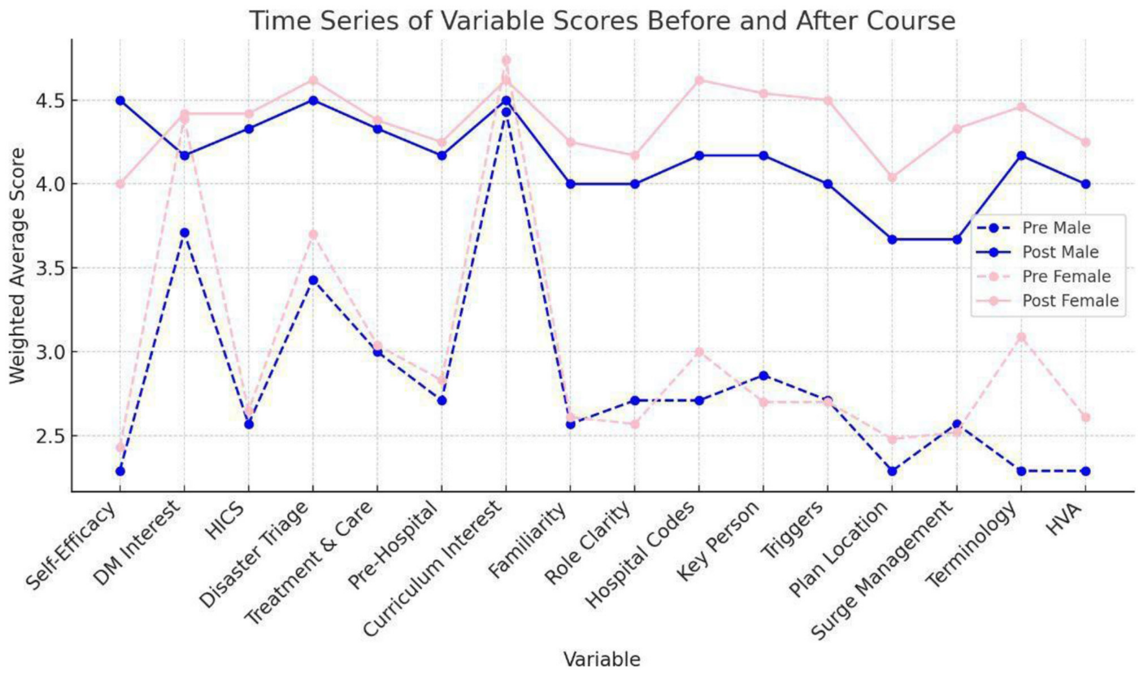

FIGURE 2
Pre vs. post intervention variables.

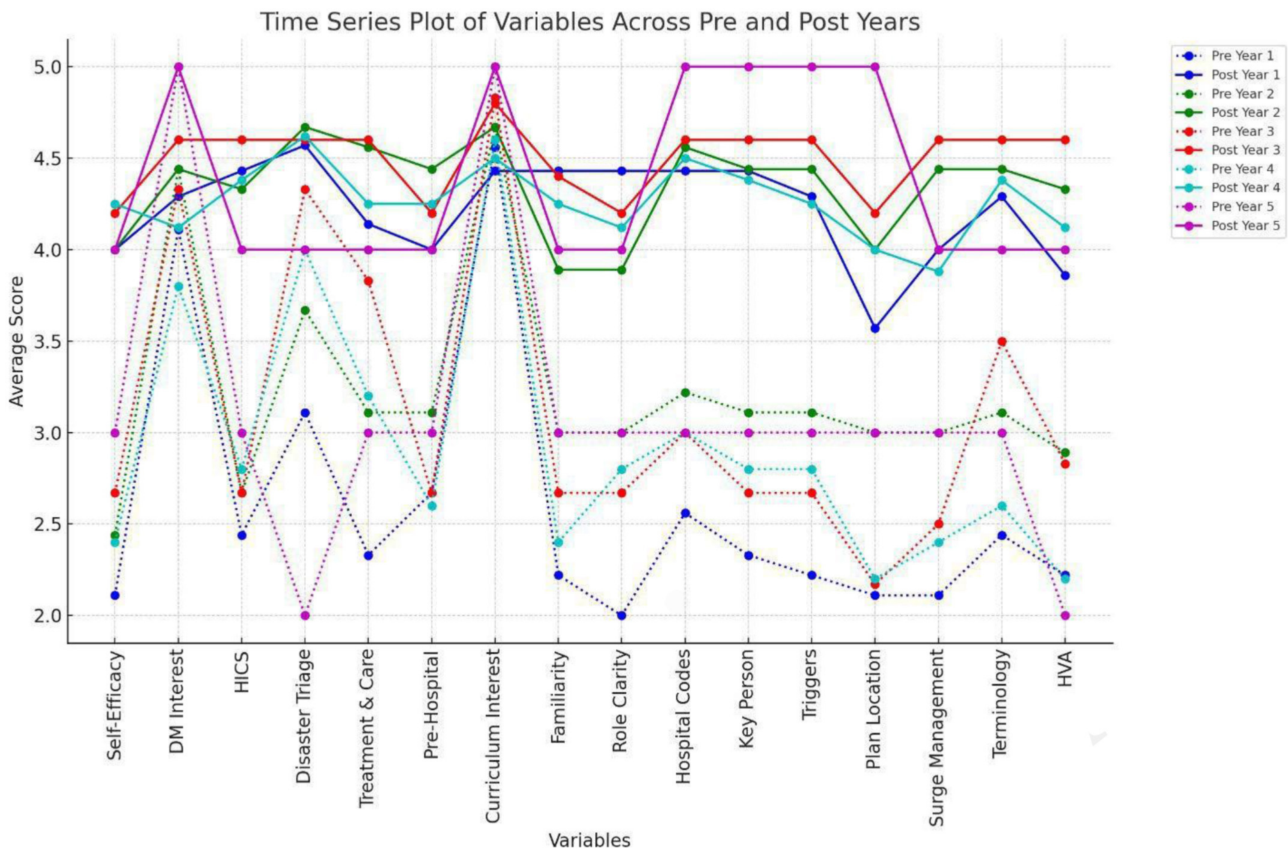

FIGURE 3
Pre vs. post intervention variables classified per training year.

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TABLE 6 Combined triage accuracy by color and cycle time (pre vs. post).

Color/measure	Pre ($N = 25$)				Post ($N = 21$)				*p*-value
	# of victims	Participants × victims	# of correct decisions	%correct	# of victims	Participants × Victims	# of correct decisions	% correct	
Black	1	25	25	100%	1	21	20	95.20%	0.27
Green	2	50	46	92.00%	1	21	21	100%	0.18
Yellow	2	50	45	90.00%	2	42	36	85.70%	0.53
Red	2	50	50	100%	3	63	63	100%	1
Overall	7	175	166	94.90%	7	147	140	95.20%	0.88
Cycle time, mean (SD), minutes	–			6.88 (9.82)				3.24 (0.87)	0.08

Hands-on simulations and self-efficacy

Consistent with Bandura's (19) theory that mastery experiences are key to self-efficacy development, participants not only *felt* more prepared but also *performed* more efficiently in simulated triage. Although triage accuracy changed minimally, the cycle-time reduction from nearly 7 min to 3 min represents a meaningful operational gain even without statistical significance ($p = 0.08$). minor reduction in triage time can have a significant operational impact during MCI, particularly in overloaded systems. This educational gain is practically relevant since modest triage duration reductions could expedite the identification of critical patient and enhance outcomes. Educational outcome may be operationally relevant even if statistical thresholds are not attained (16, 17).

Influencing factors on disaster preparedness

Prior exposure and repeated training

Prior exposure to disaster training correlated descriptively with higher baseline confidence, consistent with previous findings (20, 30). Repeated involvement in drills or real-world disaster experiences appears to reinforce and contextualize theoretical knowledge, leading to more sustained preparedness (14).

Year of training and role clarity

No consistent differences emerged across postgraduate years for most variables, aside from small discrepancies in familiarity with specific hospital protocols. Similarly, other authors note that seniority alone does not ensure improved preparedness; rather, targeted disaster medicine education is necessary to equip learners at all stages with the specific competencies needed for mass-casualty incidents (24, 26).

Curriculum and policy implications

This study supports incorporating structured, simulation-enhanced disaster-medicine modules into EM residency curricula (we recommend a formalized, scenario-based approach using lectures, simulation, and tabletop exercises to fill a critical gap between basic theoretical knowledge and real-world applicability). Regular refresher workshops and cross-departmental simulations could reinforce knowledge retention. Establishing national or regional competency frameworks would ensure consistency across institutions and strengthen healthcare-system preparedness (13, 21) Furthermore, integrating behavioral-science and social-marketing principles into program design could sustain resident engagement (22).

Limitations

Several limitations warrant consideration. First, the single-center setting and small sample size limit generalizability and statistical power. Second, the absence of a control group weakens internal validity; however, future iterations are planned with multi-site and controlled designs. Third, reliance on self-reported measures introduces potential for social-desirability and over- or under-estimation biases. To mitigate this, all responses were anonymous, participants were informed that data would not affect evaluations, and objective metrics (triage accuracy and cycle time) were incorporated for triangulation. Fourth, the short-term assessment precludes evaluation of long-term retention; follow-up assessments at 6 and 12 months are planned to address this. Finally, although the study applied validated tools, qualitative reflections from participants could have provided richer insight into experiential learning outcomes an approach recommended for future mixed-methods research.

Conclusions and recommendations

Targeted disaster-management education, particularly when anchored in simulation and scenario-based learning, can meaningfully enhance EM residents' perceived self-efficacy, preparedness knowledge, and familiarity with disaster protocols. These results affirm the educational value of structured disaster-medicine curricula and highlight the need for broader adoption within EM training programs.

Future research should expand to multi-institutional cohorts, include objective performance assessments and control groups, and evaluate knowledge retention longitudinally. Longitudinal follow-up at 6 and 12 months is planned to evaluate retention of knowledge and perceived self-efficacy over time. Implementing standardized, competency-based national guidelines defining minimum course duration, simulation frequency, and OSCE evaluation, would promote consistent disaster readiness across the healthcare workforce.

By investing in such systematic, evidence-based education, healthcare systems can cultivate a confident, capable, and agile frontline workforce ready to respond effectively to complex mass-casualty incidents.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Dubai Scientific Research Ethics Committee (DSREC), Dubai Health Authority, DSREC-GL20-2024. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

AY: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Validation, Visualization, Writing – original draft, Writing – review & editing. FA-N: Supervision, Writing – original draft, Writing – review & editing. IH: Supervision, Writing – original draft, Writing – review & editing. RA: Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

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