

Existing Disaster Preparedness and Effectiveness of a Disaster Training Module on Knowledge, Perceived Readiness, and Competence among Nursing Personnel in Primary and Community Health Centres: A Pilot Quasi-Experimental Study

Ms Chithra CK¹, Dr Juliet Sylvia²

¹Nursing Officer, Directorate of Health Services, Govt of Kerala

²Professor Cum Principal, Sacred Heart Nursing College, Ultra Trust, Madurai, Dr.MGR Medical University, Tamil Nadu

Abstract

Background: Primary and Community Health Centres (PHCs and CHCs) form the foundational layer of public-health delivery and frequently serve as frontline response points during disasters. Nursing personnel represent the core workforce responsible for triage, emergency stabilization, and community support. However, structured disaster management training remains limited in primary care settings.

Objective: To evaluate the feasibility of study procedures and assess the preliminary effectiveness of a structured disaster training module on knowledge, perceived readiness, and competence among nursing personnel in selected health centres in Kollam district, Kerala.

Methods: A non-equivalent control-group pretest–posttest quasi-experimental design was adopted. Thirty nursing officers were recruited via convenience sampling from one selected taluk, with health-centre clusters allocated to either an Intervention group (n = 16) or a Control group (n = 15 valid participants after data screening). The Intervention group received a 90-minute structured training module ("All-hazard disaster casualty management: a preparedness module for primary care nurses") comprising theoretical foundations, clinical protocols, paper-based triage drills, and tabletop simulations. The Control group received routine facility orientation. Data were collected using a demographic sheet, a 25-item knowledge questionnaire, a 20-item readiness scale, and a 27-item competence scale, and were analyzed using descriptive and inferential statistics (independent t tests, Mann–Whitney U tests, and Chi-square tests).

Results: At baseline, participants exhibited moderate levels of knowledge, readiness, and competence. Following the intervention, the Intervention group demonstrated statistically significant and practically large immediate gains compared to the Control group across all three domains: knowledge gain (5.19 vs. 0.71, $t = -5.97$, $p < 0.001$, Cohen's $d = 2.19$), competence gain (16.13 vs. 0.71, Welch $t = -7.69$, $p < 0.001$, Cohen's $d = 2.66$), and readiness gain (13.94 vs. 0.64, Welch $t = -6.06$, $p < 0.001$, Cohen's $d = 2.07$). Demographic variables showed no significant associations with baseline or post-test outcomes in this small pilot sample.

Conclusion: The structured training module demonstrated high feasibility and significant immediate effectiveness in enhancing disaster-related knowledge, readiness, and competence among primary-care nurses, supporting progression to the full-scale main study.

1. Introduction

Disasters critically strain health systems and community resilience, with global disaster frequency and intensity rising due to environmental and demographic shifts. India is highly vulnerable to natural and man-made disasters, and Kerala has faced major events such as catastrophic floods and public health emergencies. PHCs and CHCs act as the first line of defence in rural and semi-urban settings. Because nursing personnel form the largest cadre of frontline healthcare providers, their preparedness—encompassing cognitive **knowledge**, psychological **perceived readiness**, and clinical **competence**—is paramount.

Despite international recommendations from the World Health Organization (WHO) and the International Council of Nurses (ICN) emphasizing structured competency-based training, primary care nursing personnel frequently experience ad-hoc preparation, infrequent drills, and unfamiliarity with technical disaster protocols. To address this gap, a structured intervention was designed ("All-hazard disaster casualty management: a preparedness module for primary care nurses"). Prior to a full-scale 100-participant study, this pilot study was conducted to evaluate recruitment feasibility, tool clarity, intervention practicality, and preliminary effect sizes.

2. Methodology

2.1 Research Design and Setting

A quantitative quasi-experimental **non-equivalent control group pretest–posttest design** was utilized. The pilot was conducted in PHCs and CHCs within a selected taluk of Kollam district, Kerala, under the Directorate of Health Services.

2.2 Participants and Sampling

A total of 30 nursing officers (Grade I and II) registered with the Kerala Nurses and Midwives Council were recruited; 30 valid records were retained after data screening ($n = 15$ control, $n = 15$ intervention). To prevent cross-contamination, health-centre facilities were allocated as intact clusters to either the Intervention or Control arm.

- **Inclusion Criteria:** Nursing Officers directly responsible for disaster preparedness measures at selected PHCs/CHCs.
- **Exclusion Criteria:** Supervisory cadres (Senior Nursing Officers, Nursing Superintendents), Mid-Level Health Providers (MLHPs), and National Health Mission (NHM/HMC) contract nurses.

2.3 Instruments

Data collection utilized four structured instruments:

1. **Socio-Personal Data Sheet:** Captured age, gender, professional qualification, facility type, and total work experience.
2. **Structured Knowledge Questionnaire:** A 25-item multiple-choice test covering general concepts, disaster cycles, hospital planning, surge capacity, scene safety, and triage (scored 0 to 25; graded Poor: 0–12, Average: 13–18, Good: 19–25).
3. **Readiness Rating Scale:** A 20-item 5-point Likert scale measuring psychological preparedness and confidence across five domains (score range: 20–100).

4. **Self-Rating Scale of Competence:** A 27-item 3-point scale evaluating applied clinical skills across eight domains (score range: 27–81).

2.4 Intervention Protocol

The **Intervention group** received a 90-minute structured training module delivered across two 45-minute sessions: Session 1 focused on foundational concepts and clinical protocols via lecture-discussion, while Session 2 involved practical exercises, including paper-based triage-sorting drills and tabletop simulation scenarios. The **Control group** received routine facility orientation, with the training module offered afterward as an ethical waitlist provision. A same-day pre-test/intervention/post-test model was implemented.

2.5 Ethical Considerations

Administrative permissions, institutional ethics committee clearance, and written informed consent from all participants were secured prior to data collection. Confidentiality was strictly maintained.

3. Results

3.1 Baseline Characteristics

Participants were exclusively female (100%), with a mean age primarily concentrated between 36–45 years (56.7%) and 25–35 years (40.0%). Professional qualifications included B.Sc. Nursing (43.3%), M.Sc. Nursing (33.3%), and GNM (23.3%), distributed equally between PHCs and CHCs (50% each). Baseline comparison confirmed group equivalence in age, competence, and readiness, though a minor pre-existing difference in baseline knowledge favoured the intervention group ($p = 0.046$), making change (gain) scores the primary metric for evaluating training impact.

3.2 Immediate Effectiveness of the Training Module

Both parametric independent t-tests and non-parametric Mann–Whitney U tests confirmed highly significant post-intervention gains in the Intervention group compared to the Control group across all primary outcomes ($p < 0.001$).

Outcome Measure	Control Group Mean Gain (SD)	Intervention Group Mean Gain (SD)	Independent t / Welch t	p-value	Cohen's d
Knowledge Gain (0-25)	0.71 ± 1.54	5.19 ± 2.40	t = -5.97	<0.001	2.19
Competence Gain (27-81)	0.71 ± 2.52	16.13 ± 7.54	t = -7.69 (Welch)	<0.001	2.66
Readiness Gain (20-100)	0.64 ± 1.08	13.94 ± 8.70	t = -6.06 (Welch)	<0.001	2.07

3.3 Association with Demographic Variables

Chi-square tests of association (supplemented by Monte Carlo exact tests) revealed **no statistically significant associations** between knowledge, readiness, or competence and demographic variables including age, professional qualification, organization type, or work experience ($p > 0.05$). Thus, training-related gains were uniformly distributed across demographic sub-groups.

4. Discussion

The baseline findings revealed moderate levels of disaster knowledge, perceived readiness, and competence among primary care nurses, aligning with prior literature from resource-constrained and disaster-prone settings. These baseline deficiencies underscore an urgent requirement for systematic educational reinforcement in primary healthcare infrastructure.

The administration of the 90-minute structured training module yielded statistically significant and practically massive immediate score enhancements (Cohen's $d > 2.0$), corroborating international studies utilizing interactive modules and simulation frameworks. By incorporating an intact-cluster control group design, this pilot successfully controlled for maturation and testing threats, providing robust preliminary evidence that brief, structured educational packages effectively bridge frontline capability gaps.

5. Conclusion and Recommendations

5.1 Conclusion

This pilot study established the feasibility, safety, acceptability, and preliminary effectiveness of the study design and structured disaster training module. The intervention produced immediate, substantial improvements in disaster knowledge, perceived readiness, and clinical competence among nursing personnel in primary care settings.

5.2 Recommendations for Future Research and Practice

- **Full-Scale Implementation:** Proceed with the planned main study utilizing an adequately powered sample of 100 nursing personnel across all taluks of Kollam district.
- **Long-Term Retention:** Integrate a delayed post-test evaluation (e.g., at 4 to 6 weeks post-intervention) to measure the longitudinal retention of acquired knowledge and skills.
- **Policy Integration:** Institutionalize short, modular, in-service disaster preparedness training sessions combined with periodic practical drills within routine primary health centre operations.

REFERENCES

1. Asian Disaster Reduction Center. Glossary on natural disasters. Kobe: ADRC; 2003.
2. United Nations Office for Disaster Risk Reduction. The human cost of disasters: an overview of the last 20 years (2000–2019). Geneva: UNDRR; 2020.
3. World Health Organization. Primary health care in emergencies. Geneva: WHO; 2018.
4. International Council of Nurses. Core competencies in disaster nursing version 2.0. Geneva: ICN; 2019.
5. World Health Organization. Health emergency and disaster risk management framework. Geneva: WHO; 2019.
6. National Disaster Management Authority. National disaster management guidelines. New Delhi: NDMA; 2020.

7. Ul-Haq Z, Hussain Shah B, Ishaq Khattak M, Fazid S, Basharat S, Hayat Khan S, et al. Hospital preparedness for disaster and mass casualty management in Pakistan: a cross-sectional evaluation study. *Am J Disaster Med.* 2019;14(3):181–92.
8. Cliff BJ, Morlock L, Curtis AB. Is there an association between risk perception and disaster preparedness in rural US hospitals? *Prehosp Disaster Med.* 2009;24(6):512–7.
9. Goniewicz K, Goniewicz M. Disaster preparedness and professional competence among healthcare providers: pilot study results. *Sustainability.* 2020;12(12):4931.
10. Joice K, Sylu S, Pradeepkumar AP. Emergency nursing in mass casualty events: awareness and preparedness amongst nurses in Kerala, India. *Disaster Adv.* 2016;9(11):10–6.
11. Tilahun L, Desu B, Zeleke M, Dagnaw K, Andualem A. Emergency and disaster handling preparedness among front line health service providing nurses and associated factors at emergency department, at Amhara Regional State Referral Hospitals, Ethiopia. *Open Access Emerg Med.* 2021;13:221–32.
12. Shabbir R, Afzal M, Sarwar H, Gilani SA, Waqas A. Nurses knowledge and practices regarding disasters management and emergency preparedness. *Saudi J Med Pharm Sci.* 2017;3(5):464–70.
13. Kiongo JG. Disaster preparedness among members of staff at Kenyatta National Hospital, Nairobi County, Kenya [master's thesis]. Nairobi: Kenyatta University; 2015.
14. Ibrahim FA. Nurses knowledge, attitudes, practices and familiarity regarding disaster and emergency preparedness — Saudi Arabia. *Am J Nurs Sci.* 2014;3(2):18–25.
15. Alzahrani F, Kyratsis Y. Emergency nurse disaster preparedness during mass gatherings: a cross-sectional survey of emergency nurses' perceptions in hospitals in Mecca, Saudi Arabia. *BMJ Open.* 2017;7(4):e013563.
16. Tabiee S, Nakhaee M. Nurses' preparedness for disaster in South Khorasan province, Iran. *Health Emerg Disasters Q.* 2016;2(1):13–8.
17. Al-Qbelat RM, Subih MM, Malak MZ. Effect of educational program on knowledge, skills, and personal preparedness for disasters among emergency nurses: a quasi-experimental study. *Inquiry.* 2022;59:1–10.
18. Sa'd RI, Malak MZ. The effect of disaster management training program on emergency nurses' knowledge, skills, and personal preparedness in Palestine. *Int Emerg Nurs.* 2025;80:101601.
19. Alotaibi SS, Almutairi HA, Alotaibi MK, Alharbi K, Bahari G. Enhancing nurses' disaster management and preparedness: evaluating the effectiveness of an online educational program through a quasi-experimental study. *Risk Manag Healthc Policy.* 2024;17:101–11.
20. Alsaqer K, Alhmoud SH. Impact of virtual reality training on nurses' preparedness and self-efficacy in emergencies and disasters: a quasi-experimental study. *Int Emerg Nurs.* 2025;82:101662.
21. Kim K-J, Choi M-J, Kim M. Effects of virtual reality-based disaster simulation education on nursing students. *PLoS One.* 2025;20(10):e0329563.
22. Ramadan SM, Mohamed M, Abo-Elmaty G. Evaluating the effectiveness of the Jennings disaster management model on nursing students' knowledge and self-efficacy. *BMC Nurs.* 2025;24:1–12.