

# Determinants of Nurse Preparedness in Disaster Management: A Cross-Sectional Study Among the Community Health Nurses in Coastal Areas

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**Purpose:** Because Indonesia has a high risk of natural disasters, nurse preparedness is necessary to reduce and prevent deaths in the aftermath of such disasters. The aim of this study was to determine the factors associated with nurse preparedness in disaster management among a sample of community health nurses in coastal areas.

**Patients and Methods:** A cross-sectional study was undertaken from May to August 2020. The sample consisted of 142 nurses who worked at six Public Health Centers in Pangandaran, West Java, Indonesia. Participants were recruited using the total sampling technique. The data were collected using the Emergency Preparedness Information Questionnaire and analyzed using Chi-Square and binary logistic regression.

**Results:** Of the 142 respondents, 54.24% had a high level of preparedness. Multivariate analysis showed that nurses with higher levels of preparedness had worked between 6 and 10 years (adjusted odds ratio (AOR): 12.755, 95% confidence interval (CI): 2.653–61.314). Respondents who lacked disaster training were less likely to have a high level of disaster preparedness (AOR: 4.631, 95% CI: 1.604–13.367). Respondents who had never served as disaster volunteers were also less likely to have disaster preparedness (AOR: 0.18, 95% CI: 0.053–0.616).

**Conclusion:** With nearly half of the respondents (45.77%) having a low level of disaster preparedness, this topic needs more attention from the government and healthcare workers. Several actions are needed to improve community nurses' disaster preparedness: providing them with routine disaster-related training, encouraging them to serve as volunteers in various disaster conditions, and offering them useful disaster-related information.

**Keywords:** nurses, disaster, disaster management, coastal area, preparedness

## Introduction

The trend of disaster events in Indonesia continues. The National Agency for Disaster Management Indonesia recorded an increase in the incidence of disasters from August 2018 to August 2019 of around 7.3%. From January to August 2019, the average number of people affected by a disaster was 2.5% of the population.<sup>1</sup> In the West Java province of Indonesia, the Pangandaran Regency ranks sixth in earthquake and tsunamis risk. These types of disasters result in injuries, missing people, deaths, displaced families, and economic problems.<sup>2</sup> Frequent disasters require disaster management efforts that involve all possible parties, including nurses. Because nurses are the largest and most important group of healthcare providers in disaster management, their competencies need to be continually

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assessed and improved.<sup>3–5</sup> Given these facts, disaster management preparedness remains a strong area of concern for nurses in disaster-prone areas.

Disaster management preparedness is a very important professional skill for nurses, as nurses with a strong sense of readiness can provide assistance to disaster victims.<sup>6</sup> Furthermore, nurses can perform comprehensive relief management services, such as mapping the disaster location, providing disaster mitigation, triaging patients, and organizing first aid involving cross-sector collaboration and interdisciplinary professional teams.<sup>7–9</sup> Nurse preparedness can be measured using the following eight dimensions: triage and basic first aid; detection; accessing critical resources and reporting; the incident command system (ICS); isolation, quarantine, and decontamination; psychological issues; epidemiology and clinical decision-making; and communication and connectivity.<sup>10</sup> Another recent study reported that nurses with emergency preparedness competencies are more likely to have professional competence in disaster responses, maintain personal disaster preparedness, and report to work after a disaster.<sup>11</sup>

One of the roles of community public health centers (PHCs) is to minimize the effects of disasters on the population. Despite nurses being primarily responsible for most (72.97%) PHC disaster programs, previous study results indicated that 50% of PHC nurses had low disaster preparedness.<sup>12</sup> Furthermore, nurses' service capabilities for treating disaster victims at PHCs were limited to caring for victims flagged as green during triage (84.21%).<sup>13</sup>

Another study showed that high levels of readiness in nurses serving in disasters are related to nurse age, experience,<sup>14</sup> knowledge,<sup>15</sup> responsibilities,<sup>16</sup> support from the government,<sup>17</sup> and training.<sup>18</sup> In addition, the average level of nurse preparation to respond to disaster conditions was low. Results from several other studies indicated that many nurses did not know the tasks required during disaster or post-disaster conditions.<sup>19–22</sup> Providing nurses with disaster management training will increase their ability to handle disaster conditions. Other factors that can affect nurse preparedness include work experience, length of time spent preparing to face disasters, disaster volunteer experience, and access to information sources. Unfortunately, there is a lack of studies about the disaster preparedness of nurses working in disaster-prone coastal areas of Indonesia. Therefore, this study aimed to determine the factors associated with disaster management

preparedness among community health nurses in coastal areas.

## Patients and Methods

### Study Design

A cross-sectional design was used for this study.

### Setting and Sample

The study was conducted from May to August 2020 in six PHCs in the coastal areas of Pangandaran, West Java, Indonesia. The sample consisted of 142 community health nurses who were recruited using the total sampling technique. The inclusion criteria were community health nurses with a minimum of a diploma in nursing education who were employed at one of the PHCs in the coastal areas and had worked for a minimum of three months. The exclusion criteria were community health nurses who were on leave, too busy with their duties to participate in the study, or were not able to complete the study. The data were collected using questionnaires.

### Variables

The independent variables were age, education level, gender, number of years working as a nurse (referred to as work history), disaster training, disaster preparedness knowledge sources, disaster volunteering, and disaster management experience. The age variable was divided into four categories: 21–25 years, 26–35 years, 36–45 years, and >45 years. Nursing education level was divided into three categories: diploma, Bachelor's degree, and professional nursing education. Respondent gender was classified as either male or female. Work history was divided into four categories: ≤1 year, 2–5 years, 6–10 years, and >10 years. Responses about disaster training were divided into one of two categories: yes (having any level of training) or no (having no training). Preparedness knowledge sources were classified into the following categories: lectures, seminars, training, simulations, participation, and other methods. Disaster volunteering history was classified as either yes (have served as a volunteer) or no (have never served as a volunteer). Finally, disaster management was classified into ever (having provided disaster management services) or never (having provided these services).

The Emergency Preparedness Information Questionnaire (EPIQ) was used in this study to determine the dependent variable, preparedness level.<sup>23</sup> The EPIQ

assesses eight dimensions of preparedness: triage and basic first aid; detection; accessing critical resources and reporting; the ICS; isolation, quarantine, and decontamination; psychological issues; epidemiology and clinical decision-making; and communication and connectivity. The nurse preparedness variable was divided into two categories: Low (if the value was less than the mean) or High (if the value was greater than the mean). Each category was coded as Low = 0 and High = 1. The Cronbach's alpha result was 0.951.

## Data Analysis

To manage and analyze the data, we used STATA/MP version 16.1 (Mac). Chi-Square and Binary Logistic Regression were used to analyze the factors associated with nurse disaster management preparedness among the sample of community health nurses from the coastal areas. The significance value was  $p < 0.05$ , and the adjusted odds ratio (AOR) had a 95% confidence interval (CI).

## Ethical Considerations

We received approval from the Health Ethics Commission of Universitas Padjadjaran (439/UN6.KEP/EC/2020) on April 30, 2020. Respondents were informed about the study objectives and provided informed consent and this study was conducted in accordance with the Declaration of Helsinki. Participation was voluntary, and the study did not have the potential to harm the participants physically or mentally.

## Results

The demographic data showed that more than half the participants (54.23%) had a high level of disaster preparedness and 45.77% had a low level of preparedness. One-third of the respondents were 26–35 years of age. Regarding education, 50% had either a diploma or professional nursing education and most had worked for more than 10 years. A majority of respondents had attended disaster training, served as a disaster volunteer, and gained knowledge about disasters while attending lectures. Apart from that, many respondents had never provided disaster management services.

The bivariate analysis conducted using Chi-Square showed that the variables of work history ( $X^2$ : 13.784;  $p < 0.01$ ), disaster training ( $X^2$ : 16.986;  $p < 0.01$ ), knowledge sources ( $X^2$ : 13.972;  $p < 0.05$ ), disaster volunteering ( $X^2$ : 9.574;  $p < 0.01$ ), and disaster management experience

( $X^2$ : 5.459;  $p < 0.05$ ) all had a significant correlation with nurse preparedness. In contrast, age, education level, and gender were not correlated with preparedness (Table 1).

Multivariate analysis using binary logistic regression showed that nurses with a work history spanning 6–10 years were 12.755 times more likely to have a high level of preparedness than those with a work history of  $\leq 1$  year (AOR: 12.755; 95% CI: 2.653–61.314). Interestingly, nurses with no disaster training history were 4.631 times more likely to have a high level of preparedness than were those with such training (AOR: 4.631; 95% CI: 1.604–13.367). Finally, respondents who had never served as disaster volunteers were 0.18 times less likely to have a high level of preparedness than were those who had served as volunteers (AOR: 0.18; 95% CI: 0.053–0.616; Table 2).

## Discussion

It is important to consider the disaster preparedness of nurses working in coastal areas that face disasters more frequently than non-coastal areas. The results of this study indicated that almost half of the nurses surveyed had a low level of disaster preparedness. This finding is consistent with study results showing low to moderate readiness among nurses in Cambodia, China, Laos, Nepal, and the Solomon Islands.<sup>24</sup> Likewise, in the Philippines, three-quarters of nurses (80%) stated that they were not fully prepared to work during a disaster.<sup>25</sup>

In this study, we found that three factors were significantly correlated with preparedness among the nurses: work history, disaster training history, and service as a disaster volunteer. Disaster nurses are defined as nurses who have the expertise to help victims by minimizing life-threatening health risks.<sup>26</sup> Given this definition, we can surmise that nurses are expected to be able to adapt to their environment and disaster conditions.<sup>23</sup>

The results of this study showed that work history had a significant relationship with disaster preparedness. This finding is likely due to the fact that these nurses gained a great deal of disaster management information and knowledge from working and living in a coastal area. The ideal work history is in the range of 6–10 years, a period when nurses are still active and enthusiastic at work and have good cognitive abilities. This finding is in line with that of a previous study showing that nurses with the ideal length of work history can have increased productivity, performance, and ability in providing care.<sup>27–30</sup> However, it should be noted that nurses who have worked

**Table 1** Respondents' Characteristics and Bivariate Analysis of Nurse Preparedness in Disaster Management Among the Community Health Nurses in the Coastal Areas (n=142)

Variable	n	%	Nurse Preparedness				X <sup>2</sup>	p
			Low		High			
			n	%	n	%		
Age								
21–25 years old	31	21.83	14	9.86	17	11.97	0.962	0.810
26–35 years old	53	37.32	25	17.61	28	19.72		
36–45 years old	41	28.87	20	14.08	21	14.79		
>45 years old	17	11.97	6	4.23	11	7.75		
Education level							2.148	0.342
Diploma in nursing	65	45.77	27	19.01	38	26.76		
Bachelor's in nursing	14	9.86	5	3.52	9	6.34		
Professional nursing	63	44.37	33	23.24	30	21.13		
Gender							0.677	0.410
Male	51	35.92	21	14.79	30	21.13		
Female	91	64.08	44	30.99	47	33.10		
Length of working							13.784***	0.003
≤ 1 year	19	13.38	16	11.27	3	2.11		
2–5 years	40	28.17	15	10.56	25	17.61		
6–10 years	31	21.83	11	7.75	20	14.08		
>10 years	52	36.62	23	16.20	29	20.42		
Disaster training							16.986***	0.000
Yes	95	66.90	55	38.73	40	28.17		
No	47	33.10	10	7.04	37	26.06		
Source of knowledge							13.972**	0.016
Lectures	54	38.03	25	17.61	29	20.42		
Seminars	35	24.65	14	9.86	21	14.79		
Training	4	2.82	3	2.11	1	0.70		
Simulations	32	22.54	17	11.97	15	10.56		
Participation	9	6.34	6	4.23	3	2.11		
Other	8	5.63	0	0	8	5.63		
Disaster volunteering							9.574***	0.002
Yes	105	73.94	40	28.17	65	45.77		
No	37	26.06	25	17.61	12	8.45		
Ever done disaster management							5.459**	0.019
Ever	51	35.92	30	21.13	21	14.79		
Never	91	64.08	35	24.65	56	39.44		

Notes: \*\*\*p<0.001; \*\*p<0.05.

Abbreviation: X<sup>2</sup>, Chi-Square.

for a long time with a heavy workload can experience decreased productivity due to boredom and burnout when working as a disaster nurse.<sup>31,32</sup>

One surprising finding of this study was that nurses who had not participated in disaster training had a greater likelihood of having a higher level of disaster preparedness than those who had engaged in such training. This result may be due to the fact that the provided training was not

effective enough to improve nurses' disaster preparedness. This finding is consistent with previous studies indicating that a training approach that uses easy-to-understand methods is likely to be more effective.<sup>33,34</sup> Based on this finding, it is important that future research be conducted to evaluate common disaster training methods. Our respondents indicated that most of their knowledge came from lectures, seminars, and simulations.

**Table 2** Multivariate Analysis of Nurse Preparedness in Disaster Management Among the Community Health Nurses in Coastal Areas (n=142)

Variable	AOR	p	95% CI	
			Lower	Upper
Length of working				
≤ 1 year	Ref.			
2–5 years	9.313***	0.003	2.144	40.452
6–10 years	12.755***	0.001	2.653	61.314
>10 years	9.403***	0.006	1.888	46.836
Disaster training				
Yes	Ref.			
No	4.631***	0.005	1.604	13.367
Sources of knowledge				
Lectures	Ref.			
Seminars	2.328	0.151	0.735	7.376
Training	0.273	0.349	0.018	4.137
Simulations	1.229	0.714	0.408	3.696
Participation	2.028	0.455	0.318	12.947
Other	1	–	–	–
Disaster volunteering				
Yes	Ref.			
No	0.18***	0.006	0.053	0.616
Ever done disaster management				
Ever	Ref.			
Never	0.965	0.953	0.291	3.198

Note: \*\*\*p<0.001.

Abbreviation: CI, confidence Interval.

From these findings, we learned that nurses who have never volunteered during disaster conditions have a lower level of disaster preparedness. Conversely, nurses with volunteer experience have a higher level of self-confidence in dealing with disasters. These results are similar to those of previous research showing that experience dealing with and providing health services in disaster situations conveys a higher level of preparedness compared with nurses who have never been directly involved in disaster conditions.<sup>35</sup> In addition, experience as a volunteer in a disaster area can improve nurses' actions and preparedness levels.<sup>36</sup> Indeed, disaster experience is one of the main predictors of nurse competence and preparedness.<sup>24</sup> By providing opportunities for nurses to volunteer in disaster conditions, PHCs can help them improve their abilities and the quality of the services they provide in such conditions.

This study provides new information indicating that—due to the proportion of study respondents with low preparedness

levels—efforts that address the salient factors are needed to increase the disaster preparedness among nurses in coastal areas. For example, nurses' history of work experience, disaster training, and volunteering can serve as the basis for further policy formation to address this crucial issue. However, because this research was limited to specific areas in the Pangandaran Regency, future research covering more areas is needed to further explicate the factors that affect nurses' disaster preparedness in coastal areas.

## Conclusion

Almost half of the study participants had low levels of disaster preparedness. This finding requires serious attention, as the research was conducted in a disaster-prone location. Strengthening the cooperation from the government and PHCs to increase nurses' capacity to work during disasters—through training and opportunities to volunteer in disaster conditions—are necessary to improve the ability of nurses to work during disasters. We suggest two specific methods for addressing this issue: offering nurses routine disaster-related training that involves them working as volunteers in various disaster conditions, and providing effective disaster-related information through seminars, flyers, and other media.

## Funding

The study was funded by Universitas Padjadjaran with the Doctoral Dissertation Research Program scheme number 1427/UN6.3.1/LT/2020.

## Disclosure

The authors report no conflicts of interest in this work.

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