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ORIGINAL ARTICLE

DETERMINANTS OF NURSES' PREPAREDNESS FOR DISASTERS: A CROSS-SECTIONAL STUDY

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ABSTRACT

It is essential to improve disaster preparedness of hospitals, as they are the front line of health care during natural disasters. Nurses have an important role in mitigating and handling the negative impacts of disasters. This study analyzes the determinants of nurses' preparedness for disasters. The researchers employed a quantitative, cross-sectional approach. Data was collected through the Disaster Preparedness Evaluation Tools (DPAT) questionnaire. Purposive sampling was used to select 265 respondents. The Spearman test results showed a weak, positive, and statistically significant relationship between knowledge and preparedness (r = 0.377, p = 0.000). Meanwhile, a strong positive and statistically significant relationship was found between role and preparedness (r = 0.615, p = 0.000). Conversely, the relationship between attitude and preparedness is not statistically significant (r = -0.044, p = 0.480). Next, the linear regression test shows that the most dominant factors, as indicated by the beta correlation coefficients, are role and knowledge: where an increase in one role score increases preparedness by 1.290 times, and an increase in one knowledge score increases preparedness by 0.300 times. Overall, this study shows that role and knowledge factors are positively related to nurse preparedness. Therefore, disaster simulations, training, and seminars must be conducted to enhance nurses' preparedness and competence in disaster management.

Keywords: *Disaster; preparedness; nurses; hospitals*

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BACKGROUND

Maluku, an archipelagic province in eastern Indonesia with an extensive coastline, is highly vulnerable to natural disasters. The region has experienced hazards including earthquakes, tsunamis, landslides, volcanic eruptions, floods, tornadoes, tidal waves, coastal abrasion, epidemics, droughts, tidal floods, forest fires, flash floods, and maritime accidents (BNPB, 2019c, 2019b, 2019a).

Between 2019 and 2021, multiple disasters occurred in Maluku. The most significant event was the 2019 earthquake (magnitude 6.8) located 40 km northeast of Ambon Island at a depth of 10 km. The disaster resulted in 29 deaths and numerous injuries, including 47 individuals with severe injuries and 17 with minor injuries. A total of 46 individuals were referred to the hospital, 24 were injured, six had mental trauma, six had broken bones, and nine were affected by heart and blood vessel disease. More than one million (1,023,580) residents were affected by this disaster, and several health facilities sustained substantial damage, including one hospital in Central Maluku (BNPB, 2019b, 2019a, 2022).

According to the 2021 Indonesian Disaster Information Data (DIBI), additional disasters during this period included floods, strong winds, landslides, forest fires, earthquakes, high waves, conflict, and drought, resulting in 47 deaths, 1,627 injuries, 11,575 affected individuals, and 232,427 evacuees. These figures highlight that disaster risk affects all population

groups and underscore the need for shared responsibility in strengthening preparedness across children, adolescents, and adults.

Disaster management comprises four phases: mitigation and preparedness (pre-disaster), and response and recovery (post-disaster) (Khairina et al., 2022). Hospitals play a central role in disaster management by providing life-saving interventions and medical treatment. The World Health Organization (2015) emphasizes that hospital disaster management should include disaster planning and regular evaluation, inter- and intra-agency coordination, and continuous personnel training. Therefore, hospitals must designate disaster response leaders, ensure functional communication systems, mobilize transportation resources, and secure adequate medical supplies and equipment for mass casualties. External disaster management also involves deploying healthcare personnel to affected areas, expanding surge capacity, and allocating human resources effectively. The WHO recommends that all countries strengthen their preparedness for various emergencies (WHO/EHA, 2015).

Hospitals, as the frontline of health care during a disaster, are crucial for ensuring preparedness. Preparedness is a series of activities to anticipate disasters through organization and appropriate and effective steps (Indonesian government, 2007). In disaster situations, hospitals and other health service facilities, such as community health centers, must be safe, easily accessible, and function at maximum capacity to save victims. Such facilities must also continue to provide health services and coordinate with hospitals and other health service facilities (Government, 2009).

Evidence from Thailand indicates that hospitals must prioritize disaster preparedness to fulfill their responsibilities during crises (Rattanakanlaya et al., 2018). Nofal et al. (2018) also reported that a proportion of healthcare workers demonstrated limited engagement with disaster operational planning, where 12 (6.3%) nurses and doctors were not interested in knowing emergency (disaster) operational plans, and around 21 (11%) agreed that disaster management and planning are only important for some people in hospital, thereby indicating gaps in institutional preparedness culture.

The Dr. M. Haulussy General Hospital in Ambon serves as the primary referral hospital in Maluku Province, particularly during natural disasters, due to limited human resources in several community health centers. Interviews with nurses from emergency and inpatient units regarding the 2019 earthquake identified several challenges, including difficulties in patient evacuation, equipment protection, power outages, unclear command structures, and insufficient staffing. Although most nurses reported understanding their disaster-related roles, including triage and evacuation, disaster preparedness training is not routinely conducted.

Therefore, this study aims to analyze factors associated with nurses' disaster preparedness and its determinants at Dr. M. Haulussy General Hospital, Ambon, Maluku, Indonesia.

METHOD

Research design

This is a correlational, analytical study with a cross-sectional design.

Samples

This research involved 265 respondents, using the Slovin formula. The Slovin formula was used to adjust the number of respondents based on a known population size by calculating the error rate. This method is often used in research with limited time and resources because it can produce a representative sample size (Friedman et al., 2015). The researchers also used the purposive sampling technique. We applied the following inclusion criteria: 1) a nurse with a minimum education of D3, S1, Nursing Profession, Master's, or specialist, and 2) work experience of at least six months. Respondents were excluded if they were not in the hospital during data collection and were unwilling to participate in the study.

Data collection

This research was conducted at Dr. M. Haulussy General Hospital, Ambon, the referral center hospital in Maluku Province. The researchers collected data from the respondents from September to October 2022. Research assistants also contributed to data collection until all respondents completed the questionnaire.

Validity of the questionnaires

The instrument used was a questionnaire from the Disaster Preparedness Evaluation Tools (DPAT). It is a validated questionnaire comprising 47 items to evaluate nurses' knowledge, competencies, and preparedness in disaster management. The questionnaire has been modified and tested by Ramdani (2020) with a Cronbach alpha of 0.643, which is greater than the r-table value of 0.632 (obtained from the r with n table = 10). Meanwhile, the Corrected Item-Total Correlation for knowledge was 0.703, attitude was 0.654, and organization was 0.698.

Ethical considerations

Before data collection, researchers received Ethical Approval from the Research Ethics Committee of Padjadjaran University, Bandung, Indonesia (Number: 533/UN6.KEP/EC/2022). Research permission was also obtained from RSUD Dr. M. Haulussy Ambon (Number: 88/BDPA/Pen/2022). Before data was collected, all respondents received an explanation and signed an informed consent form.

Data analysis

The researchers employed univariate, bivariate, and multivariate analyses using the SPSS software version 26. The univariate analysis involved measuring the mean and median percentages. In comparison, the bivariate analysis used the Spearman test. Lastly, the multivariate analysis was conducted through multiple linear tests.

RESULT

A total of 265 respondents participated in this research. The respondents' demographic data such as gender, age, education, work period, work status, work unit, having worked during a disaster as a health worker or volunteer, history of attending disaster training in the last six months, and as a COVID-19 nurse during the pandemic are shown in Table 1. The results show that the most respondents were in the 31–40-year age group (52.1%), female (80.4%), had a D3 education level (49.8%), had more than five years of work experience (96.2%), and were civil servants (90.9%). Additionally, most respondents worked in the inpatient ward and polyclinic (67.2%). All 265 respondents (100%) worked during a disaster or were volunteers. However, the frequency of respondents who had attended training in the last six months was mostly in the never category, with 234 people (88.3%). Finally, most respondents (63.8%) had served as COVID-19 officers during the pandemic.

Table 1. Respondents' characteristics based on demographic data (n = 265)

Characteristics	Frequency	Percentage
Age		
20-30 years	3	1.1
31-40 years	138	52.1
41-50 years	106	40
51-60 years	18	6.8
Gender		
Man	52	19.6
Woman	213	80.4
Education		
D3	132	49.8
S1	35	13.2
S1+Profession	92	34.7
S2	6	2.3
Years of service		
<5 years	10	3.8
≥5 years	255	96.2
Employment status		
Civil servants	241	90.9
Contract	24	9.1
Work unit		
Inpatient	178	67.2
IGD	21	7.9
ICU	10	3.8
ICCU	11	4.2
NICU	10	3.8
Operating room	35	13.2
Have worked in disaster conditions as a health worker or volunteer		
Once	265	100
Never	0	0
Have attended disaster training in the last six months		
Once	31	11.7
Never	234	88.3
Covid-19 officer during the pandemic		
Once	169	63.8
Never	96	36.2

Source: Primary Data 2022

Table 2. Preparedness and factors related to nurse preparedness (n = 265)

Variable	Mean	Median	Standard Deviation	Min	Max
Preparedness	144.44	148.00	19.512	80	179
Knowledge	49.16	52.00	7.764	19	60
Attitude	25.73	25.00	3.374	6	32
Role	43.83	47.00	7.432	17	54

Source: Primary Data 2022

Preparedness and factors related to preparedness

Factors related to nurses' preparedness for disasters include knowledge, attitudes, and roles are shown in Table 2.

Table 2 shows that the mean of the respondents' preparedness is 144.44 (SD 19.512), knowledge is 49.16 (SD 7.764), attitude is 25.73 (SD 3.374), and role is 43.83 (SD 7.432).

Analysis of factors related to nurses' preparedness for disasters

A bivariate analysis was conducted using the Pearson correlation test to determine the relationship among factors related to respondents' preparedness. However, the normality test indicated that the independent variables (knowledge, attitudes, and roles) were not normally distributed, so the Spearman correlation test was used. The results (Table 3) show a weak, positive but statistically significant relationship between knowledge and preparedness (r = 0.377, p = 0.000). There was also a strong, statistically significant, positive relationship between role and preparedness (r = 0.615, p = 0.000). Conversely, the results showed no relationship between attitude and preparedness (r = -0.044; p = 0.480).

Table 3. Bivariate Correlation Test Table for nurses (n = 265)

Variable	r	p (value)
Knowledge	0.377	0.000*
Attitude	0.044	0.480
Role	0.615	0.000*

**) Significant <0.05*

Dominant factors related to nurses' preparedness for natural disasters

The dominant factors related to preparedness were identified through a multivariate analysis using the linearity assumption test, normality test, homoscedasticity assumption test, autocorrelation assumption, and multicollinearity assumption test. Table 4 shows that the most dominant factors, as indicated by the beta correlation coefficients, are role and knowledge. Roles and knowledge are positively related to nurse preparedness, with each increase in a role score increasing preparedness by 1.290 times, and each increase in a knowledge score increasing preparedness by 0.300 times.

Table 4. Results of the multivariate linear regression analysis of nurses (n = 265)

Variable	Coefficient	Correlation Coefficient	Sig.
Constant	73.176		0.000
Knowledge	0.300	0.119	0.042
Role	1.290	0.491	0.000

Source: Primary Data 2022

DISCUSSION

The questionnaire data and interviews with several respondents showed that the nurses' strong preparedness was due to their experience with disasters resulting from social conflicts in 1999, earthquakes in 2019, and the frequent natural disasters that often cause severe damage within the hospital.

According to Al Thobaity et al. (2015, 2017) and Brinjee et al. (2021), nurses with greater disaster-related experience will increase their knowledge, skills, and preparedness to a higher level than those with less experience. Park & Kim (2017) and Warsini et al. (2022) also support this as their research found that disaster-related experience and knowledge are important factors influencing nurses' competence during disasters.

Conversely, this study's findings do not align with a systematic review by Labrague et al. (2018), which found that nurses were not sufficiently prepared to face disasters and tended to feel less confident in responding effectively. Similarly, a study in Saudi Arabia found that surgical, critical, and emergency nurses were not prepared to respond to disasters due to limited formal and informal knowledge and education on disaster preparedness. Additionally, the study of the role and competence of nurses in disaster prevention and management was not included in the current curriculum (Al Thobaity et al., 2015).

Furthermore, Usher et al. (2015) explored nurses' disaster preparedness, knowledge, and skills in several Asia-Pacific countries. They reported that nurses in Bangladesh and Laos felt unprepared to care for disaster victims without the presence of doctors. Meanwhile, nurses in Cambodia and the Solomon Islands felt unprepared to conduct assessments involving biological and chemical agents. These studies underscore the knowledge gap in disaster preparedness among nurses. Therefore, management must plan for nurses' preparedness to respond to internal and external disasters in hospitals. It is important to design a hospital disaster plan to minimize chaos and ensure that nurses are better prepared and able to carry out their roles effectively and efficiently.

Another study by Al Thobaity et al. (2015) in Saudi Arabia explored nurses' knowledge, sources of knowledge, and skills related to disaster management among 4,660 nurses. Their study showed that nurses in Saudi Arabia have moderate knowledge about disaster preparedness. However, nurses in military hospitals have greater knowledge than those in government hospitals, and most nurses gain knowledge and skills through disaster training. According to Thobaity et al. (2015), to increase nurses' knowledge, more education and training are needed across all areas of disaster management so that nurses can effectively perform their roles during disaster response. Moreover, nurses feel they need more time to be ready and are willing to improve their disaster preparedness skills if allowed to participate in education and training. Thus, although the preparedness phase is very important and should be based on knowledge about the potential impact of disasters on health and safety, knowledge is the main factor and is the key (ICN, 2017, 2019).

This study's results do not align with previous studies. Habte et al. (2018) found that the general attitude of health workers towards disaster issues is mostly positive because 64.8% of respondents have a positive attitude. However, hospital disaster preparedness practices remain low (8.3%). In addition, hospitals lack a disaster preparedness plan and other organizational and preparedness measures. However, Powers & Daily (2010) and Veenema (2019) stated that knowledge can usually influence attitudes and preparedness to anticipate disasters. Nevertheless, attitudes greatly influence nurses in disaster management, especially when they become disaster management officers. Attitudes can also support nurses' willingness to increase knowledge.

Moreover, research in Saudi Arabia found that emergency doctors and nurses have a positive attitude toward disaster preparedness with a percentage score of 68.87% and 12 (6.3%) participants were not interested in knowing emergency (disaster) operational plans, and around 21 (11%) agreed that disaster management and planning is only relevant for a few people in the hospital (Nofal et al., 2018). Meanwhile, according to Naser et al. (2018), a positive attitude indicates the readiness of health workers to learn about disaster management and their desire to be prepared to face disasters. In addition, extensive experience does not affect professional attitudes towards disaster management.

Previous research by Alzahrani & Kyratsis (2017) in Mecca, Saudi Arabia, supports this study's findings. The study reported that emergency nurses saw a primary role in assessing casualties and promptly providing general clinical assessment and care. However, only a few emergency nurses understand their role in providing supervision, prevention, leadership, or psychological care to victims of mass disasters. In disaster conditions, nurses must be able to anticipate expanding their role during disaster events, including caring for sick and injured people (ICN, 2017, 2019; Veenema, 2019)

Moreover, a review conducted by Al Thobaity et al. (2017) found that the most common domains related to nurses' roles were communication, planning, decontamination and safety, Incident Command System, and ethics. Thus, including these core domains in planning and providing training for nurses,

such as disaster drills, will strengthen nurses' preparedness for competent disaster response.

A previous systematic review by Firouzkouhi et al. (2021) aligns with the review mentioned above, as it reported that nurses played a role in three phases of a disaster: before the crisis, during the crisis, and after the crisis. Therefore, nurses must be aware of their role in reducing and resolving existing problems and proper planning in providing better, more important services appropriately and quickly to victims in reducing disability and death.

In addition, according to Achora & Kamanyire (2016), nurses constitute the majority of health service providers. Thus, they are an indispensable workforce during disasters. The basic attributes of nursing practice include providing care to the injured or ill, helping individuals and families address physical and emotional problems, and improving health and well-being in society. These attributes require competent nurses who are ready to respond in all situations, including during a disaster. Therefore, nurses must be able to adapt their skills from focusing on individuals to large numbers of patients, both in delivering lifesaving and emergency care and in maintaining public health.

In Hong Kong, Fung et al. conducted a questionnaire survey on disaster preparedness among 164 registered nurses studying in a master's degree program at a university. Their survey results showed that all participants believed the training course would improve their readiness, and more than 80% were willing to take it (Fung et al., 2008). Meanwhile, an experimental study by Ghahremani et al. (2022) reported that the disaster simulation conducted in the intervention group was effective in increasing knowledge, preparedness, disaster triage, reporting, incident management, communication, mental disorders, and isolation domains compared to the group that only attended workshops.

Overall, this research shows a strong relationship between nurses' roles and knowledge with preparedness, and nurses consider their role in disaster events to be limited to providing general patient assessment and care, responding promptly, and communicating effectively. Meanwhile, it was found that many respondents still need to recognize the role of leadership and the need to provide psychological services.

In disaster situations, nurses' experience with prior disasters also greatly shapes their awareness of their role. Maluku Province is vulnerable to disasters due to both natural and non-natural factors. Nurses are often sent to disaster locations to care for disaster victims. Therefore, nurses must have sufficient disaster preparedness knowledge and be aware of their roles.

Research Limitations

This study has several limitations. First, the cross-sectional design precludes causal inference between variables. Second, self-reported questionnaire data may be subject to response bias. Third, the study was conducted at a single hospital, limiting the generalizability of the findings. Additionally, the respondent characteristics were not included in the association analyses, and several potentially relevant variables, such as prior emergency and disaster training, length of service, work unit, behavioral factors, self-efficacy, and education level, were not examined.

CONCLUSION AND RECOMMENDATION

This study identified that knowledge and role are dominant factors associated with nurses' disaster preparedness in Maluku, particularly at Dr. M. Haulussy Regional Hospital, Ambon. These findings may inform strategies to strengthen disaster management preparedness and competency by increasing participation in simulations, training programs, and seminars, and by integrating them into nursing education curricula. Additionally, the results may guide hospital management in developing disaster preparedness plans and continuous training programs, while considering the preparedness level of nursing staff and its influencing factors.

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