ORIGINAL ARTICLE

Factors Influencing the Preparedness of Nurses in the Face of Earthquake and Tsunami Disaster

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ABSTRACT

Introduction: Indonesia is geologically very vulnerable to earthquakes and tsunamis, so the preparedness of nurses as the frontline is an important factor in minimising these risks and impacts. Many factors are related to nurse preparedness, namely government policy, facilities and infrastructure, perception and self-efficacy. The purpose of this study was to identify the factors influencing nurses' preparedness in facing earthquakes and tsunamis. **Method:** This study used a quantitative design, involving 150 respondents selected through total sampling. Data were collected using a questionnaire and analysed using path analysis. **Results:** Government policies have both direct and indirect effects on preparedness through infrastructure, perceptions, and self-efficacy (b = 0.332, b = 0.731). Infrastructure has both direct and indirect effects on preparedness through perceptions and self-efficacy (b = 0.008, b = 0.470). Perception has an indirect effect on preparedness through self-efficacy (b = 0.177, b = 0.225). Self-efficacy has a direct effect on preparedness (b = 0.209). **Conclusion:** Government policies, infrastructure, perception, and self-efficacy influence nurses' preparedness. Self-efficacy is the dominant factor, highlighting the importance of self-efficacy interventions in disaster mitigation programmes.
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Keywords: Disaster, Facilities and Infrastructure, Government Policy, Nurse, Preparedness

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INTRODUCTION

In average earthquakes, storms, floods, and tsunamis kill 40,000–50,000 people, which is a relatively small fraction of all deaths globally. However, these extreme events can kill tens to hundreds of thousands of people in a single event. Disasters have other major consequences. Every year, disasters cause millions of people to be displaced, some of them losing their homes. And extraordinary events can cause significant economic losses that are difficult to repair especially if they occur in low-income countries like Indonesia (1). Being located between two oceanic continents, Indonesia is highly vulnerable to disasters. Indonesia is geologically located on the Ring of Fire, the volcanic belt that surrounds the Pacific basin (2). This vulnerability is further exacerbated by Indonesia's location at the meeting point of three major tectonic plates Indo-Australian, Eurasian, and Pacific which causes the region to experience frequent geological activity such as earthquakes, volcanic eruptions, and tsunamis. Indonesia's complex geological structure, including deep seas such as the Banda Sea and the Weber Trench, as well as the presence of high tropical mountains, also makes Indonesia one of the most disaster-prone regions in the world. One of the worst disasters, the earthquake and tsunami killed 170,791 people and injured 9,100 from 2000 to 2019. In addition, many properties were destroyed and 242,377 houses were severely damaged. Underwater earthquakes can cause tsunamis. Earthquakes can cause seawater to move and shift vertically suddenly. As a result, tsunamis occur when moving faults or vertical cracks extend. Seawater is sucked into the fault and then thrown back after the fault reaches equilibrium (3). One example of an earthquake that caused a tsunami was the 2004 earthquake, which had a magnitude of 9 on the Richter Scale and occurred at a depth of 30 km on the seabed southwest of Aceh.

Disasters are defined as unforeseen conditions that cause destruction and suffering to people. The Center for Research on the Epidemiology of Disasters (CRES) also describes disasters as situations that exceed local capacity and require a request to the national or international level for outside assistance. Disasters often negatively affect the quality of human life by threatening all aspects, especially the health sector (4). The negative impact of disasters can be felt if disaster mitigation is not prepared. So that efforts in disaster risk reduction are to improve disaster mitigation through preparedness (5). Preparedness is aimed at the ability to anticipate and

respond effectively to disasters recover from disasters. So that from disaster preparedness, management and recovery after a disaster can be better (6). In an urgent situation, the role of disaster preparedness is so important. Disaster preparedness is needed to deal with and minimize the impact of disasters. Nurses are an important part of the health sector that aims to provide the best emergency health facilities for the community during disaster events (4). However, in Indonesia, several studies show that some nurses are not yet optimally prepared to deal with disasters. For example, in Blitar, around 29% of nurses were found to be unprepared for the eruption of Mount Kelud. Meanwhile, in Aceh, around 40% of nurses had a low level of preparedness for earthquakes and tsunamis. Additionally, in Jakarta, around 31.9% of nurses are not prepared to handle health crises during disasters. This low level of preparedness has the potential to cause negative impacts, not only for patients or victims but also for the nurses themselves and the overall quality of healthcare services (7). Nurse preparedness is influenced by several aspects. (8) explains that disaster training in improving nurse preparedness is driven by government policies and adequate infrastructure. The main influences on preparedness include perceptions of preparedness, self-efficacy, previous experience, responsibility, and resource issues (9).

One factor that can improve nurses' preparedness is government policy (10). The existence of policies regarding disasters will facilitate the formation of disaster management teams, mobilisation of manpower and health resources, public education, disaster preparation, early warning systems, and resource mobility. Facilities and infrastructure can improve preparedness by providing ease of evacuation, rehabilitation, and recovery. Efforts made by nurses such as socialisation, simulations, and health services during disasters cannot be separated from good infrastructure. Veenema et al. said that facilities and infrastructure are a determining factor in how well nurses are prepared (11). Perception also plays an important role in influencing nurses' disaster preparedness. Positive perceptions will help nurses in decision-making to make new plans/policies and improve the quality of care during disasters prepared in the pre-disaster phase. A favourable perception is a significant factor in healthcare professionals' decision-making. A decrease in nurses' perception of preparedness influences feelings of unpreparedness, even though they may actually be prepared. Fear of not being able to manage the disaster process may lead them to believe that they are not prepared for a disaster (12). Self-efficacy also determines an individual's independence in planning and preparing for a disaster. Individuals with high self-efficacy are more motivated and responsible in reducing the impact of disasters and are more prepared and diligent in carrying out plans. This creates motivation for nurses to make preparations according to their role in a team. Belief in one's own abilities can help individuals, including nurses, solve problems effectively and support the professional competence required for earthquake and tsunami preparedness (13–15).

Areas prone to earthquakes followed by tsunamis are coastal areas along the southern part of Java and one of the areas with a high probability of earthquakes and tsunamis is the coastal area of Sukabumi Regency, which is located in the southern part of Java and directly opposite the confluence of the Indo-Australian plate and the Sunda Strait Megathrust and southern Java. The coastal areas of Sukabumi District have not experienced a tsunami disaster so far, but the potential for occurrence is quite large considering that other areas facing the Indo-Australian megathrust have experienced tsunami disasters several times (16). The potential for tsunamis in the Sukabumi coastal area is also supported by the results of megathrust earthquake modelling at seismic gaps, where under the worst-case scenario it was found that the potential for tsunamis in southern Java could reach a maximum height of 20 m and 12 m with an average height of 4.5 m along the southern coast of Java. These conditions indicate the need for nurses to be optimally prepared. However, the level of preparedness of nurses is not necessarily proportional to the potential threats that exist. Therefore, this study is important to explore the factors that influence the preparedness of nurses. The purpose of this study was to determine the factors that influence the preparedness of nurses in facing earthquake and tsunami disasters in the Coastal Area of Sukabumi Regency.

MATERIALS AND METHODS

Study Design

This type of research used quantitative methods. This study was conducted at Puskesmas Pesisir Kabupaten Sukabumi. Prior to data collection, ethical clearance was conducted (No: 000883/KEP STIKES SUKABUMI/2024).

Sample

The population in this study were all nurses at Puskesmas located in the Coastal Region of Sukabumi Regency with a sample size of 150 respondents. The sampling technique used was total sampling. Inclusion criteria included willingness to participate and at least one year of work experience. Data on who was wligible to becom a respondent was obtained directly from the administration of each health center. Those who were absent during data collection due to leave, illness, or official permission were excluded from the list of participiants. The instrument in the form of a questionnaire was handed directly to the participiants by the researcher during working hours. The participants were then asked to complete and return the questionnaire as soon as possible. Out of the 150 eligible individuals, all responded completely, resulting in a participation rate of 100%.

Instrument

The data collection method uses a questionnaire, where the research instrument refers to the Likert scale and Guttman scale. The research instrument has been tested for validity with the results of p <0.05 which means valid and reliability test with the results of Cronbach alpha> 0.7 which means reliable.

Analysis

Data Univariate analysis in this study used descriptive statistical analysis for government policy variables, facilities and infrastructure, perceptions, self-efficacy and disaster preparedness. Statistical analysis used path analysis. All statistical analyses were conducted using SPSS version 26 software.

RESULTS

Characteristics of Respondents

Based on table I shows that most of the characteristics of respondents aged <45 years as many as 102 people (68.0%), female gender as many as 107 people (71.3%), diploma III nursing as many as 104 people (69.3%), >5 years of service as many as 113 people (75.3%), non-civil servants as many as 111 people (74.0%) married as many as 138 people (92.0%), have experience of disaster as many as 116 people (77.3%) and have received disaster training as many as 115 people (76.7%).

Univariate analysis

Based on table II shows that the average value on the government policy variable is 4.59 with a standard deviation value of 0.99, the lowest value is 3 and the highest value is 6. The average value on the facility and infrastructure variable is 8.20 with a standard deviation value of 2.13, the lowest value is 2 and the highest value is 12. The average value on the perception variable is 35.63 with a standard deviation value of 5.31, the lowest value of 27 and the highest value of 44. The average value on the self efficacy variable is 45.41 with a standard deviation value of 10.95, the lowest value is 20 and the highest value is 59. The average value on the preparedness variable is 21.05 with a standard deviation value of 5.22, the lowest value is 10 and the highest value is 25.

Factors that influence preparedness

Based on Figure 1 shows that government policy has a direct influence on preparedness (b = 0.332, p = 0.000) and has an indirect influence on preparedness through facilities and infrastructure (b = 0.201, p = 0.000). perception (b = 0.061, p = 0.000), self-efficacy (b = 0.065, p = 0.000). Government policies also have an indirect influence on preparedness through facilities and infrastructure and perception (b = 0.030, p = 0.000), facilities and infrastructure and self-efficacy (b = 0.0034, p = 0.000), and also through facilities and infrastructure, perception, and self-efficacy (b = 0.008, p = 0.000). Facilities and infrastructure have a direct influence on preparedness (b = 0.346, p = 0.000) and an indirect influence on preparedness through perception (b = 0.052, p = 0.000) and self-efficacy (b = 0.058, p = 0.000). Facilities and infrastructure also have an indirect influence on preparedness through perception and self-efficacy (b = 0.014, p = 0.000). Perception has a direct influence on preparedness (b = 0.177, p = 0.000) and has an indirect influence on preparedness through self-efficacy (b = 0.048, p = 0.000). Self-efficacy through direct influence on preparedness (b = 0.209, p = 0.000)

Table I : Characteristics of Respondents (n=150)

Respondent Characteristics	N	Percentage (%)
Age		
<45 years	102	68.0
>45 years	48	32.0
Gender		
Male	43	28.7
Female	107	71.3
Education		
Diploma III Nursing	104	69.3
Bachelor/Magister of Nursing	46	30.7
Length of Service		
<5 years	37	24.7
>5 years	113	75.3
Employment Status		
PNS	39	26.0
Non-civil servants	111	74.0
Marriage Status		
Married	138	92.0
Unmarried	10	6.7
Divorce	2	1.3
Experience of Disaster		
Have experienced	116	77.3
Never	34	22.7
Disaster Training		
Ever	115	76.7
Never	35	23.3

Table II : Univariate Analysis

Variables	Mean	SD	Min	Max
Government policy	4.59	0.99	3	6
Facility and infrastructure	8.20	2.13	2	12
Perception	35.63	5.31	27	44
Self efficacy	45.41	10.95	20	59
Preparedness	21.05	5.22	10	25

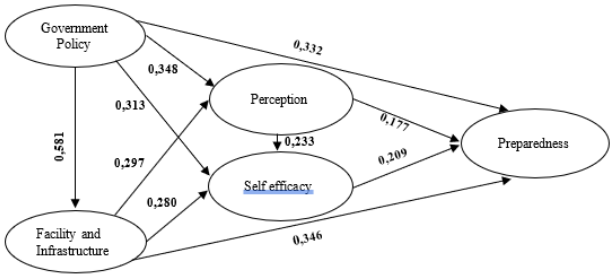

Figure I : Path Analysis Model of Nursing Preparedness

Table III shows that government policies have an indirect influence on preparedness through facilities and infrastructure, perceptions, and self-efficacy (b = 0.731). Facilities and infrastructure have an indirect influence on preparedness through perception and self-efficacy (b = 0.470). Perception has an indirect influence on preparedness through self-efficacy (b = 0.225).

Table III : Direct Effect, Indirect Effect and Total Effect of Independent Variables on the Nursing Preparedness

Variable	Direct Effect	P-value	Indirect Effect	Total Effect
Goverment policy	0.332	0.000	(0.581x 0.346) + (0.348x0.177) + (0.313 x 0.209) + (0.581 x 0.297 x 0.177) + (0.581 x 0.286 x 0.209) + (0.348 x 0.233 x 0.209) + (0.581 x 0.297 x 0.233 x 0.209) = 0.399	0.731
Facility and Infrastructures	0.346	0.000	(0.297x0.177) + (0.280x0.209) + (0.297x0.233x0.209) = 0.124	0.470
Perception	0.177	0.000	(0.233x0.209) = 0.048	0.225
Self efficacy	0.209	0.000	-	0.209

DISCUSSION

The results of the study showed that there was a direct and indirect influence of government policy on the nurse preparedness in the Coastal Area of Sukabumi Regency. Policy is an effort to achieve certain goals with certain targets and in a certain order. Government policy has a standardised definition, namely a decision made systematically by the government with certain aims and objectives that concern the public interest (17). The integration of disaster risk reduction initiatives into government policy is essential for conducting comprehensive risk assessments and developing contingency plans based on different disaster scenarios (18). Defining the roles and responsibilities of health tasks in disaster response will help to streamline the coordination of handling disaster situations properly (19). Policies related to disaster preparedness will be very influential because it is a concrete effort in implementing disaster preparedness activities which include public education, emergency planning, early warning systems, resource mobilisation (20).

Good government policy can increase nurses' ability to use available disaster facilities and infrastructure, perceptions held when a disaster occurs, and self efficacy in mitigation efforts (21,22). Policies that are in accordance with the concept of preparedness need to pay attention to the availability of facilities and infrastructure and their implementation in a disaster. The government can make policies that focus on communication and early warning systems so as to avoid confusion among caregivers and accelerate the distribution of information that is critical for evacuation, rescue, and recovery. One of the disaster facilities that is the result of the Indonesian government's policy is the Disaster Early Warning System application. Facilities and infrastructure play an important role as mediators in the relationship between government policy and carer preparedness. The government needs to set standards for health care facilities so that the buildings used are designed to withstand emergency situations and provide the equipment, personnel and schemes needed to respond to various types of disaster events (21).

The government plays a role in improving nurse preparedness training through regulatory arrangements, educational development, training programs, certification, and the provision of facilities and infrastructure. Consistent and sustainable policy support can effectively improve nurses' ability to respond to disaster situations (23). Policy makers play a major role in building nurses' awareness of disasters through policies. Nurses‘ perceptions play an important role as mediators in the relationship between government policies and nurses’ preparedness (24). When a disaster threat has been predicted to hit a location, the local government develops various policies involving health workers to reduce its impact. The policy was made as a form of seriousness in reducing the impact caused by disasters and accommodating health workers in providing optimal disaster preparedness efforts (25). Policies made can improve nurses' perceptions of disasters because they show the seriousness of the disaster situation that nurses will face. The better the government policy, the better the nurses' self-efficacy. Self-efficacy refers to an individual's belief in their ability to complete tasks and face challenges. In the context of nurses, self-efficacy can have a major influence on their preparedness in dealing with emergency situations or the complexities of daily work (26). Policies with comprehensive disaster training programmes can help nurses feel more confident in their clinical and managerial skills. Nurses‘ self-efficacy plays an important role as a mediator in the relationship between government policies and nurses’ preparedness. Self efficacy increases the number of plans developed by individuals and confidence in implementing them (27). An individual's belief in their efficacy affects preparedness for potential threats and how they are perceived.

Based on research, it is found that residents have a good level of preparedness by preparing first aid infrastructure and being able to provide evacuation locations for residents affected by disasters (28). This is also supported by Naru's research (2024) which states that facilities and infrastructure affect preparedness. Some hospitals have prepared additional rooms and food reserves to deal with disasters. Hospitals are an important aspect for the community so hospitals are expected to provide supportive facilities in the event of a disaster (29). Facilities and infrastructure can influence preparedness through the perception aspect. (30) explains that people's perception of disaster risk will increase when they are

not involved in the approval process of an infrastructure. The risk of disasters that might occur at any time from an infrastructure makes people's perceptions increase and raises awareness to be careful around the area so as to create preparedness to reduce their vulnerability. Individuals who are supported by their environment, both infrastructure and society, have greater self-efficacy. Disaster training facilities can be a means of building nurses' self-efficacy in achieving a high level of preparedness. Disaster simulation training can improve nurses' self-ability so that it affects self-efficacy in disaster management (31). Disaster preparedness can be influenced by infrastructure facilities through perception and self-efficacy. Health facilities are so important to provide medical care to the community. Qualified health facilities can make nurses' perceptions better about the readiness of the health system to face disasters. Good perceptions are also caused by disaster training obtained so that individuals are more confident in their self-competence. Bandura revealed that self-efficacy can influence the desired behavior, namely disaster preparedness (32).

Perception in disaster preparedness is one of the strong assets for nurses to be able to carry out optimal disaster preparedness. Perception is the initial identification and interpretation of a stimulus based on information received through the five senses. The perception felt by individuals is an important first point in assessing the ability of individuals to respond to disasters. Individual perceptions related to disaster risk are a concern, because knowing the risks they face will affect the efficiency of disaster risk management activities, especially disaster preparedness. Positive perceptions will motivate nurses to attend emergency response training, learn evacuation protocols, and maintain emergency medical equipment. Positive perceptions also encourage nurses to collaborate with emergency response teams and communities, and increase knowledge about potential risks in their work areas (33,34).

Self-efficacy mediates the relationship between perceptions and disaster preparation. By reinforcing positive perceptions, self-efficacy increases the likelihood of individuals to adopt preparedness measures. Positive perceptions also influence one's self-efficacy in seeking information and adapting to disasters. Individuals with high self-efficacy are more motivated to take protective actions in an emergency, make early decisions about evacuation responses, and recognise and overcome existing barriers, as they believe that their efforts will result in effective actions (35-38).

The results of this study are in accordance with Zeth et al (2022), Wurjatmiko (2018) and Edy S., et al. (2017) which show there is a significant positive relationship between nurse self-efficacy and nurse preparedness in disaster management. Self efficacy has been identified as having a significant influence on behavior. Nurses who have high self-efficacy tend to be more prepared to deal with disasters, because it can provide confidence to be able to handle victims of natural disasters well and be ready to face future disasters. Self efficacy is also able to change a person's behavior in dealing with disasters, because they feel confident in their beliefs and ability to act or control the situation in the event of a disaster. Self-efficacy in a nurse will determine one's independence in an effort to plan and prepare for disasters and excellent self-efficacy will encourage a nurse to be more prepared and responsive in the face of disasters (39). High nurse self-efficacy will improve nurses in terms of confidence to identify disaster risks, disaster impacts, and health service needs, have the confidence to be able to educate the community about disasters, and to improve disaster preparedness in the community.

This study has several limitations that need to be considered. First, the review of government policies is based only on publicly available documents and regulations, so it does not include an in-depth analysis of implementation in the field. Second, the aspects of facilities and infrastructure studied are limited to nurses' perceptions, without direct verification of the conditions of the facilities at the institutions where they work. Third, perceptions and self-efficacy were measured using subjective questionnaires, which may introduce bias in respondents' self-assessments. Additionally, the quantitative approach used did not fully explore the contextual factors influencing nurses' preparedness to respond to disasters. These limitations should be considered for future research that is more in-depth and comprehensive.

CONCLUSION

This study shows that there is a direct and indirect effect of government policy on the incidence of disaster preparedness. There is a direct and indirect effect of facilities and infrastructure on disaster preparedness. There is a direct and indirect effect of perception on disaster preparedness, and there is a direct effect of self-efficacy on disaster preparedness. Self-efficacy is the dominant factor, highlighting the importance of self-efficacy interventions in disaster mitigation programmes. It is hoped that the government and relevant policy makers can use this research as a basis for training programmes on preparedness for nurses.

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