ORIGINAL ARTICLE

Factors Associated With Preparedness of Health Workers in the Face of Earthquake and Tsunami Disaster

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ABSTRACT

Introduction: Indonesia is one of the countries consisting of islands that are geographically located at the confluence of 3 world tectonic plates and also located in the Pacific Ring of Fire. This makes Indonesia vulnerable and at high risk to disaster threats, one of which is the earthquake and tsunami disaster. To minimize the risks and impacts, the preparedness of health workers is needed. There are many factors associated with the preparedness of health workers, namely age, education, disaster training, self-efficacy, and facilities and infrastructure. This study aims to determine the factors associated with the preparedness of health workers in facing earthquake and tsunami disasters in the Coastal Region of Sukabumi Regency. **Materials and methods:** This study used associative research design. The population consisted of all Health Workers in the Coastal Area of Sukabumi Regency, with a total sample size of 512 selected by total sampling. Data were collected using questionnaires. Data analysis methods included chi square and logistic regression. **Results:** The results showed that there was a relationship between age (p=0.000), education (p=0.000), disaster training (p=0.000), self-efficacy (p=0.000) and facilities and infrastructure (p=0.000) with the preparedness of health workers. There is a simultaneous relationship of age, education, disaster training, self-efficacy, and facilities and infrastructure to the preparedness of health workers (p<0.05). **Conclusion:** Age, education, disaster training, facilities and infrastructure and self-efficacy were significantly associated with health worker preparedness. Self-efficacy is the most dominant factor. It is expected for health workers to improve disaster-related self-efficacy through disaster training and simulation.
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Keywords: Preparedness, Disaster, Earthquake, Tsunami, Health Workers

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INTRODUCTION

Natural disasters are natural events that have a very detrimental impact on communities around the world. Natural disasters cause loss of life, destruction of facilities and infrastructure, economic damage, and health disasters for the community. Indonesia is one of the countries that is geographically positioned at the convergence of the world's 3 tectonic plates, which are the Australian plate, the Pacific plate, and the Eurasian plate. This makes Indonesia geologically vulnerable and results in Indonesia being a country at high risk of disaster threats.

The 2018 World Risk Report recorded that Indonesia ranked 36th with a risk ratio of 10.36 out of 172 countries most at risk of disaster in the world (1). One of the disasters that claimed many lives was the earthquake and tsunami. Earthquakes and tsunamis caused the highest number of deaths from 2000 to 2019, reaching 170,791 people, 9,100 people were injured, and 242,377 houses were destroyed and severely damaged (2).

Earthquakes induced by the interplay of tectonic plates can cause tidal waves if they occur in the sea or ocean. Given the region is impacted by the motion of these tectonic plates, Indonesia often suffers from tsunamis. Tsunamis that happen in Indonesia are mainly generated by tectonic earthquakes across subduction zones and other seismically active regions. In the period 1600-2000, there were 105 tsunami events, 90 percent of which were generated by tectonic earthquakes, 9 percent by volcanic eruptions and 1 percent by landslides (2).

One of the efforts to mitigate the impact of disasters is to increase disaster mitigation. Disaster mitigation is one part of preventive measures to avert public health disasters or public health disasters as a result of the impact of the disaster itself (3). One form of mitigation

is to establish preparedness. Preparedness is a sequence of actions taken to prevent disasters by organizing and taking appropriate and effective actions (4).

The government is the spearhead in implementing disaster preparedness. One of the elements of government preparedness is the preparedness of health workers in disaster-prone areas. Health workers are part of the government elements that have a big responsibility in carrying out disaster preparedness so that they have a very important role and are at the forefront of facing disasters (5). Many factors affect the preparedness of health workers including age, education, disaster training, self-efficacy, acilities and infrastructure (6)(7)(8).

Age is a factor that affects the preparedness of health workers, the more mature the age will have more coordination, work habits, with more skills they have so that they have higher preparedness in facing disasters (9)(10). Education affects the preparedness of health workers. The more educated a person is, the more receptive they are to information and the better prepared they are to deal with disasters (11)(12). Disaster training can help describe events during disasters and train the ability to act quickly to have a good impact on improving preparedness (8)(13). Self efficacy is another factor associated with disaster preparedness. Self efficacy affects whether people feel pessimistic or optimistic about their ability to withstand challenges or disaster situations. Feeling optimistic in the face of disaster can give health workers the confidence to deal with disasters (14). Infrastructure facilities are another factor in preparedness because they determine efforts to prepare themselves and others in the face of disasters including disaster management processes such as helping, evacuating, and assisting disaster victims (15)(16).

The coastal area of Sukabumi Regency is vulnerable to earthquakes and tsunamis because it is located right across the meeting point of the Indo-Australian plate and the Sunda Strait Megathrust and southern Java. The potential for tsunamis in the coastal area of Sukabumi is supported by the results of megathrust earthquake modeling on seismic gaps, with the worst-case scenario finding the potential for a tsunami in the south of Java Island could reach a maximum height of 20 m and 12 m with an average height of 4.5 m along the south coast of Java. It was recorded that from 1992 to 2006 there had been several tsunamis triggered by this Megathrust, including the Flores tsunami, East Nusa Tenggara in 1992, the Banyuwangi tsunami, East Java, in 1994 (M 7.2), and the Pangandaran tsunami (M 7.7), West Java, 2006. This area also faces directly to the Indo-Australian plate meeting and is crossed by the Cimandiri fault/fracture which is an earthquake source zone with active fault status located in South Sukabumi. Health workers play an important role in disaster management, so health workers in this area need high preparedness in facing the threat of earthquakes and tsunamis. The purpose of this study is to analyze factors related to the preparedness of health workers in facing earthquakes and tsunamis in the Coastal Area of Sukabumi Regency.

MATERIALS AND METHODS

Study Design

This type of research used quantitative methods. This study was conducted at the Puskesmas of the Coastal Region of Sukabumi Regency. Ethical clearance was obtained prior to data collection (No:000445/KEP STIKES SUKABUMI/2023).

Sample

The population in this study were all health workers at Puskesmas located in the Coastal Region of Sukabumi Regency with a sample size of 512 respondents. The sampling technique was total sampling. Inclusion criteria were willing to be a respondent and at least one year working at the health center. Exclusion criteria were permission, illness, and leave during the data collection process.

Instrument

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

Data Analysis

Univariate analysis in this study used descriptive statistical analysis for the variables of age, education, disaster management training, self-efficacy, and facilities and infrastructure. Statistical analysis used chi square and logistic regression. All of the statistical analyses were performed using the SPSS statistical software package (version 16).

RESULTS

Table I shows that most respondents were < 45 years old, 391 people (76.4%), had a Diploma education, 331 people (64.6%), attended disaster training, 390 people (76.2%), had high self-efficacy, 381 people (74.4%), assessed facilities and infrastructure support, 380 people (74.2%), and had preparedness in the ready category, 400 people (78.1%).

Table I : Univariate Analysis

Variables	n	%
Age (Years)		
< 45	391	76.4
≥ 45	121	23.6
Education		
Diploma	331	64.6
Bachelor's/Master's Degree	181	35.4
Disaster Training		
Ever Participated	390	76.2
Never Participated	122	23.8
Self-Efficacy		
High	381	74.4
Low	131	25.6
Facilities and Infrastructure		
Supported	380	74.2
Not Supported	132	25.8
Preparedness		
Prepared	400	78.1
Not Prepared	112	21.9

Based on Table II shows that the results of the chi square statistical test there is a relationship between age and the preparedness of health workers in facing earthquake and tsunami disasters (p=0.000, OR=13.726), there is a relationship between education and the preparedness of health workers in facing earthquake and tsunami disasters (p=0.000, OR=2.419), There is a relationship between disaster training and the preparedness of health workers in facing earthquake and tsunami disasters (p=0.000, OR=549.267), there is a relationship between self-efficacy and the preparedness of health workers in facing earthquake and tsunami disasters (p=0.000, OR=0.051), and there is a relationship between facilities and infrastructure and the preparedness of health workers in facing earthquake and tsunami disasters (p=0.000, OR=41.400).

Table II : Chi Square Bivariate Analysis

Variables	Preparedness				P-Value	OR
	Prepared		Not Prepared			
	n	%	n	%		
Age (Years)						
< 45	352	90.0	39	10.0		
≥ 45	48	39.7	73	60.3	0.000	13.726
Total	400	78.1	112	21.9		
Education						
Diploma	277	83.7	54	16.3		
Bachelor's/ Master's Degree	123	68.0	58	32.0	0.000	2.419
Total	400	78.1	112	21.9		
Disaster Training						
Ever Participated	385	98.7	5	1.3		
Never Participated	15	12.3	107	87.7	0.000	549.267
Total	400	78.1	112	21.9		
Self-Efficacy						
High	351	92.1	30	7.9		
Low	49	37.4	82	62.6	0.000	0.051
Total	400	78.1	112	21.9		

CONTINUE

Table II : Chi Square Bivariate Analysis. (CONT.)

Variables	Preparedness				P-Value	OR
	Prepared		Not Prepared			
	n	%	n	%		
Facilities and Infrastructure						
Supported	360	94.7	20	5.3		
Not Supported	40	30.3	92	69.7	0.000	41.400
Total	400	78.1	112	21.9		

Table III shows that the results of multivariate logistic regression analysis indicated that age, education, disaster training, self-efficacy, and facilities and infrastructure were associated with health workers' preparedness for earthquake and tsunami disasters (p < 0.05). The most dominant variable associated with health workers' preparedness for earthquake and tsunami disasters was self-efficacy. The self-efficacy variable has an Odds Ratio of 25.448, meaning that health workers with high self-efficacy are likely to have preparedness in the ready category 25.448 times higher than health workers with low self-efficacy.

Table III : Logistic Regression Analysis

Variables	B	P-Value	OR
Age	-2.392	0.003	0.091
Education	-3.646	0.000	0.026
Disaster Training	-6.445	0.000	0.002
Self-Efficacy	3.237	0.000	25.448
Facilities and Infrastructure	-2.822	0.002	0.059
Constant	5.806	0.000	332.134

R Square = 0,930

DISCUSSION

The results of the analysis show that there is a relationship between age and the preparedness of health workers in facing earthquake and tsunami disasters in the Sukabumi Regency Coastal Area. The age of health workers can support preparedness behavior in health workers. Productive age plays a role in various activities, one of which is participating in disaster socialization and various other activities and has good cognitive abilities, so someone with productive age is better able to understand disaster preparedness well (17). Someone with a productive age will be better prepared to face disasters, so they have good disaster preparedness. Meanwhile, someone with an age that is not productive enough will be less prepared to deal with disasters, so they have poor disaster preparedness. The age factor is a variable of an individual that basically the older a person gets, the more maturity he will have and absorb a lot of information that will affect his productivity, such as actively seeking literacy about preparedness and the high desire to participate in disaster training activities (18). According to Gibson (1987) as a person ages, it will affect the level of experience and ability to deal with disasters. The more mature a person is, it will affect the person's information absorption, including in preparedness (19)

The results showed that there is a relationship between education and the preparedness of health workers in facing earthquake and tsunami disasters in the Coastal Region of Sukabumi Regency. Education has a crucial role in determining the preparedness of health workers in facing disasters. Higher education tends to provide more in-depth knowledge about various aspects of health and emergencies. With higher education, health workers can comprehensively understand the types of disasters, their impact on public health, and the actions to be taken to address them. In addition, higher education also enables health workers to develop critical, analytical and leadership skills required in emergency situations (20).

However, not all education in the health sector provides specialized training on disaster preparedness. Sometimes, the formal education curriculum has not fully integrated aspects of disaster preparedness into health study programs. Therefore, efforts are needed to improve health education curricula to include adequate training and knowledge on disaster management (21). Aside from formal education, additional training and professional development programs are also important to ensure that health workers have the necessary skills and knowledge to effectively deal with disasters, thus, holistic education and training will better prepare health workers to face complex disaster challenges (22).

There is a relationship between disaster training and the preparedness of health workers in facing earthquake and tsunami disasters in the Coastal Region of Sukabumi Regency. Disaster training can support the preparedness of health workers in facing disasters, namely increasing the knowledge and skills of health workers in tsunami and earthquake disaster management. This training is a necessity for health workers, especially those in coastal areas because they have a high risk of experiencing tsunamis and earthquakes, so they need adequate knowledge and skills through the implementation of disaster training to avoid the impact of natural disasters. Disaster training for health workers will increase understanding and expertise in implementing basic life support in the face of disasters. Health workers who are in disaster-related program units are required to attend disaster training and simulations. However, for health workers who are not in the program, they are only required to participate in disaster socialization to increase knowledge and know how to behave in dealing with disasters both in the pre-disaster, disaster, and post-disaster phases (23).

Based on the results of this study, it shows that there is an influence of facilities and infrastructure on the preparedness of health workers. This is in line with the results of research by Isangula et al. (2023), which states that there is a relationship between health facilities and the preparedness of health workers in responding to disasters. The preparedness of health workers is influenced by the availability of adequate facilities, equipment and infrastructure at the health service. Lack of adequate facilities and infrastructure can hamper the ability of health workers to handle disasters and treat victims (24).

Health facilities and infrastructure play an important role in health worker preparedness as they must be able to operate effectively during an emergency. The availability of adequate facilities and infrastructure is one of the keys to health worker preparedness. Well-equipped facilities, such as modern medical equipment, well-stocked medicines, and proper treatment rooms, allow health workers to provide the best services in emergency situations. Adequate infrastructure, such as easy access roads, reliable communication systems, and stable water and electricity supplies, ensure the smooth operation of health services, especially in times of disaster or patient surge. Thus, adequate facilities and infrastructure are important pillars in improving the preparedness of health workers in dealing with various situations and conditions, in order to save lives and maintain public health. With adequate and well-functioning facilities and infrastructure, health workers can work efficiently and effectively in dealing with public health emergencies and disasters (25).

Based on the results of this study, it shows that there is an effect of self-efficacy on the preparedness of health workers. This is in line with Wurjatmiko et al. (2018), showing that there is a significant relationship between self-efficacy and health worker preparedness (16). Health workers with good self-efficacy tend to have better preparedness when facing disasters. Self-efficacy is an individual's belief in their ability to achieve certain goals. In the context of health workers, self-efficacy can affect their preparedness in dealing with emergency or disaster situations. Health workers who have high levels of self-efficacy t6end to be more confident in facing challenges and are better equipped to respond effectively to emergency situations. The higher the level of self-efficacy of health workers, the greater the potential to have a positive perception of disaster preparedness management. This shows the importance of paying attention to and improving the self-efficacy of health workers as part of the preparation and response to emergency situations or disasters that may occur (26). The results of this study also show that self-efficacy is the dominant factor that can affect the preparedness of health workers in facing disasters. Self-efficacy, or confidence in one's ability to accomplish a task, is the dominant factor affecting health workers' preparedness because of its role in fostering motivation, persistence and resilience in the face of difficult situations. Health workers with high self-efficacy have a strong belief in their ability to treat patients, diagnose diseases and make sound decisions, even under pressure. This confidence encourages them to be proactive in finding solutions, never give up in critical situations, and remain calm in

emergency situations. High self-efficacy enables health workers to work effectively and efficiently, especially in emergency situations, thereby improving the quality of health services and saving patients' lives. Therefore, self-efficacy is like a fire that burns the spirit and strengthens the determination of health workers to be at the forefront of protecting public health.

A limitation of this study is that it does not accurately measure disaster events that require disaster preparedness in the event of an earthquake and tsunami. As such, it may not reflect the perceived threats and consequences of earthquake and tsunami disaster events.

CONCLUSION

Age, education, disaster training, facilities and infrastructure and self-efficacy were significantly associated with health worker preparedness. Self-efficacy is the most dominant factor. In improving self-efficacy, it is expected that collaboration with related institutions such as the Regional Disaster Management Agency (BPBD), Sukabumi District Health Office, Puskesmas and Non-Governmental Organizations (NGOs), as well as the Police Sector in the implementation of disaster training and simulations is expected.

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