

RESEARCH ARTICLE

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The Levels of Physician Disaster Preparedness Based on the Tsunami Vulnerability Zones in Banda Aceh

Taufik Suryadi^{1,*}, Balqis Qonita², Hafni Andayani³, Agung Pranata⁴

¹ Department of Forensic Medicine and Medico-legal, Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh, 23111, Indonesia.

² Medical Professional Education Program, Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh, 23111, Indonesia.

³ Department of Public Health/ Community Medicine, Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh, 23111, Indonesia.

⁴ Department of Parasitology, Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh, 23111, Indonesia.

*Corresponding author: taufiksuryadi@unsyiah.ac.id

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Abstract

Disasters caused by natural hazards may harm the health sector. It needs physician preparedness as a significant step in disaster risk reduction efforts and is expected to obtain an adequate response when a disaster occurs. This study aimed to determine the level of physician preparedness at the public health center (PHC) to face a tsunami caused by an earthquake based on the vulnerability zones. This research method is observational analytic with a cross-sectional design using a questionnaire developed by LIPI-UNESCO/ISDR adjusted to the core competencies and sub-competencies for disaster medicine and public health. The samples were collected in total sampling. The results show that most respondents have a preparedness index with categories almost prepare and not prepare, each of 12 respondents from a total of 42 people who participated in this study (28.56%). The physician from zone III has the best preparedness, and the physician from zone I are at least prepared for disasters. Statistical analysis using the Kruskal Wallis test obtained p-value 0.646 ($p > 0.05$). The conclusion was found that there was no significant difference between the levels of physician preparedness at the PHC facing tsunami disasters based on the tsunami vulnerability zone in Banda Aceh.

Keywords: physician preparedness, vulnerability zone.

Introduction

Indonesia is a country that is prone to disasters caused by natural hazards. According to the 2018 Emergency Events Database (EM-DAT), Indonesia is ranked 5th as a disaster-prone country and in 10th place with the highest mortality rate globally. Indonesia is also prone to tsunamis caused by earthquakes. In the last ten years since 2010, a tsunami caused by earthquakes that had a significant impact occurred in 2018, namely in Palu, Central Sulawesi, and the Sunda Strait (BNPB, 2019).

Earthquakes and tsunamis caused by earthquakes are prone to occur in Indonesia because Indonesia is located between three tectonic plates, namely the Pacific plate, the Eurasian plate, and the Indian-Australian plate (Widayatun & Fatoni, 2013). More than 18,000 islands in Indonesia are located along the "Ring of Fire." Areas that are quite prone to tsunamis caused by earthquakes are the islands of Sumatra, Java, Bali, and Nusa Tenggara (Ashar et al., 2018). Aceh is one of the provinces located on the island of Sumatra; apart from the tsunamis caused by earthquakes that occurred in 2004, which resulted in an impact and massive losses, a reasonably large earthquake also occurred in 2016 in Pidie Jaya, one of the districts in Aceh Province. The incident caused 96 victims to die, and many victims were injured, thousands of refugees, thousands of houses, and hundreds of health facilities were damaged (BNPB, 2019).



Disasters caused by natural hazards always have negative impacts from various aspects. One of them is the impact on the health sector, such as medical and psychological impacts (Ashar et al., 2018). These impacts can be in the form of the disturbance of health services, death victims, injured victims, nutritional problems, clean water health problems, environmental sanitation, infectious diseases, psychiatric disorders, and reproductive diseases (Oktari & Kurniawan, 2016).

Due to the large number of impacts that can arise from a disaster, efforts are needed to overcome the disaster. The disaster management cycle has four essential components, mitigation, preparedness, response, and recovery, aiming to carry out disaster management (Coppola, 2016). One of the essential components in disaster management is preparedness. Preparedness must know what is needed and how to respond when a disaster occurs and is equipped with the right tools and information to act effectively (Saavedra, 2017). One of the personnel needed in health sector preparedness is a physician (Galappatti & Richardson, 2016).

This study is different from other studies usually conducted in the community. In the community, preparedness usually only concerns pre-disaster and during a disaster. When a disaster occurs, a physician is expected to participate in the pre-disaster stage, during and after the disaster. Many are aware of the importance of individual preparedness in dealing with disasters, but several studies report that disaster preparation is still relatively low even in disaster-prone areas (Kemenkes, 2007). In the pre-disaster stage, one of which is the preparedness of physicians as a main practical step in disaster management. The lack of preparedness of physicians in dealing with disasters is one of the factors resulting in greater disaster risk (Kumar & Weibley, 2017). When a disaster occurs, physicians are tasked with rescuing victims and their patients and must prepare themselves and their families outside (Galappatti & Richardson, 2016).

As a result of the Tsunami in Aceh in 2004, which had a significant impact on the Banda Aceh region, in a study, Banda Aceh was divided into tsunami vulnerability zones. The tsunami susceptibility zone is determined based on the height of the tsunami waves and the devastating impact they have on them. The classification of the tsunami vulnerability zone is divided into three zones, namely zone I (red zone), zone II (yellow zone), and zone III (green zone). The impact caused by the tsunami is based on zones: in zone I, it is destroyed, and in zone II, it is severely damaged. Moreover, in zone III, it has no impact. The tsunami vulnerability zone is determined based on the height of the tsunami waves and the impact of the devastation resulting from the tsunami waves of the 2004 Indian Ocean tsunami. Badan Pertanahan Nasional (BPN) Aceh divides the Banda Aceh area into three regions or zones can be seen in figure 1 (Syamsidik et al., 2017).

Public Health Center (PHC) is the first line in disaster management. When a disaster occurs, it is expected that the PHC will continue to function as a first-level health service facility, especially in the event of a disaster. PHC can carry out an emergency response to save disaster victims (Oktari & Kurniawan, 2016). Based on the vulnerability zones of 9 sub-districts in Banda Aceh, 11 PHCs spread across Banda Aceh (Syamsidik et al., 2017). The purpose of this study was to determine the level of physician preparedness at the Public Health Center (PHC) to face a tsunami caused by the earthquake based on the vulnerability zones in Banda Aceh.

Methods

This study is an observational analytic study with a cross-sectional design. Data collection was conducted at 11 public health centers (PHCs) in Banda Aceh. Sampling used a total sampling technique for 42 physicians who met the inclusion criteria. The instrument used comes from the questionnaire by LIPI - UNESCO / ISDR. It is adapted from the core competencies and sub-competencies for disaster medicine and public health that have been tested for validity with Content Validity Ratio (CVR) by experts. This study was conducted to measure the level of preparedness of 42 respondents covering four preparedness parameters, namely knowledge, preparedness planning, disaster alert, and resource mobilization.

This study used univariate data analysis to describe each variable and bivariate analysis using the *Kruskal Wallis* statistical test to distinguish the differences between the two variables. This study was approved by the Health Research Ethics Committee at the Syiah Kuala University/dr. Zainoel Abidin Regional Public Hospital No. 343/EA/FK-RSUDZA/2019 and before data collection, all respondents agreed to participate in the study by signing the consent sheet before answering the questionnaire. Data collection for this research was conducted at 11 Public health centers in Banda Aceh. The data collection time was from March 5 to March 20, 2020.

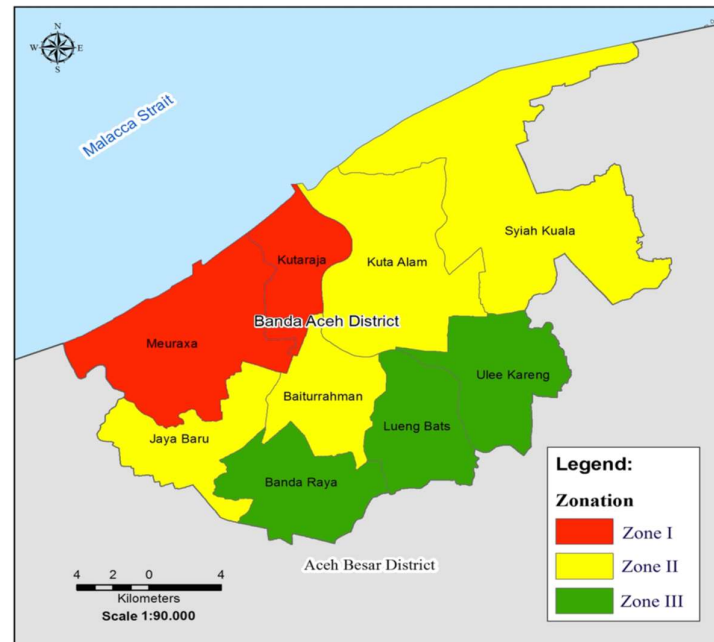


Figure 1. Distribution of tsunami vulnerability zones in Banda Aceh

Results

A total of 42 respondents have filled out the complete questionnaire (100% response rate). In general, respondents who participated in this study were female (92.9%). The respondents in this study were between 26-55 years, the most in the 26-35 year age group (61.9%). Based on the tsunami vulnerability zone, many respondents came from zone 2 (52.4%). In addition, more respondents had never attended training based on disaster training (92.9%). The characteristics of respondents can be seen in Table 1. The frequency distribution of the preparedness level of PHC Physicians in Banda Aceh can be seen in Table 2. The frequency distribution of preparedness levels for all respondents can be seen in Table 3. Analysis of differences in physician preparedness levels based on vulnerability zones can be seen in Table 4.

Table 1. Characteristics of respondents.

| Characteristics | Total (n=42) | Percentage (%) |
|-----------------|--------------|----------------|
| Sex | | |
| Male | 3 | 7.1 |
| Female | 39 | 92.9 |
| Age | | |
| 26-35 years old | 25 | 61.9 |
| 36-45 years old | 15 | 35.7 |

| | | |
|----------------------------|----|------|
| 46-55 years old | 1 | 2.4 |
| Zone | | |
| Zone I <i>red zone</i> | 7 | 16.7 |
| Zone II <i>yellow zone</i> | 22 | 52.4 |
| Zone III <i>green zone</i> | 13 | 31 |
| Employment status | | |
| Civil Servants | 36 | 85.7 |
| Non-Civil Servants | 6 | 14.3 |
| Disaster Training | | |
| Ever | 3 | 7.1 |
| Never | 39 | 92.9 |

Table 2. Frequency distribution of preparedness level of PHC Physicians in Banda Aceh.

| Public Health Center | Very high | | High | | Medium | | Low | | Very low | |
|----------------------|-----------|-------|------|-------|--------|-------|-----|-------|----------|------|
| | n | % | n | % | n | % | N | % | n | % |
| Zone I | | | | | | | | | | |
| Meuraxa | 1 | 2.38 | 1 | 2.38 | 0 | 0 | 1 | 2.38 | 0 | 0 |
| Lampaseh Kota | 0 | 0 | 1 | 2.38 | 1 | 2.38 | 1 | 2.38 | 1 | 2.38 |
| Zone II | | | | | | | | | | |
| Lampulo | 1 | 2.38 | 0 | 0 | 1 | 2.38 | 0 | 0 | 0 | 0 |
| Kuta Alam | 0 | 0 | 2 | 4.76 | 0 | 0 | 2 | 4.76 | 1 | 2.38 |
| Jaya Baru | 0 | 0 | 1 | 2.38 | 3 | 7.14 | 0 | 0 | 0 | 0 |
| Baiturrahman | 0 | 0 | 2 | 4.76 | 0 | 0 | 1 | 2.38 | 0 | 0 |
| Jeulingke | 0 | 0 | 0 | 0 | 4 | 9.52 | 0 | 0 | 0 | 0 |
| Darussalam | 0 | 0 | 0 | 0 | 1 | 2.38 | 2 | 4.76 | 1 | 2.38 |
| Zone III | | | | | | | | | | |
| Banda Raya | 0 | 0 | 2 | 4.76 | 0 | 0 | 2 | 4.76 | 0 | 0 |
| Batoh | 4 | 9.52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ulee Kareng | 0 | 0 | 0 | 0 | 2 | 4.76 | 3 | 7.14 | 0 | 0 |
| Total | 6 | 14.28 | 9 | 21.42 | 12 | 28.56 | 12 | 28.56 | 3 | 7.14 |

Table 3. Frequency distribution of preparedness level for all respondents.

| Preparedness Level | Frequency (n) | Percentage (%) |
|--------------------|---------------|----------------|
| Very high | 6 | 14.28 |
| High | 9 | 21.42 |
| Medium | 12 | 28.56 |

| | | |
|--------------|-----------|------------|
| Low | 12 | 28.56 |
| Very low | 3 | 7.14 |
| Total | 42 | 100 |

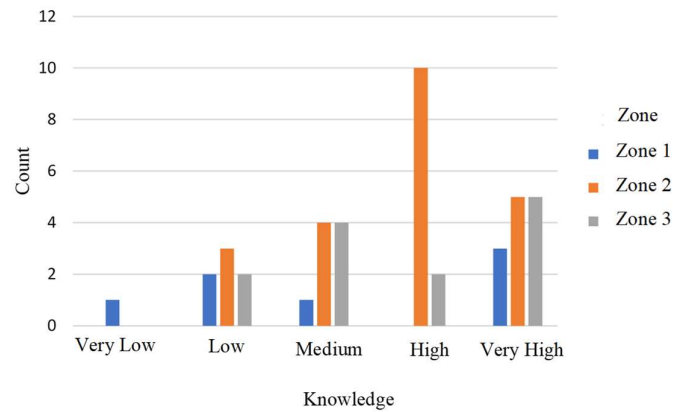


Figure 2. Distribution of respondents' knowledge of disaster preparedness.

In Table 2, out of 11 PHCs in Banda Aceh, PHC Batoh seemed best prepared for the earthquake and tsunami disasters, while PHC Ulee Kareng looked the least prepared. Table 2 shows the level of preparedness of physicians in the very high category comes from zone III (green zone), which is four respondents (9.52%). On the other hand, the level of preparedness in zone I (red zone) was equal between the high and low, with each category having as many as two respondents (4.76%). In comparison, the level of preparedness in zone 2 (yellow zone) was mainly in the medium category, namely four respondents (9.52%).

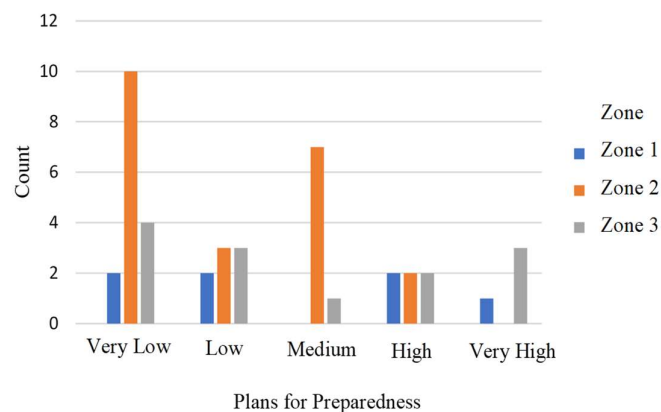


Figure 3. Distribution of respondents' plans for disaster preparedness.

Based on table 3, in general, shows that the majority of respondents have a preparedness index with categories low and medium, each of 12 respondents from a total of 42 people who participated in this study (28.56%). However, when calculated manually, the prepared category is combined between very high, high, and medium, while the unprepared category is combined between low and very low, then the prepared category is 27 respondents (64.29%), and the unprepared category is 15 respondents (35.71%).

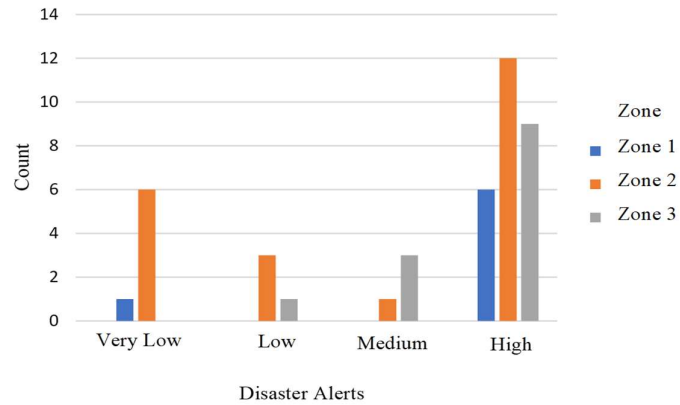
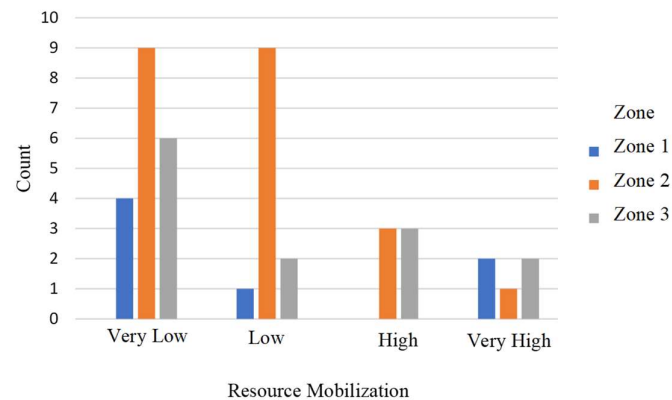


Figure 4. Distribution of respondents' disaster alerts to disaster preparedness.

This study was conducted to measure the level of preparedness of 42 respondents, covering four parameters: knowledge, preparedness planning, disaster alert, and resource mobilization. Distribution preparedness parameters of physician preparedness based on the tsunami vulnerability zone in Banda Aceh can be seen in Figures 2, 3, 4, and 5. As seen from Figures 2, 3, 4, and 5, it can be stated that zone II has the best knowledge and the best alertness in disaster preparedness, zone III is the best in disaster preparedness planning, while zone I tends to have the best readiness in resource mobilization.



The results of statistical tests using the Kruskal Wallis test obtained a p-value of > 0.05 , and this indicates that none of the four preparedness parameters have significant differences between zones from the point of view of knowledge (p-value 0.809), preparedness planning (p-value 0.342), disaster alert (p-value 0.210), and resource mobilization (p-value 0.908).

Analysis of differences in physician preparedness levels based on Tsunami vulnerability zones in Banda Aceh can be seen in Table 4. The Kruskal Wallis statistical test obtained as p-value is 0.646 (p value > 0.05). This p-value indicates that there is no significant difference in the preparedness level of PHC physicians in facing tsunami disasters caused by the earthquake based on the Tsunami vulnerability zone in Banda Aceh.

Table 4. Analysis of differences in physician preparedness levels based on vulnerability zones.

| Tsunami vulnerability zones | Preparedness index | | | | | Total n (%) | p-value |
|-----------------------------|--------------------|---------------|-----------------|--------------|-------------------|----------------|---------|
| | Very high n (%) | High n (%) | Medium n (%) | Low n (%) | Very low n (%) | | |
| Zone I (red zone) | 1 (2.38) | 2 (4.76) | 1 (2.38) | 2 (4.76) | 1 (2.38) | 7 (16.67) | 0.646 |
| Zone II (yellow zone) | 1 (2.38) | 5 (11.90) | 9 (21.43) | 5 (11.90) | 2 (4.76) | 22 (52.38) | |
| Zone III (green zone) | 4 (9.52) | 2 (4.76) | 2 (4.76) | 5 (11.90) | 0 (0) | 13 (30.95) | |
| Total | 6 (14.29) | 9 (21.43) | 12 (28.56) | 12 (28.56) | 3 (7.14) | 42 (100) | |

Discussion

This research was conducted to measure the level of preparedness of 42 physician respondents, covering four parameters: knowledge, preparedness planning, disaster alert, and resource mobilization. The results of the research data analysis found that most of the PHC physicians in Banda Aceh had low and medium preparedness levels, respectively, 28.6%. However, on average, physicians in PHC already have a high level of preparedness, namely in the high and very high category, with as many as 15 respondents. This is because many factors affect a person's preparedness level. One of the most decisive factors is knowledge and attitude to saving himself from the threat of disaster risk (Widjaja & Herlianto, 2017). The importance of knowledge on disasters aims to provide protection and preparedness efforts because knowledge will influence attitudes and awareness to be ready and prepared in anticipation of disasters (Coppola, 2016).

According to LIPI/ UNESCO-ISDR, knowledge and attitudes are the main factors for disaster preparedness. So that the higher a person's knowledge, the higher the level of disaster preparedness (LIPI-UNESCO/ISDR, 2006). The highest level of very high preparedness came from zone III, 9.52%. At the same time, zones I and II have one respondent who has a very high level of preparedness. This shows that the tsunami vulnerability zone does not affect the preparedness level of PHC physicians in Banda Aceh. Supposedly, PHC physicians in zone 1, namely Meuraxa and Kutaraja sub-districts, have a higher level of preparedness due to their location near the sea coast, and these locations were destroyed during the 2004 earthquake and tsunami in Aceh (Syamsidik et al., 2017).

In addition to knowledge, other factors that can improve preparedness are participation in disaster simulations and disaster training. Disaster simulation/drills and training are essential to increase physicians' knowledge and skills so they can be prepared when a disaster occurs. For example, the Ishinomaki Red Cross Hospital in Myagi, Japan, regularly implements disaster training, simulations, and tabletop training. So it was proven that the hospital was more prepared for disasters when the earthquake and tsunami occurred in East Japan (Munasinghe & Matsui, 2019).

The statistical analysis results showed that the p-value was 0.646 ($p\text{-value} > 0.05$), which means that there was no significant difference in the preparedness level of PHC physicians in facing tsunami disasters caused by the earthquake in Banda Aceh. There is no difference due to the many other factors that affect the level of preparedness in facing disasters, such as disaster experience, gender, and knowledge. The results of this study are supported by research conducted by Sari regarding differences in the level of preparedness for housewives' emergency response plans to face earthquakes and tsunamis in disaster-resilient villages in Aceh Besar District. Based on the statistical test results, the p-value was 0.334, meaning there was no significant difference (Sari, 2017). These results are supported by research by SteelFisher et al. regarding the preparedness of physicians in

facing a natural disaster; most were in the medium level category, namely 46%, while only 16% were at a very high level of preparedness (SteelFisher et al., 2015).

Apart from the importance of physicians' preparedness in facing disasters, the role of PHC institutions is also essential to improving preparedness and resilience. This is because the high preparedness of physicians in PHC can increase the functional component of community health center resilience to disasters (Oktari & Kurniawan, 2016). Other things also affect the preparedness level of PHC physicians against disasters. First, a group is responsible for formulating disaster preparedness, response, and recovery plans. From the results of research and interviews with respondents, the majority of physicians do not participate in the formulation of preparedness plans in their working areas. Second, there was a command system when an emergency incident occurred. The majority of respondents also did not know about the commando incident. Third, physicians who have participated in disaster simulations and regular disaster training, from this study, only 3 out of 42 respondents had attended disaster training.

The limitation of this study is that the researcher does not further identify the disaster preparedness factors that are thought to affect the research results. Another limitation in this study is that not all respondents were interviewed because it was in accordance with the agreement and availability between the respondent and the researcher.

Conclusions

Based on the results of data analysis and discussion, it can be concluded that: (1) most of the PHC physicians in Banda Aceh have a level of preparedness in the face of tsunami disasters caused by the earthquake with the categories low and medium, (2) there is no difference in the level of preparedness of PHC physicians in facing tsunami disasters caused by the earthquake based on the tsunami vulnerability zone in Banda Aceh. This is because several factors can affect the level of preparedness of a physician, one of which is the level of knowledge and experience of disasters.

Physicians are expected to participate in disaster training and simulations to increase knowledge and skills when an earthquake and tsunami occurs. The Regional Disaster Management Agency of Banda Aceh can provide more counseling and disaster simulations to the physician at PHC. Further research needs to be done on how the influence of disaster preparedness training on the strategies and attitudes of PHC physicians in dealing with disasters.

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