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The Effect of Earthquakes and Tsunamis Preparedness on Anxiety Levels: A Case Study of Alue Naga Village, Banda Aceh

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Abstract— Preparedness is a new paradigm in the context of disaster management. In order to reduce casualties, property losses, and psychological impacts, the community must improve their preparedness. Alue Naga Village, Banda Aceh is one of the earthquakes and tsunami-prone areas. This study aims at determining the effect of earthquake and tsunami preparedness on the level of community anxiety. It utilized an analytic observational method, with a cross-sectional approach with 100 respondents. Data obtained from questionnaires were analyzed using the Kolmogorov Smirnov test. This study demonstrated that 90% of respondents have low preparedness and 70% have mild anxiety levels. It concluded that there is no significant effect between the earthquake and tsunami preparedness on the level of community anxiety in Alue Naga Village, Banda Aceh, with p value = 0.864 ($p > 0.1$). This study recommends more research, especially on the important aspects of preparedness and anxiety levels.

Keywords—*earthquake, tsunami, preparedness, anxiety*

INTRODUCTION

The current disaster response paradigm has considered disaster management as an action in emergency response and disaster preparedness. It prioritizes pre-disaster phases that include early warning systems, rehabilitation, reconstruction, prevention, mitigation, and preparedness (BNPB, 2008). According to Indonesian Law No. 24/2007, increased preparedness enables to reduce of the risk of disasters such as loss of life, property, and damaging the community life. Lack of preparedness towards earthquakes and tsunamis impacts the opportunity to reduce the risk of disaster both by the governments and communities (Davis et al., 2012).

Several countries prone to disasters, including Indonesia, are more informed on the importance of increasing disaster preparedness (Kusumastuti et al., 2014). Indonesia is among the three tectonic plates and traverse by *the ring of fire*; hence disasters often occur, especially earthquakes and tsunamis. Earthquakes and tsunamis that occurred in Indonesia include the Aceh earthquake and tsunami in 2004, the 2006 Yogyakarta earthquake with a magnitude of 5.9 *Scala Richter* (SR), and the earthquake that occurred in Padang in 2009 with a magnitude of 7,6 RS (Kusumastuti et al., 2014).

Earthquakes and tsunamis are unpredictable disasters that cause property losses, casualties, and psychological impacts (Yu et al., 2010). One of the most common psychological effects experienced by people due to disaster is *Post Traumatic Stress Disorder (PTSD)*. A study in Yogyakarta found that 53% of people experience PTSD after the disaster. Another psychological problem experienced by society is anxiety (Priyo, 2012). The earthquake and tsunami disaster in Aceh in 2004 have made people worried about their future safety and deep grief over the

disaster. (Taufik, 2005). Another study also found that 69% of Acehese experienced anxiety during the 2004 earthquake and devastation in Aceh. Besides, a survey in 2007 in 14 districts in Aceh found that 39% of the community experienced anxiety after the 2004 tsunami (Erwina, 2010).

The effort to increase preparedness can reduce the psychological impact on the community (Yazid, 2012). Research in Chengdu, China, shows that 63.4% of respondents experienced anxiety regarding the aftershock and 10% of them made preparedness to deal with it (Yu et al., 2010). According to Pangesti (2012), 57% of families in Padang were unprepared in the event of a disaster, and 48.8% of the head of the family experienced mild anxiety.

Therefore, this study intends to identify the effect of earthquake and tsunami preparedness on the level of community anxiety in Alue Naga village, Banda Aceh.

Concept of Preparedness and Anxiety

According to the Law of the Republic of Indonesia Number 24 of 2007, preparedness is a part of the disaster management process and in the concept of disaster management. Increased preparedness enables to reduce disaster risk proactively before disaster strikes. Various pre-disaster preparation measures are required in achieving a certain level of preparedness.

In general, there are five preparedness parameters of disaster preparedness. The first parameter is knowledge and attitude regarding disaster risk. An appropriate level of knowledge will shape people's attitudes and foster a sense of care for disaster preparedness. The second parameter is the policy to anticipate disasters. Disaster preparedness policy is a substantial effort to carry out disaster preparedness activities. This policy on preparedness can be stated in various policy forms. Still, it will be very influential if this policy is an official policy in government regulations such as Decree Letter or Regional Regulation. Implementation guidelines are needed; thus, policies can be implemented optimally. The third parameter is the plan for natural disaster emergencies. Emergency plans include evacuation, rescue, and rescue to minimize casualties. The fourth parameter is the early warning system for disasters, especially tsunamis. This warning system is expected to reduce the number of casualties; to achieve this, it requires training and simulation of actions taken when hearing warnings to save a life. The last parameter is mobilizing resources, human resources, and infrastructure available for emergencies (LIPI-UNESCO/ISDR, 2006).

Anxiety is a feeling of worry about something in the future that manifests in physical conditions such as an increase in heart rate, headache, and muscle tension (Kaplan & Sadock, 1997). Anxiety is a subjective feeling that arises as an effort to save oneself from possible threats. Anxiety can involve the feelings, behaviors, and physiological reactions of a person (Durand & Barlow, 2006). Anxiety is the main response to a threat where it is a normal process when accompanied by process of growth, development, events that have never been experienced or have never been conducted and finding the meaning of life, as well as recognizing oneself (Fausiah & Widury, 2005). Anxiety can become abnormal if a person's response to the threat is not appropriate, and the individual cannot control himself.

RESEARCH METHODOLOGY

This research was an observational analytical study with a *cross-sectional approach*. The population in this study was all communities in Alue Naga Village, 1.585 people. The samples in this study were people who live in Alue Naga Village, Banda Aceh, and meets the inclusion criteria. In this study, the inclusion criteria are the people of Alue Naga Village aged 28-60 years, who can read and write, and are willing to be respondents. People who are currently undergoing anti-anxiety therapy and have a history of previous mental disorders were excluded from this study.

This study utilized questionnaires developed by LIPI-UNESCO/ISDR (2006) for disaster preparedness and *Beck Anxiety Inventory (BAI) questionnaire* for the anxiety level. Data analysis in this study was developed with univariate and bivariate analysis. *Univariate* analysis to obtain an overview of the frequency distribution and proportion of both free and bound variables. Analysis of bivariate data was conducted to determine if there was an impact of preparedness for earthquakes and tsunamis on the community's level of anxiety in Alue Naga village, Banda Aceh.

Data analysis was carried out using *the Kolmogorov Smirnov test*. The influence criteria were set based on the *p-value* generated with 90% *CI* and $\alpha = 0.1$. Data processing using SPSS version 16. If *p-value* is compared to $\alpha = 0.1$. If *p-value* ≤ 0.1 , then there is influence between the two variables on *CI = 90%* $\alpha = 0.1$. If *p-value* > 0.1 , then there is no relationship between the two variables at *CI = 90%* and $\alpha = 0.1$.

RESULTS

In this study, data collection was conducted in Alue Naga Village, Banda Aceh, with 100 respondents. Demographic characteristics of respondents can be seen in Table 1.

Table 1. Characteristics of Respondents

Characteristics of respondents	n (100)	%
Age		
18-40 year	65	65
41-60 year	35	35
Sex		
Male	33	33
Female	67	67
Education		
Elementary school	45	45
Junior high school	30	30
Senior high school	19	19
University	6	6
Profession		
Civil Servant	3	3
Private employee	5	5
Entrepreneur	12	12
Builder	2	2
Fisherman	25	25
Housewife	51	51
No Job	2	2
Disaster Education		
Yes	18	18
No	82	82
Disaster Experienced		
Earthquake-Tsunami	3	3
Earthquake	97	97

Table 1 shows that the majority of the respondents aged 18-40 (65%). By gender, most respondents were women (67%). Most of the respondent's level of education was an elementary school (45%). Based on employment, most respondents were housewives (51%). Most respondents did not participate in disaster training (82%), and 97% experienced earthquakes.

Overview of Preparedness for Earthquakes and Tsunami

The frequency distribution data for earthquake and tsunami preparedness levels in the community of Alue Naga Village, Banda Aceh, can be seen in Table 2.

Table 2. Overview of Preparedness Level towards Earthquakes and Tsunamis

Preparedness	n (100)	%
High	1	1
Medium	9	9
Low	90	90

Based on Table 2, the majority of respondents' preparedness for the earthquake and tsunami was low (90%). Table 3 shows the earthquake and tsunami preparedness data based on the respondents' characteristics as reflected in the frequency distribution and percentage.

Table 3. Overview of Preparedness Level Based on Respondent Characteristics

Characteristics	Preparedness for Earthquake and Tsunami					
	Low		Medium		High	
	n (90)	%	n (9)	%	n (1)	%
Age						
18-40 year	60	92	4	6.7	1	1.6
41-60 year	30	85.7	5	14.2	0	0
Sex						
Male	28	84.8	4	12	1	3
Female	62	92.5	5	7.4	0	0
Education						
Elementary school	41	91	4	9	0	0
Junior high school	28	93.3	2	6.7	0	0
Senior high school	17	90	2	10	0	0
University	4	4	1	1	1	1
Profession						
Civil Servant	2	67	1	33	0	0
Private employee	3	60	1	20	1	20
Entrepreneur	11	91.7	1	8.3	0	0
Builder	1	50	1	50	0	0
Fisherman	23	92	2	8	0	0
Housewife	47	92	4	8	0	0
No Job	2	100	0	0	0	0
Disaster Education						
Yes	14	78	4	22	0	0
No	76	93	5	6	1	1
Disaster Experienced						
Earthquake	87	90	9	9	1	1
Earthquake-Tsunami	3	100	0	0	0	0

Based on Table 3, it is found that respondents with low preparedness are those aged 18-40 years, female, elementary school graduates, not working, never attended disaster education, and had experienced an earthquake.

Overview of Anxiety Level

Table 4 shows the anxiety level data depicted in the frequency and percentage distribution.

Table 4. Overview of Respondent's Anxiety Levels

Anxiety	n (100)	%
Mild	72	72
Moderate	27	27
Severe	1	1

Table 4 shows the majority of respondents had a mild anxiety level of 72 respondents (72%). Table 5 shows the level of anxiety data based on the respondents' characteristics, which were reflected in the frequency distribution and percentage.

Table 5. Overview of Anxiety Levels Based on Respondent's Characteristics

Characteristics	Anxiety Level					
	Mild		Moderate		Severe	
	n (72)	%	n (27)	%	n (1)	%
Age						
18-40 year	43	66	21	32	1	2
41-60 year	29	83	6	17	0	0
Sex						
Male	31	94	2	6	0	0
Female	41	61	25	38	1	1
Education						
Elementary school	33	73	11	25	1	2
Junior high school	28	93	2	7	0	0
Senior high school	17	90	2	10	0	0
University	5	83	1	17	0	0
Profession						
Civil Servant	2	67	1	33	0	0
Private employee	5	100	0	0	0	0
Entrepreneur	10	83	2	17	0	0
Builder	2	100	0	0	0	0
Fisherman	20	80	20	0	0	0
Housewife	32	63	18	35	1	2
Jobless	1	50	1	50	0	0
Disaster Education						
Yes	16	89	2	11	0	0
No	56	68	25	30	1	2
Disaster Experienced						
Earthquake	69	71	27	28	1	1
Earthquake – Tsunami	3	100	0	0	0	0

Based on Table 5, the respondents with severe anxiety levels are 18-40 years old, female, elementary school graduates, housewives, never participated in disaster counseling, and have experienced earthquakes and tsunami. In general, the respondents in this study had the majority of mild anxiety levels in each characteristic.

The Effect of Earthquakes and Tsunamis Preparedness on the Level of Anxiety

Bivariate analysis was conducted to determine the relationship of the independent variable to the dependent variable. This study's independent variable is earthquake and tsunami preparedness, while the dependent variable is the level of anxiety. The data analysis of this study used the Chi-square test. However, because the Chi-square test did not meet the requirements cells were merged to form a new row-column (rxc) table, namely the 2x3 table. After merging the cells, the Chi-square test was carried out again, and because it did not meet the Chi-square test requirements, the hypothesis test was chosen according to the 2x3 table, namely the Kolmogorov Smirnov test.

Table 6. Effect of Earthquake and Tsunami Preparedness on Community Anxiety Levels

Preparedness for earthquake and tsunami	Anxiety Level						Total	<i>P-value</i>
	Mild		Moderate		Severe			
	n(72)	%	n(27)	%	n(1)	%	N	%
Low	63	70	26	29	1	1	90	100
Medium + High	9	90	1	10	0	0	10	100

The data above shows that the p-value is greater than α ($p = 0.864$), which means that there is no significant effect of earthquake and tsunami preparedness on the level of community anxiety.

DISCUSSIONS

This study identified 65 respondents aged 18-40, while the rest 35 were aged between 41 and 60. Most respondents were women with 67 respondents, and the education level was an elementary school (45 respondents). Many respondents work as housewives, and more than 82 respondents did not attend the training and counseling about a disaster. The majority of 97 respondents had experienced an earthquake and tsunami. These data indicate that the respondents' number of characteristics in this study allows different answers according to each respondent's characteristics. This result is in line with Pangesti (2012) research that differences in each respondent's characteristics, such as gender and age, will result in different knowledge and attitudes about disaster preparedness.

This study reveals that Alue Naga community's preparedness level in experiencing the earthquake and tsunami is low, reaching 90%. The community did not make preparations before the disaster since most of them thought disaster was destiny. Therefore, they considered preparation is less important. The research by Chrisantrum et al. (2011) on Teluk's people, Yogyakarta, also found that people were not ready to face disasters since they considered natural disasters to be God's destiny.

The preparedness of the Alue Naga community varies according to their characteristics. Based on the age stage, respondents between 18-40 years old have low preparedness (92%) since it is considered the more mature a person is, the more mature the preparations are. Ahmad (2011), contradicting this finding, which states that an increasingly mature age does not indicate a willingness to prepare for a disaster. The majority of people who have never participated in disaster training have lower preparedness than those who have attended disaster training. This result is in line with the research of Ramli et al. (2014), which stated that disaster preparedness training would increase one's preparedness when facing disasters. According to Jacklin (2015), the level of disaster preparedness

in people who have attended training or counseling related to disasters is higher. This result is also in line with Afifah et al. (2014) that there is a significant influence between before and after being given education about dealing with disasters on disaster preparedness. Based on the community's disaster experience, 100% of respondents who only experienced an earthquake have low disaster preparedness levels. Experience allows a person to know better what to do if the same thing happens again. This is in accordance with Susi et al. (2014), which found that the community's tsunami experience increased understanding and knowledge of tsunami signs so that it could be a reference for the community to act in the event of another tsunami.

This study shows that most respondents experienced mild anxiety, as many as 72 respondents (72%). In Table 5, it can be seen that the level of anxiety of the Alue Naga village community varies according to their characteristics. Based on age, respondents aged 18-40 had more moderate anxiety levels (32%). Ages 18-40 years are early adulthood, where young people tend to be more anxious than middle adults. Kaplan & Sadock (1997) also supported this, who argued that young people experience anxiety more quickly than old age.

Based on gender, most respondents experiencing anxiety were women (38%). Women experience an average of two to three times as much anxiety as men (Wiramiharja, 2015). Women are at greater risk of suffering from anxiety disorders because of their position in society and their basic traits in dealing with others (Wiramiharja, 2015). In general, women have less power in society, and their status is typically tied to men (Wiramiharja, 2015). Myers & Myers (2010) said that women are more anxious about their inadequacy than men. Men are more active, explorative, while women are more sensitive. Women are more prone to feelings of guilt, anxiety, decreased appetite, sleep disorders, and eating disorders (Myers & Myers (2010). When viewed from the level of education, people with low education tend to feel more anxious than those with higher education. According to Sutejo et al. (2011), residents with secondary education tend to be more able to cope with anxiety; this is because their knowledge and understanding in solving problems are higher. When viewed from disaster experience, most respondents experiencing anxiety are respondents who have experience earthquake disasters. According to Hidayat et al. (2008), the Indonesian people's experience in dealing with disasters has been increasing. Learning psychology states that experience is the best source of self-development. According to Triutomo (2007), a lack of knowledge would impact a person's attitudes and behaviors in disaster management and disaster preparedness.

A comparative test using the Kolmogorov-Smirnov statistical test in this study found that there was no significant effect between earthquake and tsunami preparedness and the level of community anxiety in Alue Naga Village, Banda Aceh ($p = 0.846$). This is because most respondents still think that disaster is destiny, so that no preparation is necessary.

Maryam (2007) found that for the people of Aceh, perceiving themselves as Muslims is a part of cultural life as if they have become one with Islamic teachings. This high level of religiosity makes Acehnese people quickly rise after the disaster. According to Kumara & Susetyo (2008), coping against disasters increases with a high religiosity level. According to Hidayat et al. (2008), the Asian community, including Indonesia, is more likely to have a holistic way of thinking. When experiencing a disaster, the eastern community understands that disasters are related to nature and its creator, thus making people tolerant of disasters. This is also in line with Nashori et

al. (2007), which stated that most victims of the Aceh earthquake and tsunami experienced physical and psychological suffering. Still, some of them showed a calm and controlled attitude.

The Acehnese also have a high level of religiosity. According to Yulmia et al. (2015), the better the religiosity, the lower the person experiences anxiety. Besides, Dewi et al. (2012) found that the coping strategy in the Alue Naga village community was high so that the majority of people did not experience significant anxiety. According to Dewi (2013), the Acehnese people's belief in this destiny does not make them better prepared when facing disasters; people tend to surrender to whatever happens. Meanwhile, people consider no more tsunamis because tsunamis have occurred during their stay in the Alue Naga area. Lack of knowledge of disaster vulnerability areas makes people less alert (LIPI-UNESCO/ISDR, 2006).

This study's results are different from Yazid (2012) on the relationship between earthquake and tsunami preparedness and preparedness levels. The results show that there is a relationship between earthquake and tsunami preparedness and community anxiety levels. Rinaldi (2009) also found that preparedness to face disaster aims to reduce vulnerability, damage buildings, and increase individual and community control of disasters. Disaster preparedness provides awareness and confidence in the community and can minimize disaster victims and psychological impacts.

Disaster preparedness is one of the components in reducing disaster risk (Sutejo et al., 2011). The community is very important to know disaster preparedness because they are the largest component in stakeholders who play an important role in preparedness (Sutejo et al., 2011). Increased preparedness can reduce the risk of disasters such as the loss of life, loss of property, and the order of community life (Priyo, 2012). It is important to improve preparedness, especially in disaster-prone areas, including Aceh.

This study is the first study to use the Beck Anxiety Inventory (BAI) in the context of disasters, particularly earthquakes and tsunamis. This study's limitation is this research only examines the preparedness parameters developed by LIPI-UNESCO/ISDR (2006), without looking at other factors that affect preparedness.

CONCLUSIONS

The study concludes that there is no effect of preparedness for earthquakes and tsunamis on the people's anxiety in Alue Naga Village, Banda Aceh. Therefore, efforts are necessary to improve community preparedness, e.g., through disaster counseling to form disaster response communities. Further research is needed on the level of correlation between preparedness for earthquakes and tsunamis with anxiety levels. The need for more research on the most critical aspects of disaster preparedness and anxiety levels.

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