

ORIGINAL RESEARCH

Assessing disaster preparedness and mental health of community members in Aceh, Indonesia: a community-based, descriptive household survey of a national program

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ABSTRACT

Introduction: Disaster preparedness of the community is an essential disaster-mitigation strategy to protect human life and to prevent injuries and property damage. This study aimed to assess the knowledge of disaster, and the disaster preparedness of community members in Aceh, Indonesia.

Methods: A community-based descriptive household survey was conducted in 40 villages of three tsunami-affected districts in Aceh State, Indonesia. In total, 827 randomly selected community members were interviewed with structured questionnaires during the period September–October 2014.

Results: About 57.6% of community members had good knowledge of disaster, while 26.0% had good community disaster preparedness. Neither knowledge of disaster nor disaster preparedness of community members achieved the target of the Community Mental Health Nurse Program outcome indicators (<70.0%).

Conclusions: The proportions of people with good knowledge of disaster and disaster preparedness were quite low. The government of Aceh State should revitalize the program to improve the effectiveness of community mental health nurses in



transferring the knowledge of disasters and disaster preparedness to the community's members, then expand it to other provinces of Indonesia, using standard approaches and the lessons learned from Aceh.

Key words: Aceh, disaster preparedness, Indonesia, knowledge of disaster.

Introduction

The earthquake–tsunami on 26 December 2004 was one of the most severe natural disasters to hit Indonesia¹. It was reported that 126 741 persons were killed, 93 285 went missing, 500 000 lost their abodes, and 750 000 were suddenly unemployed². The emergency health sector was also reduced to chaos^{3,4}, with 517 health facilities destroyed⁵. Local health personnel played a minimal role in the response to the disaster, with about 245 health workers confirmed dead and 413 missing. The World Bank estimated the overall loss to the health sector at about \$91.9 million, with \$131.14 million being required for health facility reconstruction^{6,7}. However, the full impact of the earthquake–tsunami was unknown⁸.

Apart from damage, ecological disruption, loss of human life, and worsened health status, people were exposed to high levels of immediate and long-term stress, for years^{9–12}. WHO reported that up to 50.0% of the tsunami-affected people in Aceh experienced significant psychological distress and 5–10% developed diagnosable stress-related psychiatric disorders^{9,13}.

After the tsunami, the Indonesian government, working with national and international organizations, launched a national disaster preparedness policy, including the management of mental health and psychosocial problems in tsunami-affected Aceh communities. The Community Mental Health Nurse Program (CMHNP), started in 2006, aimed to (1) provide psychosocial and mental health services for communities impacted by disasters and conflicts, (2) increase community participation in community mental healthcare dealing with disasters and conflicts, and (3) encourage community

members to prepare for potential disasters and promote good mental health among communities in disaster-affected areas^{14–20}. Medical doctors, nursing staff and community health workers with mental health training provide mobile outreach services in rural areas, which include treatment, education, and support, targeted at patients, their families and community members²¹.

Aceh is a disaster-prone area, highly vulnerable to natural hazards such as floods and earthquakes^{9,14–20,22}. Therefore, household and community disaster preparedness is an essential mitigation strategy to protect human lives from the adverse health impacts of natural disaster high-risk areas²³. There have been few population-based studies of disaster preparedness among people in the tsunami-affected areas in Aceh. Therefore, this study aimed to assess knowledge of disasters and disaster preparedness of the community members, which were the outcome indicators of the CMHNP.

Methods

Study setting, design and samples

This community-based descriptive household survey study was conducted in Aceh, in September and October 2014. The study population comprised community members representing three selected districts strongly affected by the tsunami: Aceh Besar on the west coast, Banda Aceh on the north coast, and Pidie on the east coast (Fig1). The inclusion criteria were (1) community member aged 18–70 years, living in the study area, who had experienced the earthquake–tsunami disaster, (2) voluntary participation in the study, (3) ability to communicate in Bahasa Indonesia.



Community members who were deaf, sick at the time of data collection, and migrants from outside Aceh or who resided in the community after the rehabilitation and reconstruction of Aceh, were excluded.

In this study, the unit of analysis was the individual household. Sample size was calculated using the single proportion formula²⁴, with 95% confidence interval. The sample size was based on 50.0% of population having good levels of disaster preparedness, since there was no published literature regarding the proportion of disaster preparedness among community members in these earthquake–tsunami areas. Precision was set at 5.0%, and sample size calculated as 384. The sample size was multiplied by the maximum design effect for clustering of two to give a sample of 768. To allow for an 8% non-response rate, the final sample size was 830. There were 220 villages in 17 subdistricts in three tsunami-affected areas. Of these, 40 villages were randomly selected using two-stage probability proportional to size sampling. For each village, systematic random sampling was used to select 20–21 representative household community members for interview by starting from the centre of the village and moving left to select every other household. One representative was selected for one household. The total study sample was 827, yielding a response rate of 99.6% (827/830).

Survey instrument

The household survey instrument developed by the researchers comprised three parts. Part I consisted of 11 questions regarding the respondent's baseline characteristics, including sex, age, marital status, family type, religion, ethnicity, previous abode/history, education, occupation, households with children aged less than 12 years, and households with physically dependent members.

Part II comprised 23 dichotomous items with 'true/yes', or 'false/no' format, to assess the community members' disaster knowledge. A score of 1 was given for a correct answer and a score of 0 for an incorrect answer. A score of up to 60% of the total score was 'poor', 61–80% 'moderate', and more than 80% 'good'. Cronbach's alpha was 0.748 for knowledge of disasters.

Part III dealt with community disaster preparedness, and consisted of a 17-item questionnaire measuring community-related disaster preparedness (three items), disaster information for the family (six items), and disaster supply kit/vehicle at home (eight items). Responses were rated on a three-point rating scale: 0='never', 1='sometimes', and 2='always'. A score of 0–20 ($\leq 60\%$ of total score) was 'low', 21–27 (61–80% of total score) 'moderate', and 28–34 ($\geq 80\%$ of total score) 'good'. Cronbach's alpha was 0.901.

All 17 items of the three components (community-related disaster preparedness, disaster information for the family, disaster supply kit/vehicle at home) were included in the analysis. The most highly rated factor was disaster supply kit/vehicle at home (factor loading 0.53–0.81), followed by disaster information for the family (factor loading 0.59–0.74), and community-related disaster preparedness (factor loading 0.58–0.90) (Table 1).

The study questionnaire was back-translated (Bahasa Indonesia–English–Bahasa Indonesia); the final version was pre-tested with 30 samples and revised before data collection in the main study.

Data collection

Ten research assistants who were postgraduate students in the Disaster Management Program at Syiah Kuala University Aceh, Indonesia were trained for 1 day on the informed consent process and interviewing participants. These research assistants also were trained how to deal with community members who have tsunami experience. All participating community members were interviewed and survey forms were filled out by trained research assistants. Each research assistant received onsite supervision from the principal investigator who has been teaching in disaster management in Kuala University Aceh for more than 10 years and also working as a public health professional in Aceh for more than 30 years. All research assistants were familiar in dealing with community members. During data collection, no potential acute mental health issues caused by the data collection process were found. All respondents' answers were kept confidential and discussed only among team members and solely for research purposes.



Source: Adapted from reference 25.

Figure 1: Map of Aceh, Indonesia, showing tsunami-affected and tsunami-survival areas²⁵.

Table 1: Factor analysis for 17-item disaster preparedness survey using principal component extraction with varimax rotation ($n=827$)

Component	Item	Loading on three factors [†]		
		F1	F2	F3
Community related	Q1 Participate in disaster preparedness training before			0.90
Disaster preparedness	Q2 Participate in disaster drill before			0.89
	Q3 List of community emergency contact numbers			0.58
Disaster information for family	Q4 Emergency evacuation plan for the family		0.59	
	Q5 Family communicate beforehand where to meet if a disaster happens		0.72	
	Q6 Talk to children about disaster preparedness or minor earthquake happens		0.73	
	Q7 Listen to radio weather forecast in rainy season or minor earthquake happens		0.61	
	Q8 Watch TV weather forecast in rainy season or minor earthquake happens		0.74	
	Q9 Informed family of any abnormal condition		0.71	
	Q10 First-aid kit	0.59		
	Q11 Important documents in a plastic bag	0.65		
	Q12 Enough clean water for ≥ 3 days	0.74		
	Q13 Enough non-perishable food for ≥ 3 days	0.81		
Disaster supply kit/vehicle at home	Q14 Flashlight with extra batteries	0.77		
	Q15 Well-charged mobile phone	0.73		
	Q16 Battery-operated radio	0.53		
	Q17 Emergency transport vehicle (car/bicycle)	0.54		
Variance explain (%)		24.4	19.7	14.7



Data analysis

Study data were edited, coded, and entered into the Statistical Package for the Social Sciences for Windows v18 (SPSS; <http://www.spss.com>). The general characteristics and other study variables were described by number, percentage, mean, and standard deviation. Factor analysis was used to analyze explanatory factors for the disaster-preparedness questionnaire.

Ethics approval

This study was approved by the Ethical Review Committee of the Faculty of Public Health, Mahidol University (COA. No. MUPH 2014-188; 2014 Sep 18), and permission was provided by the Aceh Government of Indonesia (ND. NO. 875.1/1003, Tanggal 23 Mei 2014).

Results

General characteristics

Of the 827 community members, 68.6% were female, 57.6% were aged 35 years or less, 87.1% were married, 74.4% were from 'nuclear families' (two parents and their children), 99.4% were Muslim and 83.9% were of Aceh ethnicity. Native villagers constituted 75.3% of the sample, 48.8% had finished high school, 47.8% were housewives or unemployed. A total of 77.7% were in households with children aged less than 12 years and 1.8% were from households with physically dependent members (Table 2).

Prevalence of knowledge of disasters, and good disaster preparedness

About 57.6% of community members had good disaster knowledge. Only 26.0% had a good level of disaster preparedness (Table 3). Both knowledge of disaster and disaster preparedness of the community members did not achieve the target of the CMHNP outcome indicators (<60.0%) (Table 4). Details for knowledge of disasters is shown in Table 5. The main problems of

disaster knowledge were that only 52.1% of community members reported having a battery-operated radio at home, while 56.7% reported storage of enough fresh meat for at least 3 days at home. A total of 66.9% reported turning off mains water before evacuation and 68.3% reported being able to indicate the location of an emergency warning system in the community (Table 5).

Table 6 shows the components of disaster preparedness. For the community-related disaster preparedness component, only 20.7% reported that they had always participated in previous disaster drills, 27.9% always had a list of community emergency contact numbers and 29.0% had always participated in disaster preparedness training.

Regarding disaster information for the family, 47.8% reported always listening to radio forecasts in the rainy season or about the occurrence of a minor earthquake, 48.1% always talked to children about disaster preparedness, 50.7% reported always having an emergency evacuation plan for the family and 55.3% reported always communicating to family beforehand where to meet if a disaster happens.

In the last component, disaster supply kit/vehicle at home, 36.8% reported that they always had a battery-operated radio at home, 42.7% reported always keeping the mobile phone well charged, 52.4% reported always storing enough non-perishable food for at least 3 days at home and 56.1% reported that they always stored enough clean water for at least 3 days at home.

Discussion

Although the community members in the study areas had direct experiences of a tsunami, the proportions of people with good knowledge of disaster (57.6%), and good disaster preparedness (26.0%) were much lower than the Aceh government target indicators, which were set at 70%. Only half of the community members had good levels of knowledge, in particular poor knowledge of disaster preparedness in relation to the storage of items. There may be too many items to remember.



Table 2: General characteristics of surveyed community members in Aceh Besar, Banda Aceh and Pidie, Indonesia (n=827)

Variable	Number	%
Female	567	68.6
Age (mean±SD=35.9±9.7 years, range=18–80 years)		
≤35	476	57.6
>35	351	42.4
Marital status		
Single	52	6.3
Married	720	87.1
Divorced/separated/widowed	55	6.6
Family type		
'Nuclear' (two parents and children)	615	74.4
Other	212	25.6
Muslim	822	99.4
Ethnicity		
Aceh	694	83.9
Other	133	16.1
Previous abodes/domicile history		
Migrated from another place	204	24.7
Native villager	623	75.3
Education		
Never attended school/ primary	76	9.2
Secondary school	143	17.3
High school	404	48.8
College/university	204	24.7
Occupation		
Housewife/unemployed	385	47.8
Agriculture/fishery/laborer	156	18.9
Government officer	117	14.1
Other	189	19.2
Household with children aged <12 years	643	77.7
Household with physically dependent member	812	1.8

SD, standard deviation

Table 3: Prevalence of knowledge of disasters, and disaster preparedness of surveyed community members in Aceh Besar, Banda Aceh and Pidie, Indonesia (n=827)

Variable	Number	%
Knowledge of disasters		
Good	476	57.6
Moderate	250	30.2
Poor	101	12.2
Disaster preparedness		
Good	215	26.0
Moderate	271	32.8
Low	341	41.2



Table 4: Target and actual community member indicators of the Community Mental Health Nurse Program, Aceh, Indonesia

Indicator	Target [†] (%)	Actual (%)
Community members with good knowledge of disasters	70	57.6
Community members with good disaster preparedness	70	26.0

[†] According to the Aceh Government target (references 14, 17)

Table 5: Disaster knowledge among community members in Aceh Besar, Banda Aceh and Pidie, Indonesia (n=827)

Item	Correct answer	
	n	%
Disaster, causes and preparedness	821	99.3
The cause of a tsunami is an earthquake	699	84.5
The cause of a tsunami is heavy rain	730	88.3
The cause of flooding is heavy rain	655	79.2
The causes of flooding are deforestation/illegal logging, and poor sewerage systems		
The cause of an earthquake is a volcanic eruption	585	70.7
Disaster preparedness in the household includes the following:		
Storage of enough clean water for at least 3 days	667	80.7
Storage of enough fresh vegetables for at least 3 days	567	68.6
Storage of enough fresh meat for at least 3 days	469	56.7
Storage of non-perishable food	654	79.1
Storage of flashlight ready for use	737	89.1
Storage of spare batteries for a flashlight	677	81.9
Storage of blankets	727	87.9
Storage of money	746	90.2
Set-up of first aid kits	711	86.0
Update emergency contact phone list	641	77.5
Readiness of mobile phone	673	81.4
Battery-operated radio	431	52.1
Able to indicate the location of a community shelter during a disaster	643	77.8
Able to indicate the location of an emergency warning system in the community	565	68.3
Before evacuation what should you do for your house?		
Turn off the main water tap	553	66.9
Turn off the main gas switch	746	90.2
Turn off the main electricity switch	750	90.7
There is always a natural warning sign before a tsunami, eg a rapid reduction in the seawater level	608	73.5

This study included only community members in the tsunami-affected areas, unlike a previous study, which included samples from both tsunami-affected and non-affected areas in coastal Aceh²⁶. That study found that people with direct experience of the tsunami had higher mean scores for knowledge, individual emergency planning and resource mobilization than those with indirect experience²⁶. Another study from Thailand²⁷ reported that people who experienced loss from the 2004 tsunami were more likely to participate in community activities and respond to earthquake hazards. The actual experience of loss can increase levels of disaster preparedness among these people. The finding in Aceh is

inconsistent with the study in Thailand. One possible explanation is that Thailand has a clearer policy for disaster preparedness, drills and training. In the tsunami-prone areas, there are clear signposts, assembly points, forecasting, early-warning systems, and awareness of potential disaster risks and knowledge of disaster preparedness is actively promoted. People were encouraged by the village headman and staff to participate in disaster drills twice a year. In addition, the villagers are more likely to participate in community activities since disaster risk reduction is not just an individual effort. It can be fostered by social networking²⁷.



Table 6: Level of disaster preparedness among surveyed community members in Aceh Besar, Banda Aceh and Pidie, Indonesia (n=827)

Item	Never (n(%))	Sometimes (n(%))	Always (n(%))
Community-related disaster preparedness			
Participate in disaster preparedness training before	337(40.7)	250(30.2)	240(29.0)
Participate in disaster drill before	389(47.0)	267(32.3)	171(20.7)
List of community emergency contact numbers	394(47.6)	202(24.4)	231(27.9)
Disaster information for family			
Emergency evacuation plan for the family	191(23.1)	217(26.2)	419(50.7)
Family communicate beforehand where to meet if disaster happens	122(14.8)	248(30.0)	457(55.3)
Talk to children about disaster preparedness	132(16.0)	297(35.9)	398(48.1)
Listen to radio weather forecast in the rainy season or if a minor earthquake happens	140(16.9)	292(35.3)	395(47.8)
Watch TV weather forecast in the rainy season or if a minor earthquake happens	66(8.0)	298(36.0)	463(56.0)
Informed family for any abnormal condition	76(9.2)	285(34.5)	466(56.3)
Disaster supply kit/vehicle at home			
Store a first-aid kit at home.	136(16.4)	215(26.0)	476(57.6)
Store important documents in a plastic bag	112(13.5)	184(22.2)	531(64.2)
Store clean water for at least 3 days at home	106(12.8)	257(31.1)	464(56.1)
Store nonperishable food for at least 3 days at home	127(15.4)	267(32.3)	433(52.4)
Store flashlight with extra batteries at home	75(9.1)	261(31.6)	491(59.4)
Keep the mobile phone well charged	91(11.0)	383(46.3)	353(42.7)
Have a battery-operated radio at home	313(37.8)	210(25.4)	304(36.8)
Have a car/bicycle/vehicle for emergency transport	93(11.2)	195(23.6)	539(65.2)

The study found that the community-education intervention was ineffective. The educational intervention by the community mental health nurse, focusing on disaster preparedness and mental health status, seemed to be a common occurrence for the community members; this was the first evaluation of this national program. Since 2009, the CMHNP had not been re-orientated, and did not reflect the mental health promotion activities of the CMHNP, with no integration into routine public health service delivery to ensure the sustainability of the program²⁸. Therefore, it is necessary to understand the culturally specific coping mechanisms of the Acehnese. They were quite familiar with the tsunami event. Many community members believed that the tsunami disaster was 'a punishment from God' due to the long-lasting civil war and their bad behavior. Therefore, they may have paid less attention to the community mental health nurses. The communities' strong religious faith had helped them to mitigate their pain, and accept and overcome

negative events throughout their lives²⁹. Like Buddhists in Thailand, they interpreted the tsunami disaster according to the 'law of karma', or cause and effect. They believed that life is to a certain extent predetermined and the result of one's own intent and actions³⁰.

At present, few studies have reported on public health disaster preparedness in Banda Aceh. Well-prepared communities are more likely to participate in disaster recovery efforts, to deliver services more effectively, and to shorten the necessary disaster response²⁸. A well-prepared health system can reduce disaster risk, but a response capacity is needed, especially an information system. The CMHNP might not be the best way to help communities prepare for a disaster, because of the large populations involved. Community participation and networking are also required.



Study limitations

The results of this study relied on self-reports, so there may be some reporting bias regarding disaster preparedness among community members. There were no baseline data regarding the evaluation of knowledge of disaster and disaster preparedness status in the study areas. Also, Aceh has up to eight local languages; there might be differential interpretations of questions and responses among community members.

Conclusions

This study provides baseline data for some outcome indicators of the CMHNP, but does enable assessment of the program's effectiveness. Disaster preparedness and knowledge of disaster education should be promoted and supported in remote rural Acehese communities. Working at the community level can reduce the negative impact of disasters, such as injuries and loss of life, property damage and social disruption; however, the best way to manage the negative impact remains unresolved. Community participation may be needed, together with the establishment of networks to strengthen community capacity in the affected areas; this may be a more effective focus for the CMHNP. Qualitative research is recommended to elicit more detail about the quality of disaster preparedness and the disaster knowledge of community members.

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