Tsunami Preparedness of People Living in Affected and Non-Affected Areas:

A Comparative Study in Coastal Area in Aceh, Indonesia

Rachmalia

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Author	Mrs. Rachmalia
Major Program	Nursing Science (International Program)

Major Advisor:

……..
Asst. Prof. Dr. Urai Hatthakit)

Co-advisor:

……..
Assoc. Prof. Dr. Aranya Chaowalit)

Examining Committee:

……..Chairperson
(Asst. Prof. Dr. Wongchan Petpichetchian)

……..
(Asst. Prof. Dr. Urai Hatthakit)

……..
(Assoc. Prof. Dr. Aranya Chaowalit)

……..
(Prof. MD. Virasakdi Chongsuvivatwong)

……..
(Dr. Jaroonrat Rodniam)

The Graduate School, Prince of Songkla University, has approved this thesis as partial fulfillment of the requirements for the Master of Nursing Science (International Program).

……
(Assoc. Prof. Dr. Krerkchai Thongnoo)
Dean of Graduate School

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ABSTRACT

The aims of this descriptive comparative study are to describe the levels of tsunami disaster preparedness of people living in areas affected and non-affected by the December 2004 tsunami, and to compare the tsunami disaster preparedness of these two groups of people. A total of 304 subjects were recruited using a multistage-stratified random sampling from both of the areas along the west coast of Aceh Province.

The Individual's Tsunami Preparedness Questionnaire was developed by the researcher and validated by three experts yielding a content validity index (CVI) of .95. Test-retest was performed with reliability coefficients for knowledge, individual emergency planning, and resource mobilization capacity of .99, 1, and .99, respectively. The Individual's Tsunami Preparedness Questionnaire was used to measure the subjects' knowledge, individual emergency planning, and resource mobilization capacity related to tsunami preparedness.

The findings showed a moderate level of tsunami preparedness of people living in both areas including the variables that cover knowledge, individual emergency planning, and resources mobilization capacity. The mean scores for each variable of people living in affected areas were significantly higher than people living in non-affected areas ($p < .05$). Sub-variables were also at higher mean scores except one of the sub-variables, individual emergency planning: "skills related to disaster preparedness", that was at a lower mean score. This study provided evidence that direct experience for the people living in affected area and indirect tsunami experience for the people living in non-affected area has a significant impact on people's tsunami preparedness. **Keywords:** disaster, tsunami, preparedness, Indonesia

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LIST OF ABBREVATIONS

APB	Adoption of Protective Behaviors
BASARNAS	*Badan SAR Nasional;* National Search and Rescue Agency
BMG	*Badan Meteorologi dan Geofisika;* Meteorological and Geophysical Agency
CPR	Cardiopulmonary Resuscitation
CVI	Content Validity Index
DART-Buoys	Deep-ocean Assessment and Reporting of Tsunamis-Buoys
ERS	Earthquake Readiness Scale
U.N. ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization
FEMA	Federal Emergency Management Agency
FGD	Focus Group Discussion
GPSs	Global Positioning Systems
IDR	Indonesian Rupiah
IDPs	Internally Displaced Persons
IRB	Institutional Review Board
ITPQ	Individual's Tsunami Preparedness Questionnaire
KOGAMI	*Komunitas Siaga Tsunami;* Tsunami Alert Community

LIST OF ABBREVATIONS (Continued)

LIPI	*Lembaga Ilmu Pengetahuan Indonesia;* Indonesian Institute of Science
MOUs	Memorandum of Understandings
NOAA	National Oceanic and Atmospheric Administration
PEMDA	*Pemerintah Daerah;* Regional Government
PU	*Pekerjaan Umum;* Public Works Department
RRI	*Radio Republik Indonesia;* Radio of the Republic of Indonesia
RSY	Rescue Stockyard
SATLAK	*Satuan Pelaksanaan Penanggulangan Bencana dan Pengungsi*; District Coordination Body for Disaster and IDPs Management
SATKORLAK PBP	*Satuan Koordinasi Pelaksanaan Penanggulangan Bencana dan Pengungsi;* Provincial Coordinating Unit for the Management of Disasters and IDPs/Refugees
TEWS	Tsunami Early Warning System
TVRI	*Televisi Republik Indonesia;* Television of the Republic of Indonesia
USGS/NEIC	The United States Geological Survey's National Earthquake Information Center
ISDR	International Strategy for Disaster Reduction

LIST OF ABBREVATIONS (Continued)

UNESCO	United Nations Educational Scientific and Cultural Organization
UN-OCHA	The United Nations Office for the Coordination of Humanitarian Affairs
USD	United States dollar
WHO	World Health Organization

CHAPTER I

INTRODUCTION

Background and Significance of the Problem

The Indian Ocean Tsunami of December 2004 had an enormous impact on the human, social and economic sectors of the societies of the region because it was a terrifying and complex physical phenomena and was responsible for great loss of life and extensive destruction to property. The disaster affected the livelihoods of up to 2.5 million people that live in rural coastal communities and have a high dependence on natural resources such as fisheries and agricultural sectors in Indonesia, Thailand, India and Sri Lanka bordering the Indian Ocean (Pomeroy, Ratner, Hall, Pimoljinda, & Vivekanandan, 2006). In the worst affected region of Indonesia, that is Aceh Province which is located close to epicenter of earthquake, more than half of its districts were affected by the disaster (FAO as cited in Subagyono, Sugiharto, & Jaya, 2005). The human toll according to the government's disaster coordinating agency (BAKORNAS) reported that in Aceh Province 123,598 bodies were buried, 113,937 people were missing and 406,156 were displaced, though the full impact of the tsunami may never be known (OCHA, 2005).

These effects were caused by the large-scale in-land penetration of tsunami waves, as high as 10 meters in some areas, and the very little time available to evacuate the people living in tsunami prone areas, and were the two main reasons behind the difficulty to reduce the massive level of damage (Kurita, Arakida & Colombage, 2007). The other main issues were the reasons for the enormity of the loss, such as the absence of warning systems, lack of knowledge and lack of

preparedness at the individual level (Johnston et al., 2005; Rodriguez, Wachtendorf, Kendra, & Trainor, 2006; Kelman, 2006; Iemura, Takahashi, Pradono, Sukamdo, & Kurniawan, 2006; Obura, 2006). However, these factors can be controlled through improvement of preparedness and warning systems in order to minimize tsunami impact (Obura, 2006). The preparedness of a community in anticipating a future natural disaster can refer to community resilience.

In affected areas, community resilience may be determined as the degree to which the community is capable of organizing itself to increase its capacity for learning from past disasters for better future protection (Dekens, 2007a). For non-affected areas, resilience can be defined as the ability of individuals, households, communities to withstand external shocks that may based on the entitlement, enfranchisement, empowerment or capabilities of the people (ESCAP, 2008). Moreover, the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP, 2008) recommends that:

"Community resilience to natural disasters would be strengthened by giving people relevant information about the way of best life – saving plans of action during and after the natural disaster and also by providing comprehensive knowledge about the origin of earthquakes and tsunami. The acquisition of such knowledge is very important, not only for improving the preparedness of those vulnerable for dealing with disasters, but also to give them lives with a higher degree of confidence and certainty " (p. 49).

Although outside aid, for example from local officials and relief workers, will be on the scene after a disaster, they cannot reach individuals immediately (FEMA, 2004). So individual preparedness is important. Based on recommendations from Queensland, Service, & Services (2009), preparedness at an individual level includes preparation for emergency planning, an emergency kit and a

safety house. The other reviews related to individual preparedness that support the preparation should be included ensuring their homes meet or exceed the relevant building standards and have provisions for survival after a disaster before getting aid from outside sources (Spital, Siegert, McClure, & Walkey, 2005).

Preparedness at the individual level plays an important role in minimizing impacts caused by a tsunami. Previous studies have shown that an individual's preparedness should be of significant concern for everyone who is living in a tsunami prone area. Populations living on a coast, near to the epicenter of a major earthquake that can trigger a tsunami, should know what to do when a major earthquake strikes because they have only a few minutes to react to the disaster (ISDR/UNESCO, 2006). The best technology like tsunami detection networks cannot guarantee to help people who live near the coastal areas. Indonesia has just developed a thorough disaster warning system, however there is still failure in its implementation (Sagala & Okada, 2007). Activities in responding to a disaster from outside sources will not save any lives, if the people do not prepare themselves to respond to a tsunami when it approaches. People should take responsibility for their own safety (Samant, Tobin, & Tucker, 2008). The degree to which they are prepared to respond will be a major factor in survival, if a tsunami occurs (Paton et al., 2008).

Generally, except the west coast of Borneo and the east coast of Sumatra, there is no seaside in Indonesia that is safe from a tsunami because they are all located in one of the most active geological subduction zones in the world (Muhari, Diposaptono, & Imamura, 2007). However, recently Indonesia’s population has started to migrate to these unsafe areas due to various income opportunities, such as tourism, small-scale industries and fisheries. Therefore, tsunami preparedness for

this part of the population is important because in the near future tsunamis are likely to occur in unpredicted areas, which is related to several tectonic plates moving towards each other (Post et al., 2007). The 2004 tsunami is an indication of how prone Indonesia, especially Aceh Province, is to tsunamis and so everyone should prepare themselves to face the next natural disaster.

Actually, people in affected areas should be more prepared because of the personal experience with a disaster, which allows people to see the risk very closely and understand its nature and impacts on the community (Greening & Dollinger as cited in Mishra & Suar, 2007). Many communities in non-affected areas that do not face the direct threat of the disaster tend to avoid the need for disaster planning (Clark, 2008). On the contrary, Matsuda and Okada (2006b) interpreted that, "Motivation for disaster preparedness become stronger when the people face the disaster as a self-experience, or when they become nervous about possible earthquakes after they observed others suffering by the disaster" (p.155).

In this study, the researcher is interested in conducting a study to examine the level of tsunami preparedness of people living in affected and non-affected areas of the 2004 tsunami, and compare the preparedness for a tsunami of those people who live in coastal areas of Aceh Province, Indonesia. Comparison of the two study areas will help understand the contribution of this factor. It is expected that this study will provide baseline data for healthcare providers to provide appropriate interventions to promote preparedness of people living in affected and non-affected areas.

Objectives of the Study

The objectives of this study are as follows:

1. To describe the level of tsunami preparedness of people living in an affected area in Aceh Province, Indonesia.
2. To describe the level of tsunami preparedness of people living in a non-affected area in Aceh Province, Indonesia.
3. To compare the tsunami preparedness among the people living in affected and non-affected areas in Aceh Province, Indonesia.

Research Questions of the Study

This study attempts to answer the following questions:

1. What was the level of tsunami preparedness of people living in an affected area in Aceh Province, Indonesia?
2. What was the level of tsunami preparedness of people living in a non-affected area in Aceh Province, Indonesia?
3. What was the difference of the tsunami preparedness among the people living in an affected and a non-affected area in Aceh Province, Indonesia?

Conceptual Framework of the Study

According to the International Tsunami Information Center (Comission, 2008), tsunami preparedness is defined as readiness of plans, methods, procedures, and actions taken by government officials and the general public for the purpose of minimizing potential risk and mitigating the effects of future tsunamis.

Having tsunami preparedness will help the people living in coastal areas to respond to the consequences of a tsunami. Those people will know what to do and where to go if a tsunami occurs.

The 2004 tsunami was an international disaster that influenced livelihoods of many people affected by its direct and indirect impacts. Direct damage is defined as the material losses that occur as an immediate consequence of a disaster. Direct damage is measured first in physical terms. The physical loss includes assets, capital, and material things that can be counted. The people living in an area that had direct impacts are most likely to get direct experience that guides them to see risk more clearly (Matsuda & Okada, 2006b). While the people living near to the affected area generally were influenced by indirect effects, which refer to the loss of production of goods and services as a result of the disaster, reduced income associated with those activities, and increased costs to provide those goods and services. In addition by observing through the globally-networked media, or through the disaster event which occurred in one's close neighborhood, then these people can have indirect experience (Matsuda & Okada, 2006b). These experiences increase awareness of an individual's preparedness.

The conceptual framework of this study was derived and synthesized from the concept of individual preparedness and knowledge from tsunami preparedness literature (Matsuda & Okada, 2006a; Ronan, Johnston, Daly, & Fairley, 2001; ISDR/UNESCO, 2006). There are three parameters used in preparedness at the individual level (Figure1).

The first parameter is the knowledge. Knowledge is an important and key factor in preparedness. Specific knowledge includes the nature of a tsunami,

responses to signs of a tsunami, basic emergency preparedness, existing warning systems and sources of information for tsunami warnings. The knowledge is influenced by the attitude and awareness of people to prepare themselves in advance, and when a disaster seems to approach their place, especially for those who are living in coastal areas and are vulnerable to natural disasters.

The second parameter is individual emergency planning. Preparing an emergency plan is an important step towards preparing the individual to survive and cope with emergencies. Although the response to a disaster will be event specific, general preparations are similar. Preparations for individual emergency planning include implementing some activities that should be done to save oneself from a tsunami event, preparing a disaster supplies kit that provides some emergency supplies, and developing safety skills. It is very important for personal preparedness to ensure that the people can survive for at least 72 hours post disaster without any aid from outside.

The third parameter is resource mobilization capacity. The preparations for this parameter include preparing oneself for the rehabilitation period and preparing to seek help from significant others. Resources mobilization can be defined as part of a pre-planning strategy to identify potential resources for disaster response that can provide the people, as disaster victims, their needs before getting outside aid (Keeney, 2004).

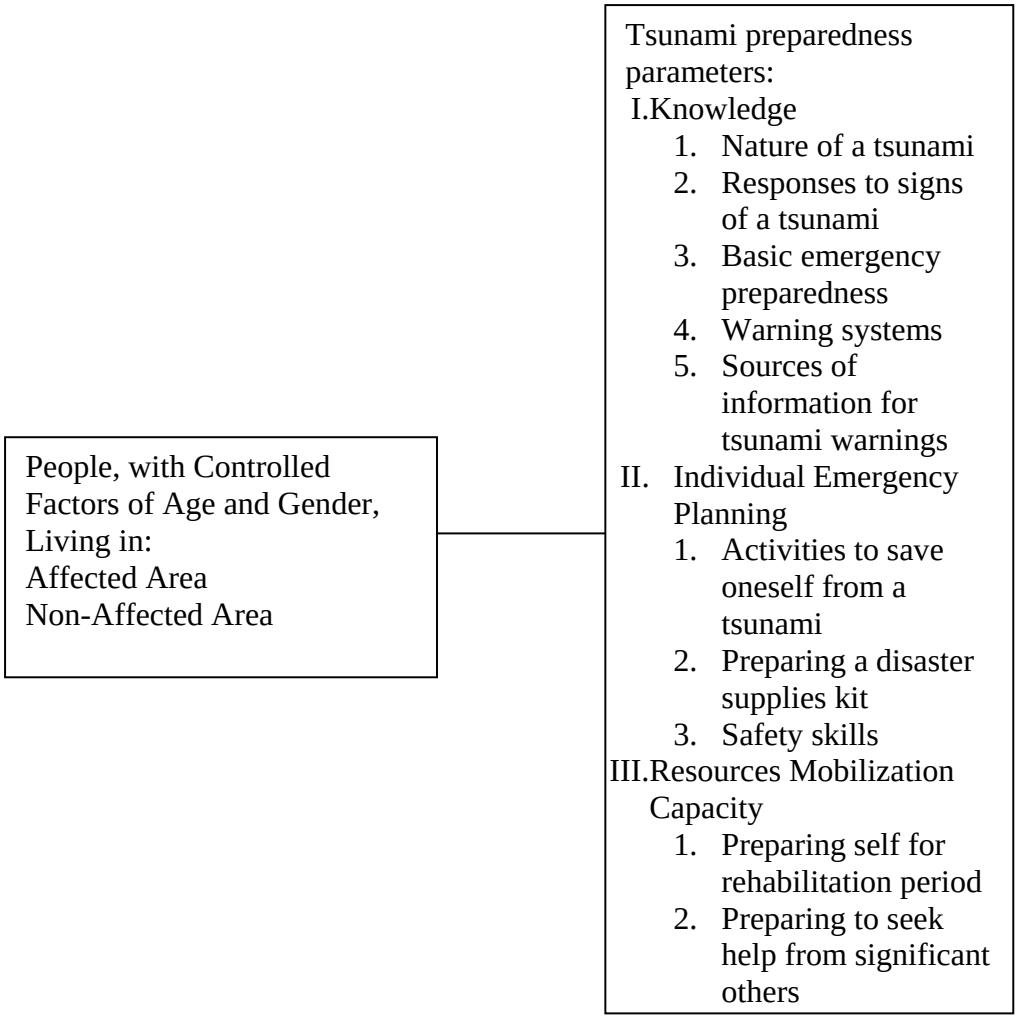

Figure 1

Conceptual Framework to Study Tsunami Preparedness of People Living in Affected and Non-Affected Areas

Hypothesis

Tsunami preparedness of people living in affected areas was higher than the preparedness of people living in non-affected areas.

Definition of Terms

Tsunami preparedness refers to an individual's perception of the extent of being prepared to confront a future tsunami. There are three parameters of tsunami preparedness: knowledge, individual emergency planning and resources mobilization capacity where an individual can prepare for the purpose of minimizing potential risk and mitigating the effects of a future tsunami. In this study it was measured by using the Individual's Tsunami Preparedness Questionnaire developed by the researcher based on related literature (Matsuda & Okada, 2006a; Ronan, Johnston, Daly, & Fairley, 2001; ISDR/UNESCO, 2006).

An affected area is an area which was directly affected by the loss of life and other socio-economic aspects along the west coast of Aceh Province during and after the tsunami on December 26, 2004.

A non-affected area is an area which was indirectly affected by losing community members, who were present in the affected area as either tourists or residents, and other socio-economic aspects along the west coast of Aceh Province during and after the tsunami on December 26, 2004.

Scope of this Study

This study described and compared tsunami preparedness of people living in affected and non-affected areas of Aceh Province, Indonesia on December 26, 2004. The data were collected between December 2009 and January 2010, approximately five years after the world's largest tsunami.

Significance of the Study

The results of this study contribute to nursing practice and the development of future research as follows:

1. For nursing practice, the results of this study provide useful information for the nurses to promote tsunami preparedness of people living in affected and non-affected areas.
2. For nursing research, the results of this study provide evidence based information for designing interventions to promote tsunami preparedness of people living in affected and non-affected areas of Aceh Province, Indonesia.

CHAPTER 2

LITERATURE REVIEW

The literature review begins with an overview of the 2004 tsunami. The highlights of this review include the concept of tsunami preparedness, the parameters of tsunami preparedness, and influencing factors. Furthermore, the study explores the level of preparedness of people living in affected and non-affected areas.

Overview of Tsunamis in Indonesia

Tsunami Preparedness

Parameters of tsunami preparedness

Knowledge

Individual emergency planning

Resources mobilization capacity

Factors influencing disaster preparedness

Disaster preparedness instruments

Level of Disaster Preparedness of People Living in Affected and Non-affected Areas

Summary of the Literature Review

Overview of Tsunamis in Indonesia

Communities in coastal Indonesia have been facing an increasing frequency and variety of magnitudes of earthquakes that have the potential to cause a tsunami event, due to being located in an active subduction zone. According to the U.S. Geological Survey National Earthquake Information Center (USGS/NEIC,

2009), an earthquake that has a minimum magnitude of 6.5 Richter has the potential to cause tsunamis. A number of direct and indirect effects from previous disasters should be a lesson learned for the people living in tsunami prone areas in order to take the opportunity to prepare themselves better for a future event.

Historically, records in Indonesia indicate that tsunamis happen almost every two years on average (Muhari, Diposaptono, & Imamura, 2007). On 26 December 2004, the Indian Ocean Tsunami was the largest ever recorded tsunami having a moment magnitude of 9.2 Richter, which was centered at 3.32°N and 95.85°E offshore of Sumatra at 7:58:53 AM local time. The epicenter of the earthquake was located off the shore of Banda Aceh, the west coast of the northern tip of Sumatra. It created massive destruction in several countries surrounding the Indian Ocean. The destruction included the deaths of over 220,000 people and left a million of people homeless, with maximum damage occurring in Indonesia, Thailand, Malaysia, Sri Lanka, India and the Maldives (Athukorala & Resosudarmo, 2005; Kurita, Arakida & Colombage, 2007).

The economic destruction and environmental damage on Sumatra Island was extensive. It had the worst impact on rural coastal communities in that area. Most of them belong to below poverty-line groups with a high dependence on natural resources for their livings (Pomeroy, Ratner, Hall, Pimoljinda, & Vivekanandan, 2006). Eleven districts of the Aceh Province were affected by the tsunami (FAO as cited in Subagyono, Sugiharto, & Jaya, 2005). According to the World Health Organization, the west coastal region including Banda Aceh, Aceh Besar, West Aceh and Nagan Raya were most severely affected during the 2004

tsunami and the waves reached 4 or 5 kilometers landward of the coast (WHO, 2005).

Following the event, a great earthquake with a magnitude of 8.6 Richter occurred at 04:09:36 AM local time on March 28, 2005 in Northern Sumatra, Indonesia (USGS/NEIC, 2009). It affected the islands of Simeulu and Nias, and southern Aceh, and created significant further loss of 900 deaths and 13,500 families displaced (Muhari, Diposaptono, & Imamura, 2007).

A further tsunami struck the south coast of West Java Province on July 17, 2006, triggered by an earthquake with a magnitude of 7.7 Richter, located at 9.295°S and 107.347°E. This event caused more than 668 casualties and financial loss of $44.7 million up to July 2006. Increasing financial loss followed the event because of the collapse of the tourism sector that has become the primary sector in local economic development of the region (Muhari, Diposaptono, & Imamura, 2007).

The most recent event in a tsunami-front area occurred on September 30, 2009 when a magnitude 7.6 earthquake struck Padang, the capital city of the Province of West Sumatra, and caused a great number of causalities and extensive destruction to property. At least 603 people died and 785 seriously injured, the most common cause of death and injury was from collapse of the building or housing in that area (Aazman, 2009).

Tsunami Preparedness

Parameters of tsunami preparedness

Based on the disaster preparedness assessment framework developed by UNESCO Office, Jakarta and the Indonesian Institute of Science (LIPI), there are four

parameters related to tsunami preparedness at an individual level which includes knowledge, emergency planning, warning systems and resources mobilization capacity (ISDR/UNESCO, 2006). For this study, warning systems will be used as part of knowledge preparedness to describe understanding of people towards the warning systems that have already been established in their region.

Knowledge. Knowledge is the main factor in preparedness for disasters. Knowledge that is needed by the people living in tsunami prone areas to prepare themselves in facing the next disaster includes factual knowledge related to the origin of earthquakes and tsunamis, and the best lifesaving plans of action during and after a natural disaster (ESCAP, 2008; FEMA, 2004).

1) Knowledge of the nature of tsunami and responses to signs of tsunami

People should be familiar with information about tsunamis. The natural warning signs and the history of the area will be helpful to make people aware of the possibility of disaster. A tsunami is defined as a series of long waves generated by a sudden displacement of a large volume of water. Tsunamis are produced by submarine earthquakes, submarine volcanic eruptions, underwater landslides or slumps of large earth, meteor impacts and even onshore slope failures that fall into the ocean or a bay. Tsunamis can be classified as local or distant. Locally generated tsunamis usually have minimal warning times and may occur along with the damage resulting from earthquake shaking such as ground shaking, surface faulting, liquefaction, or landslide. A distant tsunami approaches the coastline after traveling for hours towards the shore (NOAA et al., 2001). A tsunami has specific characteristics, if compared with general waves, in several ways. A tsunami is a series

of extremely long sea waves with the length from crest to crest reaching as much as 150 kilometers. It crosses deep ocean and travels to the shallower water near the coast at a speed of 1000 km/hour.

Coastal communities especially in disaster prone areas should be aware of natural warning signs of tsunamis, namely: earthquake shaking, sea-level fluctuations, and various sounds that have been described as thunder, thunderbolts, locomotives and helicopters a few minutes before the tsunami impact occurs (USGS, 2005; Webb, 2005). The people who live and work near the sea will be impacted the greatest due to loss of lives and livelihoods. The impact of the tsunami does not just destroy raw materials and tools for income-generation enterprises, but also causes extensive damage to critical social, occupational, and physical infrastructure and the environment. At the individual level, the severity of its impact varies according to each person's pre-disaster social, economic, and political power or vulnerability (Oxfam, 2007).

A tsunami threat needs immediate response from the people to protect their safety, if they find the warning signs following a strong earthquake. Although not all earthquakes can cause a tsunami, they should be aware of tsunami emergency messages and stay out of danger areas such as by moving to higher ground, higher stories in a high rise building, or inland (FEMA, 2004). A lesson learned from the past 1960 Chile tsunami was that some people who were trapped and unable to reach high ground, saved their lives by climbing a tree or something that floats, or going up to an upper floor or roof of a building (USGS, 2005). Emergency information from an official agency for seismic monitoring, and a warning from an official agency will be

issued by transmitting the information to a repeater to activate sirens, radio, and public alarm facilities (USGS, 2005).

2) Basic knowledge on basic emergency preparedness

Knowledge related basic emergency preparedness at individual-level programs focuses on basic family preparedness, reduction of household hazards, preparation of family emergency kits and plans, and developing family notification systems (Litchterman as cited in Clark, 2008). Besides that, preparing households through such means as emergency plans and inventories of stored food and equipment are included as preparedness at an individual level (Tomabechi, Keiwkarnka, & Chompikul, 2007). Recommendations from some official sources for tsunami warning say there are simple tasks that can help individuals prepare for survival, including preparation of emergency-supply kits, emergency plans and safety houses (FEMA, 2004; Queensland, Service, & Services, 2009).

2.1) Knowledge of disaster supply kits

It is very important for personal preparedness to ensure that people can survive for at least 72 hours post disaster without any aid from outside. The information that they need to know includes activities that should be done to save the people from tsunami events such as preparing an emergency kit that provides some emergency supplies. These supplies include 6 basic items.

First, water, it should be stored in clean plastic containers such as thoroughly washed and rinsed soft drink bottles with tight fitting screw-on caps. A 3-day supply of water should be stored for each individual. If the people live in a warm weather climate, there will be need of more water.

Second, food, there should be stored at least a 3-day supply of non-perishable food. Select foods that require no refrigeration, preparation or cooking and little or no water to prepare it. Use these foods frequently in rotation, so as to fit them into the regular diet and thus keep the supply fresh. The disaster supply kit should include: ready-to-eat canned meats, fruits and vegetables; canned juices, milk, soup (if powdered milk, extra water should be stored); staples such as sugar, salt, pepper; high energy foods such as peanut butter, jelly, crackers, granola bars, trail mix; vitamins and food for special diets; comfort/stress foods such as cookies, hard candy, instant coffee and tea bags.

Third, assemble a first aid kit for the home and one for each vehicle. An approved American Red Cross kit should be purchased, or may be assembled with the following items: sterile adhesive bandages in assorted sizes, 2-inch and 4-inch sterile gauze pads (4-6 of each), hypoallergenic adhesive tape; triangular bandages (3), 2-inch and 3-inch sterile roller bandages (3 rolls each), scissors, tweezers, needle, moistened towel, antiseptic, thermometer, tongue blades (2), sunscreen, tube of petroleum jelly or other lubricant, assorted sizes of safety pins, cleansing agent/soap, and latex gloves (2 pairs). The other important items in the first aid kit should be non-prescription drugs such as Aspirin or non-aspirin pain reliever, anti-diarrhea medication, antacid (for stomach upset), syrup of Ipecac (use to induce vomiting, if advised by the Poison Control Center), laxative, activated charcoal (use if advised by the Poison Control Center).

Fourth, various tools and supplies are needed for temporary repairs or personal needs. Those are a battery operated radio and extra batteries, flashlight and extra batteries, non-electric can opener, utility knife, map of the area

(for locating shelters), cash or traveler's checks, fire extinguisher (small canister, ABC type), tube tent, pliers, tape, compass, match sticks in waterproof container, aluminum foil, plastic storage containers, signal flare, paper, pencil, needles, thread, medicine dropper, shut-off wrench, whistle, plastic sheeting, mess kits or paper cups, plates and plastic utensils, emergency preparedness manual. The sanitation tools and supplies include toilet paper, soap, liquid detergent, feminine hygiene supplies, personal hygiene items, plastic garbage bags, ties (for personal sanitation uses), plastic bucket with tight lid, disinfectant and household chlorine bleach.

Fifth, clothing and bedding that includes at least one complete spare set of clothing and footwear per person. Items which are included in this category are: sturdy shoes or work boots, rain gear, blankets or sleeping bags, hat and gloves, thermal underwear and sunglasses.

Sixth, include important documents which should be kept in a waterproof, portable container. These includes wills, insurance policies, contracts, deeds, stocks and bonds, passports, social security cards, immunization records, bank account numbers, credit card account numbers, inventory of valuable goods, important telephone numbers, and family records (birth, marriage, death certificates).

2.2) Knowledge of emergency plans

A disaster creates confusion and disorientation among the victims because the most common problem during a disaster is communication failure. The people living in at risk areas should have knowledge about a plan that addresses the following: escape routes; family communications, utility shut-off and safety; insurance and vital records; special needs; and safety skills. Moreover, knowledge on tsunami-specific planning for the people living in tsunami prone areas,

includes how to identify the tsunami risk in the community; the steps involved in developing a plan for an evacuation route from home, school, workplace, or any other place which is at risk of a tsunami; how to practice the evacuation route; the purpose of listening to emergency information from official sources; the benefit of talking with insurance agents in advance; and the importance of discussing the tsunami safety skills with their own family (FEMA, 2004).

2.3) Knowledge about a safe place to take shelter

The knowledge in increasing the ability of physical infrastructure to withstand climatic change is one important approach for anticipatory adaptation that can reduce vulnerability of the people living in coastal areas toward natural disaster hazards (Klien, Nicholls, & Thomalla, 2004). Sturdy roofs enable people to escape from the tsunami water (Guha-Sapir, Parry, Degomme, Joshi, & Arnold, 2006). House reinforcement and furniture fixation in order to prevent falling can be step to make sure the place is safe to be used as a shelter (Agency as cited in Matsuda & Okada, 2006a). In developing countries, structural methods with artificial protection are not usually appropriate because of the cost. Until now, the construction of fishery houses in Indonesia has been implemented with the strengthening of the platform of the house and raising it up from the ground and the section below the floor remains empty. The purpose of this concept, which is based on the traditional Indonesian architecture, is to minimize the affect of the dynamic forces of a tsunami (Muhari, Diposaptono, & Imamura, 2007).

3) Knowledge of existing warning systems

The tsunami that occurred on 26 December, 2004 made the communities geographically prone to tsunamis more aware of the importance of the

Tsunami Early Warning System (TEWS). Warning systems can play a great role in reminding the people in vulnerable areas to evacuate prior to a tsunami event. People's understandings of warning systems will be encouraged enabling the use of the surrounding news services as a means to increase awareness as well as preparedness.

Early warning systems can be defined as a service that provides timely and effective information through identified institutions that allow individuals to get forewarning of hazards so as to take action to avoid or reduce their risk and prepare for effective response (ISDR as cited in Sagala & Okada, 2007). The warning system needs to be planned as an integrated component of the community in order to be developed, implemented and maintained successfully (Kelman as cited in Sagala & Okada, 2007).

In Indonesia, the Tsunami Early Warning System can be divided into two components, namely a structural and cultural component. The structural component falls under the responsibility of the national-level government and comprises of the installation of earthquake and tsunami detection equipment, processing of data into warnings and delivery of warnings to institutions (regional administrations, relevant instrumentalities, and the mass media). The equipment under this component consists of seismometers, accelerometers, models, tsunami databases, Deep-ocean Assessment and Reporting of Tsunamis (DART-Buoys), tide gauges, Global Positioning Systems (GPS), and communication systems. The cultural component, which falls under the responsibility of regional administrations, consists of delivering disaster warnings to communities, ensuring communities to act according to their expectations and strengthening community preparedness. The

Tsunami Early Warning System (TEWS) Agency development team for Indonesia through Meteorological and Geophysical Agency (BMG) has signed Memorandum of Understandings (MoUs) with provincial and district/city governments that set out their roles in developing the cultural component in each respective region.

4) Knowledge on sources of information for tsunami warnings

The people need to have knowledge related to sources of information for tsunami warnings because information for tsunami warnings that are disseminated from credible sources will be more readily accepted and can minimize confusion among the receivers. In Indonesia, Meteorological and Geophysical Agency (BMG) is an official agency for seismic monitoring, information dissemination, an operations' center and an official warning agency. Activities during a tsunami warning covers the management of information among regional centers, national centers, and government and authoritative officials at the local and national levels, which includes the governor, district mayor, police and Indonesian Army among others. The transmission of data and/or dissemination of information may be conducted by telegraph, telephone (mobile), facsimile, TV, radio, cellular operators, mosques, churches, *kentongan* (Indonesian version of a drum made from bamboo or wood which is struck to sound an alarm), and sirens (Figure 2).

Observed data transmitted to the national center will be conveyed to the president, ministers, police stations, local government officials, mosques, churches, *wihara* (Buddhist houses of worship), temples, army stations, post offices, cellular operators, TV stations (for example Television of the Republic of Indonesia or TVRI), and radio stations (for example Radio of the Republic of Indonesia or RRI) for all Indonesian people. Finally, the information will be released to the public.

Technical information should be transmitted after consulting the Provincial Coordinating Unit for the Management of Disasters and IDPs/Refugees (SATKORLAK PBP), District Coordination Body for Disaster and IDPs Management (SATLAK), National Search and Rescue Agency (BASARNAS), Public Works Department (PU), and Regional Government (PEMDA).

Information from the national center will be sent to the local government TEWS through the modem to personal computers. The information is then sent to the receiver (who also receives the data via telephone), and transmits the information to the repeater to activate sirens, radio, and public alarm facilities. Alerting the public is one of the main purposes of disseminating information. This is achieved through education and communicating the warning messages to the people on the coast to take appropriate action such as to move inland to higher ground to escape from the destructive waves.

Individual emergency planning. Planning and preparation for a tsunami in advance is very important because of the limited action time available when a tsunami occurs. Based on the instructions provided by the officials issuing tsunami warnings, such as the Federal Emergency Management Agency (FEMA), there are some activities which should be done to get prepared for a tsunami. Based on recommendations provided by The Department of Emergency Services, Emergency Management Queensland and the State Emergency Service, developing an emergency plan with family and practicing it regularly three times per year will ensure that everyone is familiar with the required tasks for evacuation (Queensland, Service, & Services, 2009).

The other preparations which are very important for personal preparedness include an emergency kit that provides some emergency supplies. This should be prepared and stored in a sturdy and easy-to-carry container. These supplies includes food and water; medical and sanitation supplies; tools, communication and supplies; clothing and footwear; and miscellaneous items. Special recommendations for the items are ensure so that the emergency kit is up to date and each person in the household knows where it is kept (Queensland, Service, & Services, 2009). Listen to local community safety announcements to identify the preferred evacuation routes from the area of risk to higher ground, and help neighbors particularly those who need special assistance by passing on information or warnings, which helps to ensure that the people at risk of the disaster are prepared (FEMA, 2004). Moreover, individuals can choose to live in a safe building and safer geographical location to avoid the risk (Spital, Siegert, McClure, & Walkey, 2005).

Besides that, according to FEMA (2004), safety skills should be one part of an individual's emergency plan. It is important that each individual knows how to administer first aid and CPR. The people should have a fire extinguisher, an ABC type at the minimum, and be sure everyone knows how to use the fire extinguisher(s) and where it is kept.

Resources mobilization capacity. Resource mobilization is a part of a pre-planning strategy to identify potential resources needed for disaster response (Keeney, 2004). It can help the disaster victims to meet their needs before receiving outside aid. The preparation for this parameter includes preparing oneself for the rehabilitation period and preparing to seek help from significant others. The preparation can help to provide shelter when homes are destroyed or are unsafe,

pharmacies which can provide medicines for people when existing prescriptions are destroyed, and locations of food supplies that would be available during disasters. Therefore, resource mobilization capacity is a crucial factor during disaster response.

Non-affected communities surrounding an affected area can be human resources for this parameter. They can provide some services to reduce the severity of the disaster's impact on the life of the survivors. The service can be provided to those who had to leave their community because of the disaster, and food, clothes, or money should be donated and fundraising should be organized to provide shelter voluntarily at the time of disaster (Blendon et al., 2007).

Saving money in an emergency savings account that could be used during any crisis will not only provide greater peace of mind, but will also speed up the recovery, if a disaster occurs (FEMA, 2004), because many coastal communities in the developing world have high dependence on natural resources. The impacts of the tsunami not only cause loss of lives, but also include losses to the household and productive assets such as boats, ponds, marketing facilities and jetties. These losses indirectly reduce the ability of affected people to earn income and sustain their livelihoods (Pomeroy, Ratner, Hall, Pimoljinda, & Vivekanandan, 2006).

The other component of resource mobilization capacity that is very important at the individual level in disaster preparedness is the shelter that is available as a safe place when homes are destroyed or unsafe during disaster response. To provide effective shelter, the people should first consider the hazards and then choose a place in their home or other building that is safe for that particular hazard because the safest locations and shelter vary according to the type of hazard (FEMA, 2004). During a tsunami disaster, moving towards higher inland areas is the safest place, but

also mass care sheltering can be one alternative besides a nearby relative's or neighbor's house that can be used during the disaster event.

One study conducted in Indonesia, Sri Langka and The Maldives post 2004 Tsunami (Kurita, Arakida & Colombage, 2007), found a temple or mosque was the most optimal location to use as a tsunami evacuation site. This reflects the residents' high level of trust in religious facilities where mosques in Aceh, for example, survived the earthquake and the tsunami with only minor damage due the mosque constructions that provide space for water flow

Factors influencing tsunami preparedness

Disaster preparedness at an individual level can be influenced by many factors, some of which cannot be controlled but others may be controlled (Covington, & Simpson, 2006). Personal factors influencing tsunami preparedness include age, gender, level of education, occupation, income, marital status, previous disaster experience (Miceli, Sotgiu, & Settanni, 2007), and risk perception (Paton et al., 2008). Previous tsunami experience and traditional local knowledge of tsunamis, such as folk stories and local songs, can both influence tsunami preparedness at an individual level (McAdoo, Dengler, Prasetya, & Titov, 2006). Besides this, readiness of government in creating awareness among the public and thus reducing the damage due to a tsunami (Kurita, Arakida, and Colombage, 2007), and the role of the public health sector (Bissell, Pinet, Nelson, & Levy, 2004) are higher level influencing factors.

Age. Age may contribute to the individual's performance of the right actions towards preparedness for disaster. Middle-aged adults will have more mental capability of processing information and power to take the right action toward disaster preparedness (Covington, & Simpson, 2006). While children as part of a community

do not have the same independence level of action toward disaster preparedness, they can just take individual protective action, for example becoming a “turtle” during an earthquake and moving at least one kilometer inland and can receive information from adults related to disaster preparedness (Ronan, Johnston, Daly, & Fairley, 2001). Seniors over 65 years of age may find it difficult to quickly evacuate from a tsunami-prone area and there will be limited time between the initial earthquake ground shaking and subsequent tsunami inundation (Wood, Burton, & Cutter, 2009).

Gender. Disaster preparedness is also influenced by gender. A higher proportion of male respondents showed better disaster preparedness behavior than female respondents (Tomabechi, Keiwkarnka & Chompikul, 2007), although females tend to have higher risk perceptions, demonstrate higher preparedness planning, and are more likely to respond to warnings than the men. The reason behind this is that the females are more likely to be single parents or primary care givers and have lower incomes, fewer financial resources, and less autonomy than males (Bateman & Edwards, Enarson & Morrow, Laska & Morrow as cited in Wood, Burton, & Cutter, 2009). Males are more inclined to adopt protective behaviors than females because of their social role and the men usually are the key person within the family context (Miceli, Sotgiu, & Settanni, 2007).

Level of education. There are some studies that explain the association between level of education with the level of disaster preparedness. The people who had higher levels of education showed better behavior towards flood disaster preparedness, while more than one-half of the primary education level group showed poor behavior towards flood disaster preparedness (Tomabechi, Keiwkarwa, & Chompikul, 2007). In fact, education can provide knowledge and life skills to the

educated people in order to have an improved access to the information and health promotion resources (Ross & Wu, 1995).

Occupation. Occupation is a factor that has a good correlation with disaster preparedness. Type of occupation can help people to avail opportunities in order to prepare themselves for disaster. For example, a relatively high percentage of mobile homes, lower incomes, natural-resource occupations and relatively low percentage of civilian labor-force participation would indicate that coastal communities are highly vulnerable (Wood, Burton, & Cutter, 2009). Fishermen are at risk and do not have enough time to mitigate the risk of disaster. While they are working, they may be exposed to the full force of the tsunami (Guha-Sapir, Parry, Degomme, Joshi & Arnold, 2006).

Income. High income has a correlation with readiness of people to prepare themselves to face a natural disaster (Tomabechi, Keiwkarwa, & Chompikul, 2007). These people can easily get access to assets and entitlements in pre and post-disaster periods as a part of preparation for disaster (Covington, & Simpson, 2006). The people with low-income household find it difficult to maintain their mitigation initiative and often have insufficient financial reserves for buying services and materials following an event (Wood, Burton, & Cutter, 2009).

Previous disaster experience. According to Matsuda and Okada (2006b) experience can be divided into direct experience and indirect experience. The people living in affected areas mostly have direct disaster experience which is obtained through the personal impact of the disaster that has been imposed on them. And the people who live in non-affected areas can have the same experience which was gained by those who faced the disaster impact. This can be gained through the

media, or by seeing and hearing directly what happened in their neighborhood. This experience is called indirect disaster experience. Both experiences can trigger people to increase their awareness of preparation for future disaster because it helps the people to see the risk clearly and understand its nature and possible impacts on them (Greening & Dollinger as cited in Mishra & Suar, 2007).

The positive association between previous disaster experiences, including frequency of disaster experience, and disaster preparedness is well known. In a study, a high frequency of disaster experience (at least 4 times) created higher levels of disaster preparedness behavior, while the group with a low frequency of disaster experience showed poor behavior level (Tomabechi, Keiwkarwa, & Chompikul, 2007). Another study has shown that indirect disaster experiences have an association with attitudinal change of people in adopting earthquake countermeasures (Matsuda & Okada, 2006b).

Experience gained from observations and personal experience from natural hazards can be referred to as local knowledge that will help to guide people to be prepared with preventive measures during the next event. Prior knowledge and past experience of a tsunami on Simeulu Island already helped to save the local people from the 2004 tsunami (McAdoo, Dengler, Prasetya, & Titov, 2006).

Marital status. Young and single people are less likely to prepare themselves for a disaster (Eisenman et al., 2006). However, from the review and results of a study, families with many dependents, which includes females who are single parents, are likely to find many difficulties when responding to an emergency due to the limited financial reserves and the coupling of work responsibilities and care for family members (Wood, Burton, & Cutter, 2009).

Risk perception. Risk perception has a consistent relationship with disaster preparedness behavior (Tomabechi, Keiwkarnka, & Chompikul, 2007). Risk perception can be referred to as the subjective evaluation of the likelihood of an occurrence of a future risky event and the personal and material damage resulting from it (Miceli, Sotgiu, & Settanni, 2007). The people with more unrealistic risk perceptions were found to have lower perceived ability to cope in the case of a future disaster event (Ronan, Johnston, Daly, & Fairley, 2001). To understand risk and responses to risk, people need some supporting factors that have an interaction with each other. Not only scientific information or information about direct physical consequences are needed, but also information about the interaction of psychological, social, cultural, institutional and political processes (Burns et al., Sjoberg as cited in Webb, 2005). One study showed that there was a diversity of tsunami risk perceptions among the three countries Indonesia, Sri Lanka and the Maldives, because each country has differing geographical, cultural, and social backgrounds (Kurita, Arakida, & Colombage, 2007). People's level of preparedness was in accordance with the level of risk they perceived. Those who perceived a low level of risk had undertaken basic preparedness measures, and those who perceived a disaster to be a real and imminent threat had done more preparations (Burgelt, Johnston, & Paton, 2009).

Local Knowledge. Local knowledge has a significant correlation with ability of people to save their lives during a disaster (McAdoo, Dengler, Prasetya, & Titov, 2006). There are many terms used to describe this idea, some literature sources use other terms such as 'indigenous knowledge', 'traditional knowledge', 'folk knowledge', 'folk science', and 'citizen science' (Dekens, 2007b)

The definition of local knowledge is the knowledge held by indigenous people, or local knowledge which is unique to a given culture or society (Berkes as cited in Dekens, 2007b). Local knowledge will be helpful to guide the local and indigenous people in a particular area in interacting with their environment. This knowledge helps the people to monitor, interpret and respond to the dynamic changes in ecosystems and can be valuable to design appropriate interventions, including disaster preparedness. Local knowledge on disaster preparedness is composed of four major dimensions: observation, anticipation, adjustment, and communication (Table 1) (Berkes et al., Langill as cited in Dekens, 2007b).

Local knowledge is referred to in this study as the knowledge generated through observation and experience of the local environment by a specific group of people (Berkes et al. as cited in Dekens, 2007b). The types, frequency, and intensity of past and present natural hazards influence local knowledge, because local knowledge of disaster preparedness is related to the people's observation of natural hazards through their daily experiences of their local surroundings (Table 1). Sagala and Okada (2007) proposed that, "local knowledge in concern with a thoughtful education plan can go a long way toward mitigating the hazards in the areas that are closest to the tsunami source."

During the last tsunami event in 2004, there was 7 people out of the total population of over 78,000 in Simeulu island, part of Aceh Province, whereas in fact 95% of its population lives on coastal areas close to the earthquake's epicenter. These communities are isolated from high-tech communication and warning systems

Table 1

The Four Pillars of Local Knowledge on Disaster Preparedness

(1) Observe People's experience of the local surroundings	**(2) Anticipate** People's identification and monitoring of environmental indicators	**(3) Adjust** People's access to assets	**(4) Communicate** People's ability to transfer knowledge among themselves and between generations
History of natural hazards Examples: Knowledge on the location, time, duration, frequency, intensity, predictability of previous hazards **Nature of natural hazards** Examples: knowledge on the onset, origin, and velocity of water flow; knowledge of different types of rain **Evolution of social and physical vulnerabilities to natural hazards** Examples : life stories explaining the impoverishment processes of households following recurrent natural hazards and other stresses	**Early warning signals** Examples : Interpretational knowledge of changes in animal behavior, vegetation patterns; knowledge of local weather forecasts **Time thresholds** Examples: knowledge of when it is time to buy and store food in advance, leave the house, move the cattle, and remove important belongings **Escape routes and safe places for human and cattle** Examples: knowledge of the safest and fastest routes **Key actors and skills** Examples: knowledge of who knows what, who does what and when, who stays behind, who goes first	**Human assets** Examples : Specific skill such as traditional carpenters and masons **Sociocultural assets** Examples: knowledge of different social groups depending on occupational, physical ability, ethnicity, gender, caste, class, and age characteristics **Institutional assets** Examples: knowledge generated by local institutions and cross-scale linkages **Financial assets** Examples: micro-finance arrangements such as credits and savings **Natural assets** Examples: natural resource management strategies such as intercropping and agro forestry that conserve biodiversity and protect soil erosion and can contribute to reducing the impacts of natural hazard **Physical assets** Examples: infrastructural safety arrangements such as boats, housing, embankments	**Oral & written communication** Examples : local songs, poems, proverbs which help the younger generation and outsiders learn about previous hazards; stories of previous hazards encoded in the names of specific places **Early warning systems** Examples: use of visual signals such as mirrors, fire or audio signals like drums; having dreams of natural hazards in advance **Other practices** Example: taboos which prevent people from going to certain hazard-prone areas; ceremonies, local art which helps the community to understand and remember past natural hazards, and relieve the anxiety related to the threat of future hazards

Note. From The Four Pillars of Local Knowledge on Disaster Preparedness. Reprinted from *"Herders .of chitral: the lost messenger? local knowledge on disaster preparedness in Chitral District, Pakistan,* " by Dekens, J. 2007, p.6. Nepal: International Centre for Integrated Mountain Development (ICIMOD).

but they had been able to evacuate and run away before the tsunami on December 26, 2004 hit the coast. Their ability to save their lives is related to previous tsunami experience in 1907, which had been repeatedly handed down from one generation to the next through stories and songs. This local knowledge was known as "*smong* stories" (McAdoo, Dengler, Prasetya, & Titov, 2006).

Government policy. Government plays an important role in disaster preparedness of the community by providing the necessary policy in raising public awareness and reducing tsunami damage. This contributes to the creation of a people that is better prepared for disaster. For example, the policy of conducting evacuation training or drills will encourage and facilitate people to acquire the relevant preparedness to face the next disaster (Kurita, Arakida, and Colombage, 2007), in order to ensure that the people can take responsibility for their own safety (Samant, Tobin, & Tucker, 2008). A survey of residents and government officials in Indonesia found that "the establishment of an early warning system" is considered to be a most necessary policy (Kurita, Arakida, and Colombage, 2007).

Public health sector. The public health can help and encourage the people to prepare themselves. For example, they can educate the public about how to prevent disasters, minimize their consequences, and assist the development of preparedness of the community for disaster response and ensure that the people still have relevant knowledge and ability in using emergency training and exercise. Improving disaster preparedness is important for the health sector through keeping knowledge and skills up to date and being involved in activities related to disaster preparedness for communities. A study shows an evidence-based significant relationship between health sector preparedness levels and case fatality rate. In the

study, the authors compared four earthquakes in different countries and the ability of public health and health sector preparedness in those countries (Bissell et al., 2004).

Disaster preparedness instruments

There are no specific tools to measure tsunami disaster preparedness. Some measurement tools in general can be used to assess the preparedness of people living in high risk areas to cope with a tsunami event, including the Earthquake Readiness Scale (ERS) (Spitall, Walkey, McClure, & Siegert, 2005), Adoption of Protective Behaviors (APB) (Miceli, Sotgiu, & Settanni, 2007), Rescue Stockyard (RSY) list questions (Matsuda, & Okada, 2006a) and the Indonesian Institute of Science Disaster Preparedness Assessment (ISDR/UNESCO, 2006). There are no data available about the validity and reliability of these tools, except that internal consistency for the APB using KR-20 was .60.

The Earthquake Readiness Scale (ERS) was developed by Spitall, Walkey, McClure, and Siegert (2005). The ERS is a 23-item instrument designed to assess the number of steps that people have taken to prepare for a major earthquake. Respondents are asked about the steps that they have taken to mitigate the impact of an earthquake, and the steps they have taken to increase the probability of survival when disaster occurs. They answer by circling Yes or No as possible alternatives.

Adoption of Protective Behaviors (APB) was developed by Miceli, Sotgiu and Settanni (2007) based on the existing literature. The APB consists of 9 items, particularly regarding the necessary behaviors in order for people to be prepared in facing floods accompanied by landslides. The respondents are asked to indicate whether or not they had adopted each of the presented behaviors.

The Rescue Stockyard (RSY) list of questions is a list of questions regarding “anxieties” raised by past participants in the workshops organized by RSY. This survey consists of two parts; the self-evaluation to evaluate self preparedness and community preparedness for an earthquake on a scale of 1 to 10. In addition, there are also questions regarding behavior, the three- or four-point Likert scale provided the present state, and attitude towards earthquake preparedness. It is divided into seven categories: housing safety, storage, shelter, special support (the elderly, handicapped and infants), community linkage, fire and emergency contact.

The disaster preparedness assessment framework has been developed by the Indonesian Institute of Science within the “Strengthening Community-based Disaster Preparedness in Indonesia” project in collaboration with UN-ISDR. This instrument is a guideline to measure the level of community preparedness in facing natural disasters with emphasis on earthquakes and tsunamis. This tool is formulated from 5 parameters, which are: (1) knowledge-attitude-practice; (2) emergency planning; (3) policy statement and legal product; (4) resource mobilization capacity, and (5) warning system. Based on the parameters, they develop a set of comprehensive assessment tools in order to get accurate data. They are divided into 3 sets, namely:

1) List of questions for the survey activity; includes 3 sub-sets of specific questionnaires for individual and household, school community, and local government
2) Guideline for interviewer, includes 6 sub-sets of guidelines for school community and several groups of local government and community agencies

3) Guideline for Focus Group Discussion (FGD) for school community and community, and workshop activity at district level

This tool consists of 25-item questions for 4 parameters, including knowledge, emergency planning, warning systems and resources mobilization capacity. In order to assess and improve the effectiveness of the tool, it has been piloted in three sites in Sumatra (Padang, Bengkulu and Nanggroe Aceh Darussalam).

In this study, the researcher will develop an assessment tool at the individual level based on literature reviews which includes knowledge, individual emergency planning, and resources mobilization capacity (Matsuda & Okada, 2006a; Ronan, Johnston, Daly, & Fairley, 2001; ISDR/UNESCO, 2006).

Level of Disaster Preparedness of People Living in Affected and Non-Affected Areas

Most of the disaster preparedness studies have been conducted in affected areas, and some studies have shown which activities have been done in non-affected communities in preparing to face disaster events. The variance in preparedness levels among people living in prone disaster area not only depends on the kind of the disaster but also some influencing factors. The most significant influencing factors are age, gender (Oxfam, 2007), and previous disaster experience (Matsuda & Okada, 2006b). The other factors that should be considered are level of education, occupation, income, marital status (Miceli, Sotgiu, & Settanni, 2007), risk perception (Paton et al., 2008), local knowledge (McAdoo, Dengler, Prasetya, & Titov, 2006), readiness of government in raising public awareness and reducing tsunami damage (Kurita, Arakida, & Colombage, 2007), and the public health sector (Bissell, Pinet, Nelson, & Levy, 2004). The level of the people's disaster preparedness

can be described in the following parameters including knowledge, individual emergency planning and resources mobilization capacity.

Knowledge

A study in an affected area showed that tsunami preparedness consisting of prior knowledge alone is not enough to mitigate the enormous tsunami disaster that struck Indonesia because many residents reported that the damage would not have been reduced, even had they been equipped with such knowledge in advance (Kurita, Arakida, and Colombage, 2007). Moreover, although coastal residents have a fairly high level of knowledge about tsunami hazards in general, most of them did not know the warning signs of a tsunami and did not know how much time they would need to evacuate after feeling a strong offshore earthquake or getting a tsunami warning (Davis, 2007).

A study was conducted on how best to prepare people in communities outside the main areas devastated by Hurricanes Katrina and Rita based on their knowledge, attitudes, and behaviors about hurricane preparedness and response to the disaster. Based on this study, there were three out of four affected regions that needed more assistance for disaster planning, increased positive coping strategies for stress following the disaster, and quality information available to a huge audience in order to prepare and minimize the impact (Blendon et al., 2007).

Related to warning systems, messages that are clear, practical, relevant and informative will allow the people to decide on an appropriate course of action. An individual's perception about the possibility of disaster can arise from the past experience of disaster, psychological traits, and socio-cultural attitudes. Another factor includes warning confirmation; this would only be believed if the sources of the

warnings were official, if there is increasing evidence and probability of disaster, and if the geographic location is proximate to the expected disaster location (Clark, 2008).

There will still be believed in prone tsunami area, if the warning is not early enough or loud enough to cover the area effectively. Living close to the source of the tsunami and given limited time to evacuate between the earthquake and the arrival of the first tsunami wave would reduce the effectiveness of a warning. The other finding from this study showed that evacuation warning message were not known very well because they were not specific enough and did not make sense to many people that are living in the area, and there is the possibility they generate misleading (Blendon et al., 2007).

Individual emergency planning

The actual level of people's preparedness for a particular event varies widely even though they have prior experience. People sometimes do not realize that they are lacking some critical elements of preparedness. For example from 3,448 respondents for a personal disaster preparedness study in America, nearly 40% said that they “have been prepared for at least the past six months” but they did not have a household plan, nearly 80% had not conducted the home evacuation drill, and nearly 60% did not know their community’s evacuation routes (Corps & FEMA, 2009).

A study evaluated awareness of disaster preparedness information and warning sirens on Hawaii’s Island. It reported that only one-third of the respondents indicated that they have an emergency plan for a lava-flow, hurricane, or earthquake; one-third claimed to have practiced what to do during an emergency at home and very few respondents felt the need of an emergency evacuation shelter to be located near their school or home (Gregg, Houghton, Paton, Swanson, & Johnston, 2004). In this

study, it was found that an individual whose family has an emergency plan of action is 2.2 times as likely to have practiced what to do during an emergency at home and is 3.2 times as likely to practice with their family.

Another study investigated disaster preparedness among the people living in nine Italian communities located in a mountain valley that were exposed to floods and landslides, showed that the respondents were fairly well prepared to deal with the disasters. Most of them had adopted at least three protective behaviors to reduce their vulnerability. The most frequently practiced behaviors were “Keep a working flashlight and a battery operated radio in a convenient location”, “Keep a readily available list of emergency phone numbers”, and “Teach (and/or arrange with) relatives what to do in case of emergency” (Miceli, Sotgiu, & Settani, 2007).

A study conducted on hydrogeological disasters showed that one-half of heads of households in an area that had a high frequency of flood disasters in Thailand reported that they had a good level of flood disaster preparedness behavior with good knowledge and high moderate perception. This study provided recommendations to prepare emergency bags for keeping goods in each household in addition to preparing food, money and a boat (Tomabechi, Keiwkarnka, & Chompikul, 2007).

Resource mobilization capacity

In a non-affected area, a study conducted to identify people’s disaster preparedness from Hurricanes Katrina and Rita showed that although the communities that have recently experienced real threat from a natural disaster, they still have insufficient plans and capacity in place regarding disaster preparation and readiness (Blendon et al., 2007). The reason for not leaving the high-risk area may be that the

road in the community may not be wide enough to allow all the residents to evacuate simultaneously.

This issue can take place not only because of limited space but also due to accidents and the people coming into the area to safeguard their family members (Johnston et al., 2005). Another study in hurricane affected regions showed there are several reasons why people do not evacuate the high-risk area, including; they have no friends or family outside the area with whom they could stay, they are not able to leave their jobs, they did not trust what government officials told them to do, they are physically unable to leave or had to care for someone who was physically unable to leave (Blendon et al., 2007).

Actually the people living in non-affected areas should be prepared for themselves and the communities that were affected by the hurricane(s).Thus they can play a role as a helper for affected communities through sharing substantial services and doing some activities to help those affected by the disasters (Blendon et al., 2007).

There are several reasons behind why people have low level of tsunami preparedness and high levels of refusal to evacuate the risk area. (Johnston et al., 2005). Firstly, inadequate knowledge related to the nature of tsunami hazards. Some reasons were also identified for this issue. One reason refers to the difficulties about information distribution. People who take responsibility to distribute information tend to hold the information back due to fear of negative impacts on their activities such as city council or real estate agency. The another reason can include, an inadequate tendency with regard to the content and frequency of dissemination of information that lets people know what they could do to prepare personally, and what their

communities should have in place for responding when a tsunami occurs. Secondly, the people living in coastal areas do not show much interest to implement many of the things that have been established as best preparations for a tsunami disaster. This is due to the combination of lack of money, the fear of negative effects on the economy, and perceiving the risk of a tsunami as relatively low.

Summary of the Literature Review

In summary of the literature review, tsunami preparedness is defined as the level of knowledge, individual emergency planning and resource mobilization capacity that are implemented by an individual for the purpose of minimizing potential risk and mitigating the effects of a future tsunami. This preparedness will give the people that vulnerable to disasters a higher degree of confidence and certainty to living in tsunami affected and non tsunami affected areas along west coast of the Province of Aceh post tsunami December 26, 2004. The lesson learned from the tsunami taught people living in high-risk coastal areas that they should have sufficient knowledge and preparation done because the impact of a catastrophic disaster would exceed the capacity of the public rescue services.

CHAPTER 3

RESEARCH METHODOLOGY

Research Design

A descriptive comparative design was employed in this study to describe and compare the level of tsunami disaster preparedness of people who lived in affected and non-affected areas in coastal Aceh Province of Indonesia.

Population and Setting

The affected and non-affected populations in this study were the people living in coastal areas of Aceh Province. Aceh Barat District is one of the districts which was severely affected by the 2004 tsunami and received outside aid to recover from the impact (Appendix D). Aceh Barat District was selected as an affected area because of the following reasons:

1. It is located close to the epicenter of earthquake that caused the tsunami and is prone to tsunami disasters.
2. It was severely affected by the 2004 tsunami because of its geographic position and was completely inundated and considered an area of extreme human impact. This district has 12 sub-districts. Meulaboh is the capital of Aceh Barat District. Previous studies (Athukorala, & Resosudarmo, 2005; FAO as cited in Subagyono, Sugiharto, & Jaya. 2005) reported that the tsunami disaster in Aceh Barat caused the following problems:

2.1 More than half of the sub-districts were destroyed.

2.2 Thirty-six villages in four sub-districts of Aceh Barat were completely destroyed; the remaining affected districts absorbed a large number of Internally Displaced Persons (IDPs) and were therefore classified as affected.

2.3 A lot of people were killed and missing in that area as a result of the tsunami December 26, 2004 event.

2.4 About 4,084 hectares of land for food crops and horticulture were damaged.

Aceh Selatan District of Aceh Province was selected as a non-affected area. This district is located 200 kilometers from Aceh Barat District and consists of 16 sub-districts (Appendix D). Although geographically, this coastal area was at high risk of the 2004 tsunami, most of the area was not directly impacted by the disaster and no death was reported in that area during tsunami event. Tapaktuan is the district capital and is one of the areas along west coast of the province that was safe from the 2004 tsunami.

Sample and Sampling

Sample size

The number of subjects in this study was estimated by using power analysis. The sample size determined at the level of significance (α) of 0.05 and power of 0.80 and effect size (γ) of 0.20, which can be categorized as a small effect size study because no prior relevant research has been conducted (Burn & Groves,

2001). Using the above criteria, the required sample size was 152 per group with the total subjects of 304.

Sampling

To obtain representatives of these two groups, affected area and non-affected area, a multistage-stratified random sampling strategy was used. There were four stages as follows (Figure 3).

Stage 1: Made a list of sub-districts from the affected areas (n=12) and non-affected areas (n=16)

Stage 2: Randomly selected one-sub district from each study area; then listed the villages (n=21 and 15 for affected and non-affected area, respectively) each sub-district

Stage 3: Randomly selected at least half of the total number of villages of the sub-districts, and listed the housing units in the village

Stage 4: Randomly selected a number of housing units from each representative village.

Stage 5: Listed the residents of the housing units and randomly selected the subject who met inclusion criteria. Inclusion criteria for this study were as follows:

5.1) Adult aged 17 years or older (according to Indonesian law)

5.2) Had been living for at least one year in the area of study

5.3) Had direct experience of the tsunami for subjects living in the directly affected area

5.4) Ability to communicate in the Indonesian language

5.5) Willing to participate in this study

Sampling of non-affected area. Tapaktuan Sub-district that is the capital district capital of South Aceh District was selected as the non-affected area. To recruit 152 subjects for the study, 8 villages were selected out of the 15 villages. The 152 subjects who met the inclusion criteria were recruited by a stratified random sampling method to represent influencing factors, such as age and gender of the group, equally. For age, the subjects were grouped into three ranges, which were 17-34 years (55.3%), 35-54 years (34.2%) and more than 54 years (10.5%). The number of female (50.7%) and male (49.3%) participants were counted from the people living in this study area.

Sampling of affected area. Johan Pahlawan is a sub-district of Aceh Barat District which was selected as the affected area. To recruit 152 subjects into the study, 15 villages were selected out of the 21 villages. The 152 subjects who met the inclusion criteria were recruited by a stratified random sampling method to represent influencing factors of the group equally such age (age range; 17-34 years (55.3%), 35-54 years (34.2%) and more than 54 years (10.5%), gender including female (50.7%) and male (49.3%).

Instrumentation

Instruments

The instruments consisted of two parts, the *socio-demographic questionnaire* and the *individual's tsunami preparedness questionnaire*.

The socio-demographic questionnaire (Appendix B)

The questionnaire was developed by the researcher and consisted of eight items: age, gender, marital status, level of education, occupation, income, source of information of preparedness, perceived likelihood and ability to cope with the impact of a tsunami event.

Individual's tsunami preparedness questionnaire (Appendix B)

The questionnaire was developed by the researcher based on relevant literature (ISDR/UNESCO, 2006; Matsuda & Okada, 2006; Ronan, Johnston, Daly, & Fairley, 2001). The researcher developed a list of the parameters of the tsunami preparedness questionnaire. Parameters for tsunami preparedness at an individual level comprised of knowledge, individual emergency planning and resources mobilization capacity.

The tsunami preparedness parameters encompassed 44 items that covered: knowledge preparedness (20 items including knowledge of the nature of a tsunami = 4 items: numbers 1 to 4; responses to signs of a tsunami = 3 items: numbers 5 to 7; basic preparedness for emergency = 3 items: numbers 8 to 10; existing warning systems = 3 items: numbers 11 to 13; and the source of the information for tsunami warnings = 7 items: numbers 14 to 20), individual emergency planning (17 items including activities to save oneself from a tsunami = 4 items: numbers 21 to 24; disaster supplies kits = 10 items: 25 to 34; and safety skills = 3 items: numbers 35 to

37), resources mobilization capacity (7 items including preparing self for the rehabilitation period = 3 items: numbers 38 to 40 in which item number 40 covers 4 sub items; and preparing to seek help from significant others = 4 items: numbers 41 to 44). Subjects responded to each item on a five-point Likert-like scale, ranging from 0-4 in which 0 = Not at all, 1 = A Little, 2 = Somewhat, 3 = Much, 4 = Very Much. The scores were categorized into three levels:

Score		Level of Preparedness
0.00 – 1.33	=	Low
1.34 – 2.67	=	Moderate
2.68 – 4.00	=	High

Validity and reliability of the instrument

Validity of the instrument. Three experts, consisting of two experts in disaster nursing and community health nursing and one expert in tool development from the Faculty of Nursing, Prince of Songkla University, examined the Individual's Tsunami Preparedness Questionnaire for content validity. The content validity index (CVI) of the Individual's Tsunami Preparedness Questionnaire was .95, indicating acceptable level of content validity.

Reliability of the instrument. The instrument was tested for reliability with 20 subjects, who had similar criteria to the study subjects. Test-retest reliability was analyzed to evaluate stability of the Individual's Tsunami Preparedness Questionnaire with the accepted value of .70 (Burns & Grove, 2001), and the reliability of Individual's Tsunami Preparedness Questionnaire was .99 for knowledge, 1 for individual emergency planning, and .99 for resources mobilization capacity.

Translation of the instrument

The researcher developed the instrument in English. The translation process was done by two bilingual English–Indonesian experts in the Faculty of Medicine at the University of Syiah Kuala, Banda Aceh, Indonesia. In this study, the tool was translated using simple back-translation technique (Brislin, 1970).

Step 1: The first translator translated the original English version of the tool into an Indonesian version.

Step 2: The translated instrument was back translated into English language by another bilingual translator.

Step 3: Finally, the two English versions were examined for comparability of language and similarity of interpretation by the researcher with the help from the first translator. Comparability of language refers to the formal similarity of words, phrases, and sentences, whereas similarity of interpretation refers to the degree to which the two versions would engender the same attitude of response even with different words.

Ethical Consideration

The research approval was obtained from the Institutional Review Board (IRB) of the Faculty of Nursing, Prince of Songkla University. The researcher asked for the permission from the Head of Johan Pahlawan Sub-district in Aceh Barat District and Head of Tapaktuan Sub-district in Aceh Selatan District and the

responsible community leaders where this study was conducted. After obtaining the permission, the researcher selected the subjects in the areas of the study who met the inclusion criteria. All subjects were informed about the study. The researcher explained the purpose of the study, expectation from the subject's participation and potential harm of this study such as feelings of flashback, sadness, depression, and despair during completing the questionnaires. The subjects were allowed to stop completing questionnaire for a while in order to calm down and wait until the subjects felt better. If the subject was not ready to continue completing the questionnaire, they had the right to withdraw from this study at any time for any reasons without any fear or negative consequences. Informed consent was verbally obtained from the subjects participating voluntarily. The identity of the subjects was kept confidential, and a code was substituted in order to maintain anonymity (Appendix B).

Data Collection

Data were collected during January-February, 2010.

Preparation phase

1) The researcher contacted and asked for permission from the Head of Johan Pahlawan Subditrict in Aceh Barat and Head of Tapaktuan Subdistricts in Aceh Selatan, Aceh Province, Indonesia.
2) With the permission, the researcher met the community leader to explain the purposes of the study.
3) Five research assistants who had experience in working with the community were trained to assist in data collection.

Implementation phase

1) The eligible subjects were approached by the researcher or the research assistants.
2) The researcher/research assistants explained the purposes, benefits and ethical considerations of this study to the subjects.
3) The subjects who agreed to participate in this study were required to give verbal consent. Then the researcher/research assistants explained to them how to complete the questionnaire.
4) Each subject took approximately 30-40 minutes to complete the questionnaires. For illiterate subjects, the researcher/research assistants read the questionnaire and helped them to complete the questionnaire, or otherwise they could bring the questionnaire back home to complete it with the assistance of family members and return it to the researcher/research assistants one day later when the researcher/research assistant came back and collected it from their home.

Data Analysis

Data were analyzed by using computer program software. Data analysis included descriptive and inferential statistics as follow:

1. The socio-demographic data

   Descriptive statistics were used for presenting demographic data (frequencies, percentage, means and standard deviations).

2. The level of tsunami preparedness

Descriptive statistics was used for presenting the levels of tsunami preparedness of people living in affected and non-affected areas. Frequency, percentage, means and standard deviations were determined.

3. The differences between tsunami preparedness of people living in directly affected and non-directly affected areas.

   Inferential statistics was used to examine the differences of tsunami disaster preparedness among the people living in affected and non-affected areas. Independent-t test was used if the assumptions of normality and homogeneity of variances of the datasets were met. Mann-Whitney U test was used instead if the assumptions were violated.

CHAPTER 4

RESULTS AND DISCUSSION

The findings of this study are presented as follows: subjects' characteristics, level of tsunami preparedness of people living in affected areas, level of tsunami preparedness of people living in non-affected areas, and the differences of tsunami preparedness between the people living in affected and non-affected areas in Aceh Province, Indonesia.

Results

Subjects' characteristics

Affected areas. The age of the subjects ranged between 17-34 years (55.3%), 35-54 years (34.2%) and more than 54 years (10.5%). The average age of the subjects was 34.69 years (SD=11.91). About half of the subjects were female (50.07%). The majority of them were married (55.3%), had highest education at senior high school level (40.8%), and worked as businessmen/businesswomen (42.1%). More than fifty percent (52.6%) of the subjects in the affected area had an income between 500,000 IDR and 1,000,000 IDR (50 USD-100 USD) per month.

With regard to sources of the information related to tsunami preparedness, most of the subjects in affected areas, obtained the information by reading books or reading other disaster related materials (94.7%). The majority of them did not obtain information by reading disaster related materials from the internet (68.4%). While most of them obtained information from TV or radio (100%) and participation in community drills or simulations related to disaster (99.3%).

All subjects in the affected area had direct tsunami experience (100%). Regarding the perceived risk of tsunami occurrence, half of the subjects in the affected area (50%) perceived that a tsunami was likely to occur in near future. However 64.5% of the subjects perceived that a tsunami was likely to occur in their living area. When taking the perceived ability to cope with the impact of a tsunami event into account, 99.3% of the subjects perceived that local authorities have good enough preparedness to respond to a possible tsunami.

Non-affected areas. More than half of the subjects' ages ranged from 17-34 years (55.3%), while 34.2% were 35-54 years and 10.5% more than 54 years. The average age of the subjects was 35.2 years (SD=11.46). About half of the subjects were female (50.07%). The majority of them were married (57.9%), 43.4 % had highest education at college or above, and worked as businessmen/businesswomen (45.4%). And 36.2% of the subjects in the non-affected area had an income of less than about 500,000 IDR (50 USD) per month.

With regard to sources of information about preparedness, most of the subject in the non-affected area received the information from reading books or reading other disaster related material (83.6%), or received the information from reading disaster related materials from the internet (52%). And most of the subjects in non-affected areas obtained information from TV or radio (95.4%) and whereas the majority of them did not obtain the information from participating in drills or simulations related to disaster (65.1%).

Most of the subjects in the non-affected area did not have direct tsunami experience (70.4%). Regarding the perceived risk of tsunami occurrence, the majority of the subjects in non-affected area (71.4%) perceived a that tsunami was not

likely to occur in near future. However 61.2% of the subjects perceived that a tsunami was likely to occur in their living area. When taking the perceived ability to cope with the impact of a tsunami event into account, 55.9% of the subjects perceived that local authorities did not have good enough preparation to respond to the possibility of a tsunami.

A comparison of demographic characteristics between tsunami affected and non tsunami-affected groups was conducted. It was found that there was statistically significant difference in the level of education, occupation, income/month, sources of information about tsunami preparedness, perceived likelihood of a tsunami occurring in the near future and the ability of local authorities' preparation to respond to the possibility of a tsunami impact ($p<.05$). Age, gender, marital status and perceived likelihood of a tsunami occurring in the living area had no statistically significant difference between people living in affected and non-affected areas ($p>.05$).

Table 2

Frequency and Percentage of Socio-Demographic Characteristic of the Subjects (N=304)

Characteristics	Affected Areas *(n =152)*		Non-Affected Areas *(n=152)*		χ^2	p
	N	%	N	%		
Age						
17-34	84	55.3	84	55.3	55.33	.16*
35-54	52	34.2	52	34.2		
>54	16	10.5	16	10.5		
	(*M* = 34.69 years, *SD* = 11.91, *Min*=17, *Max* = 68)		(*M* = 35.20 years, *SD* = 11.46, *Min*=17, *Max* =64)			
Gender						
Female	77	50.7	77	50.7	.00	1*
Male	75	49.3	75	49.3		
Marital status						
Single	38	25	44	28.9	2.53	.28*
Married	84	55.3	88	57.9		
Separated	30	19.7	20	13.2		
Level of education						
No formal education	6	3.9	2	1.3	56.56	<0.001
Elementary school	21	13.8	5	3.3		
Junior high school	46	30.3	15	9.9		
Senior high school	62	40.8	64	42.1		
College	17	11.2	66	43.4		

Characteristics	Affected Areas *(n =152)*		Non-Affected Areas *(n=152)*		χ^2	p
	N	%	N	%		
Occupation						
Fisherman	19	12.5	5	3.3	40.43	<0.001
Farmer	11	7.2	3	2		
Government Employee	25	16.4	54	35.5		
Businessman	64	42.1	69	45.4		
Other	33	21.7	21	13.8		
Monthly Income						
< 500,000 IDR	42	27.6	55	36.2	52.57	<0.001
500,001 IDR – 1,000,000 IDR	80	52.6	30	19.7		
1,000,001 IDR – 2,000,000 IDR	29	19.1	37	24.3		
> 2,000,001 IDR	1	0 .7	30	19.7		
Source of the information of tsunami preparedness:						
Reading books or reading other disaster related to material						
Yes	144	94.7	127	83.6		
No	8	5.3	25	16.4	8.7	<0.001
Reading disaster related materials from the internet						
Yes	48	31.6	79	52	12.17	<0.001
No	104	68.7	73	48		

Characteristics	Affected Areas *(n =152)*		Non-Affected Areas *(n=152)*		χ^2	p
	N	%	N	%		
Obtaining information from TV or radio						
Yes	152	100	145	95.4	Fisher's	.015**
No	0	0	7	4.6	Exact	
Participating in drills or simulations related to disaster						
Yes	151	99.3	53	34.9	Fisher's	<0.001
No	1	0 .7	99	65.1	Exact	
Have direct tsunami experience						
Yes	152	100	45	29.6	Fisher's	<0.001
No	0	0	107	70.4	Exact	
Perceived likelihood and ability to cope with the impact of a tsunami event:						
Tsunami is likely to occur in the near future						
Yes	76	50	43	28.3	15.04	<0.001
No	76	50	109	71.7		

Characteristics	Affected Areas *(n =152)*		Non-Affected Areas *(n=152)*		χ^2	p
	N	%	N	%		
Tsunami is likely to occur in the living area						
Yes	98	64.5	93	61.2	.22	.63*
No	54	35.5	59	38.8		
The local authorities have good enough preparation to respond to the possibility of a tsunami impact						
Yes	151	99.3	67	44.1	Fisher's	<0.001
No	1	0 .7	85	55.9	Exact	

Level of tsunami preparedness of people living in affected areas

The total mean score of the tsunami preparedness of people living in tsunami affected areas was at a moderate level (M = 2.56, SD = 1.27). Knowledge was at a high level (M = 3.03, SD = 2.66), and the mean scores of other variables of tsunami preparedness were at a moderate level: individual emergency planning (M = 2.32, SD = .51), and resources mobilization capacity (M= 2.35, SD = .64) (Table 3).

Mean scores of knowledge preparedness regarding sources of information for tsunami warnings (M=3.17, SD=.35) and existing warning systems (M=3.37, SD=.64) were at a high level. The other variables were at a moderate level including knowledge of the nature of a tsunami (M=1.91, SD=.35), response when

signs of a tsunami are detected (M=2.45, SD=.60), and basic preparedness for emergency (M=2.48, SD=.63) (Table 4).

Mean scores of individual emergency planning regarding preparing disaster supplies kit items (M=2.81, SD=.45) were at a high level. Other variables including activities to save oneself from a tsunami (M= 1.95, SD=1.07) was at a moderate level, and safety skills (M=.68, SD=.67) was at a low level (Table 5).

Mean scores of resources mobilization capacity in preparing to seek help from significant others (M=2.79, SD=.83) was at a high level. And preparing oneself for the rehabilitation period (M=2.06, SD=.65) was at a moderate level (Table 6).

Level of tsunami preparedness of people living in non-affected areas

The total mean score of the tsunami preparedness of people living in non-affected areas was at a moderate level (M = 1.67, SD = .88). All tsunami preparedness variables were at a moderate level with the mean scores ranging from 1.42 to 1.9. The item with the highest level was knowledge (M = 1.9, SD = .82) (Table 3).

Mean scores of knowledge preparedness regarding sources of information for response when signs of the tsunami are detected (M=2.16, SD=1), and basic preparedness for emergency (M=1.82, SD=.1.09), tsunami warnings (M=1.96, SD=.93) and existing warning systems (M=1.55, SD=1.10) were at a moderate level. Knowledge of the nature of a tsunami (M=1.11, SD=.58) was at a low level (Table 4).

Mean scores of individual emergency planning regarding preparing a disaster supplies kit (M=1.62, SD=.98) was at a moderate level. The other sub variable, activities to save oneself from a tsunami (M= 1.24, SD=1.05) and safety

skilla (M=.88, SD=.93) were at a low level (Table 5). Mean scores of resources mobilization capacity in preparing oneself for the rehabilitation period (M=1.51, SD=.98) and preparing to seek help from significant others (M=1.94, SD=1.06) were at a moderate levels (Table 6).

The difference of the tsunami preparedness between the people living in affected and non-affected areas in Aceh Province, Indonesia

The differences of tsunami preparedness between people living in affected and non-affected areas was examined by inferential statistics, independent t-test and Mann-Whitney U test if the assumptions for an independent t-test were not satisfied. Independent t-test was used to examine the equality variables of tsunami preparedness that met the assumptions of homogeneity of variance. The assumptions of an independent t-test were examined.

Variables of tsunami preparedness including knowledge and resource mobilization capacity total mean scores, and almost all sub-variables of tsunami preparedness between people living in affected and non-affected areas were normally distributed, and these were accepted for further analysis to obtain the results of independent t-test. Except for individual emergency planning total mean scores between people living in affected and non-affected areas, the Mann-Whitney U was the analysis technique of choice. Mann-Whitney U test was used to examine the equality variables of tsunami preparedness that were not normally distributed including the sub-variables of knowledge such as “knowledge of existing warning systems”, and two individual emergency planning sub-variables: “activities that the people do to save themselves from tsunami events,” and “safety skills”. The results indicated that the mean scores of knowledge, individual emergency planning and

resource mobilization capacity of people living in affected areas were statistically significantly higher than people living in non-affected area (p<.05) (Table 3).

Table 3

Comparison of Tsunami Preparedness between People Living in Affected Areas and Non-Affected Areas (N=304)

Variables	Affected Areas *(n =152)*				Non-Affected Areas *(n=152)*				*Value*	*p*
	Mdn	M	SD	Level	Mdn	M	SD	Level		
1. Knowledge		3.03	0.26	High		1.9	0.82	Moderate	15.93^{t}	<0.001
2. Individual Emergency Planning	2.41	2.32	0.51	Moderate	1.35	1.42	0.9	Moderate	-8.88^{U}	<0.001
3. Resources Mobilization Capacity		2.35	0.64	Moderate		1.68	0.92	Moderate	7.35^{t}	<0.001

Note. *t*= Computed value of *t* test; *U*=Computed value of Mann-Whitney U test.

People living in affected areas had mean scores of knowledge preparedness regarding the nature of a tsunami, responses to signs of a tsunami, basic preparedness for emergency, the sources of the information for tsunami warnings, and existing warning systems significantly higher than that of people living in non-affected area (p<.05) (Table 4).

There were significant differences in mean scores of sub-variables of individual emergency planning between people living in affected and non-affected areas including disaster supply kit items and activities to save oneself from a tsunami (Table 5). People living in the affected area reported significantly higher mean scores than people living in the non-affected area. And there were not significant differences in mean scores of sub-variables of individual emergency planning, particularly for

safety skills, between people living in affected and non-affected areas. The mean scores were low in both study areas ($p<.05$) (Table 5).

Table 5

Comparison of Individual Emergency Planning Preparedness between People Living in Affected Areas and Non-Affected Areas (N=304)

Variables	Affected Areas (*n* =152)				Non-Affected Areas (*n*=152)				*Value*	*p*
	Mdn	*M*	*SD*	*Level*	*Mdn*	*M*	*SD*	*Level*		
1. Disaster supplies kits		2.81	0.45	High		1.62	0.98	Moderate	13.59*t*	<0.001
2. Activities to save oneself from a tsunami	2.12	1.95	1.07	Moderate	1	1.24	1.05	Low	-5.64*U*	<0.001
3. Safety skills	0.5	0.68	0.67	Low	0.67	0.88	0.93	Low	-1.11*U*	.266

Note. *t*= Computed value of *t* test; *U*=Computed value of Mann-Whitney U test.

People living in affected areas had mean scores of resource mobilization capacity, either regarding preparing oneself for the rehabilitation period and preparing to seek help from significant others, significantly higher than those of people living in non-affected areas (Table 6).

Table 6

Comparison of Resources Mobilization Capacity Preparedness between People Living in Affected Areas and Non-Affected Areas (N=304)

Resources Mobilization Capacity	Affected Areas (*n =152*)			Non-Affected Areas (*n=152*)			t	p
	M	SD	Level	M	SD	Level		
1. Preparing oneself for the rehabilitation period	2.06	0.65	Moderate	1.51	0.98	Moderate	5.77	<0.001
2. Preparing to seek help from significant others	2.79	0.83	High	1.94	1.06	Moderate	7.75	<0.001

For additional analysis, a Mann-Whitney U test was used to measure the differences in tsunami preparedness between people that participated and those did not participate in drills or simulations related to disaster. The results showed that there were significant differences in tsunami preparedness between the two groups towards participating in drills or simulations related to disaster (Table 7).

Table 7

Degree of Tsunami Preparedness between People In Participating in Drills or Simulations Related to Disaster (N=304)

Participating in drill or simulation related to disaster	N	Mean Rank	Sum of Ranks	z	p
Yes	204	189.59	38675.50	-10.511	<0.001
No	100	76.85	7684.50		

Discussion

This study aimed to examine and compare the tsunami preparedness of people living in affected and non-affected areas in Aceh Province of Indonesia. This study focused on three variables of tsunami preparedness including knowledge, individual emergency planning and resource mobilization capacity. A total of 304 subjects from two coastal areas, including the affected area, Johan Pahlawan Sub-district, Aceh Barat District (152) and the non-affected area, Tapaktuan Sub-district, Aceh Selatan District (152), participated in this study.

Age and gender in this study were controlled. The difference in the level of preparedness for these characteristics would be a result of previous experience of a tsunami (Corps & FEMA, 2009; Guha-Sapir, Parry, Degomme, Joshi, & Arnold, 2006; Larsson, & Enander, 1997).

The findings are discussed following three main parts: 1) the levels of tsunami preparedness of people living in affected areas, 2) the level of tsunami preparedness of people living in non-affected areas, and 3) the differences of the tsunami preparedness among the people living in affected and non-affected areas.

The levels of tsunami preparedness of people living in affected areas

Overall, the levels of tsunami preparedness of people living in an affected area were at a moderate level with total mean scores of 2.56 (SD=.47) except knowledge that was at a high level with a mean score of 3.03 (SD=.26) (Table 3). The findings indicated that people living in areas affected by the 2004 tsunami had good knowledge to prepare themselves to face a tsunami event. Two sub-variables of knowledge were knowledge about the source of information for tsunami warnings and about existing tsunami warning systems and were at a high level with mean scores of

3.17 (SD=.35) and 3.37 (SD=.64) respectively. The level of knowledge was higher perhaps due to the fact that after the 2004 tsunami, the importance of tsunami early warning systems and the process of disseminating early warning systems had been realized and that it was urgent that the warning systems be installed in the Indian Ocean (Sagala & Okada, 2007).

The knowledge of the nature of a tsunami and responses to signs of a tsunami were at moderate level with mean score of 1.91 (SD=.35) and 2.45 (SD=.63) respectively. All respondents in the affected area reported a direct involvement in the 2004 tsunami had given them a chance to identify the nature of tsunami and the appropriate responses when signs of a tsunami are detected such as evacuation to higher land (ISDR/UNESCO, 2006). In addition, post the 2004 tsunami, the people living in the affected area obtained a large amount of aid from international organizations and aid agencies in organizing and coordinating relief efforts (Athukorala, & Resosudarmo, 2005). The aid was not only material support but also educational support about disaster preparedness and response including training or simulation drills related to tsunami disasters and knowledge in basic preparedness for emergency, which was at a moderate level (M=2.48, SD=.63). This support could have increased their knowledge related to preparedness besides the other common sources of information such as reading material related to disaster from books or the mass media and TV or radio.

The higher level of knowledge about preparedness did not mean that there was a high level of preparedness, as there are many other high priority problems in people's lives (Samant, Tobin, & Tucker, 2008). In this study, emergency planning

and resource mobilization capacity were at moderate levels with mean scores of 2.32 (SD=.51) and 2.35 (SD=.64), respectively.

Disaster supply kit items that the people have implemented because of the possibility of an occurrence of tsunami events were at a high level (M=2.81, SD=.45) because most people living in the affected area received help including a disaster emergency kit from the donor organizations (ISDR/UNESCO, 2006). Even in the affected area, which was directly impacted by the natural disaster and there was high perceived likelihood of a tsunami event occurring in the area, the planning related activities to save oneself from tsunami events still was at a moderate level (M=1.95,SD=1.07). The sociodemographic characteristics may influence this level particularly their minimum monthly income of between 500,000 IDR – 1,000,000 IDR or (50 USD-100 USD) (52.6%) and kind of the common occupation, businessman/businesswoman (42.1%). The low income may result in people giving priority to work. Thus there is limited capability for them to prepare the planning and it may not be their priority due to other competing demands on the people's lives (Burgelt, Johnston, & Paton, 2009). The findings of the study are consistent with the study of Corps & FEMA (2009), who found that individuals with lower incomes were less likely to have taken preparedness measures and indicated an increased need for help in evacuation.

Moreover, the results of this study revealed that safety skills related to disaster preparedness were at a low level. This might be because most subjects in this area perceived that the local authorities had good enough preparation to respond to the possibility of a tsunami impact (99.3%). Furthermore, most of the subjects had junior high school education (40,8%), and they did not find first aid and CPR skills easy to

understand if the responsible institutions such as local emergency services did not give them enough support. A study reported the trainings related to disaster preparedness were not conducted regularly in some affected areas, the training provided by official sources took place a few years ago and the people who attended the training did not have enough knowledge and capability to distribute the information due to limited time and availability of the information during the training (Echevarria, Bessuges, & Basuki, 2002).

Preparing oneself for the rehabilitation period as a part of resource mobilization capacity preparedness in the affected area was at a moderate level. Saving was one of the choices taken by the people because saving is useful not only as an alternative to keep money but can be a preparation for urgent needs of money (ISDR/UNESCO, 2006). Insurance was not held by a large number of people possibly because most of them did not have a high enough monthly income (52.6%).

In terms of preparing to seek help from significant others, many individuals seek help from neighborhood or friends**.** The support from neighborhood/friends would be material or psychological support that is very useful for them to cope with the situation post disaster. These choices selected by the people living in that area, the disaster caused them separate from their relatives. Then, the communities' agency can be an alternative choice for the people to meet their needs (ESCAP, 2008).

The level of tsunami preparedness of people living in non-affected areas

The level of tsunami preparedness of people living in the non-affected area was at a moderate level with a total mean score of 1.67 (SD=.88) including all of

the parameters (Table 3). Although this area was not affected by the 2004 tsunami, they recognized that their living area is at risk of a future event. The indirect experience with the 2004 tsunami to increase their awareness to be prepared, however, was not at a maximum level.

Level of knowledge of this group was at a moderate level (M=1.9, SD=.82), which almost all of the knowledge components had mean scores at a moderate level except knowledge about the nature of a tsunami, which was at a low level (M=1.11, SD=.58) (Table 4). Most of the subjects reported that they obtained the information for disaster preparedness from public media that was easy to get access to, such as TV or radio (95.4%) as the most common sources. Other sources of information were books and similar items disaster related material (83.6%). All of the subjects did not have direct tsunami experience (70.4%) which resulted in knowledge of the nature of a tsunami being at low level.

Although most of the subjects perceived that risk, earthquakes and tsunamis could happen at any time in their living area (61.2%) (Table 2), it was not enough to increase their awareness of preparation for a future disaster. For individual emergency planning, the plan related to “activities to save oneself from a tsunami” and “safety skills“were at a low level. Limited information and a lack of support from official sources made the indirect disaster experience did not not compelling enough to encourage them to get enough information and training about skills related to disaster preparedness. This is particularly so in cultures where fire extinguishers are not commonly used (Appendix C). Most of the subjects (55.9%) reported that the local authorities do not have good enough preparation to respond to the possibility of a tsunami impact.

Disaster supply kit items that the people have prepared with awareness toward the possibility of a tsunami occurrence was at a moderate level. Most of the subjects already implemented it for the items that were easy to practice without spending significant money and time such as important and valuable documents. In addition, these activities had already been implemented by the people before the tsunami event, because the burning of homes of villagers accused of assisting rebels was one of a common violent acts during the previous 30-year civil conflict (Aspinal, 2006). The conflict was resolved with the signing of a memorandum of understanding in Helsinki on 15 August 2005 between the Free Aceh Movement and the Indonesian Government, less than one year after the tsunami event (McGibbon, 2006). The impact of the conflict event, where the people have great chance to lose valuable things such as important documents, encouraged them to prepare for items in a supply kit (Appendix C). One study found common items that were implemented in the supply kit were those that had less cost and took less time (ISDR/UNESCO, 2006). The findings show that 36.2% of the subjects in the non-affected area had an income of less than about 500,000 IDR per month which was considered not enough (Table 2).

For preparation of the subjects for resources mobilization capacity, both of the sub-items were at a moderate level. An “open safety place” that is higher inland and a “religious-practice place for example mosque” were naturally occurring surrounding their living area and could be used as temporally shelters even though the facility of mass sheltering was not provided. For other alternative places to stay if a tsunami occurs, mosques were the most common alternative location to be used as a tsunami evacuation site (Appendix C). Mosques, are the center of each village in Islamic society where people gather daily for worship and other purposes. It was

evident that mosques in Aceh noticeably survived the earthquake and the tsunami with only minor damage due to constructions that provide space for water flow. This may be the reason why most Muslims in Sri Langka, the Maldives and Indonesia selected “a temple or mosque” as the optimal location for tsunami evacuation besides reflecting their high level of trust in religious facilities (Kurita, Arakida & Colombage, 2007).

This plan they learned from local knowledge and folk stories and observations of the impacts of the 2004 tsunami event, which have greatly contributed to the subjects' understandings of tsunami flooding areas even along a few kilometers of coastline. As seen during the last tsunami event in 2004, traditional wisdom in the oral histories and songs of local people of Simeulue Island saved many of their lives when so many others perished (McAdoo, Dengler, Prasetya, & Titov, 2006).

As a part of community villages, the people living in that area did not have difficulty in finding the other persons that could be called upon for help where this preparation is moderate level, because they still have a certain culture such as mutual cooperation and high relative relationship (ISDR/UNESCO, 2006). These social networks are effective media to encourage information related to preparedness to disseminate among them and also do some preparation together.

The difference of the tsunami preparedness among the people living in affected and non-affected areas

The results of the study indicate that the mean scores of knowledge, individual emergency planning and resource mobilization capacity of people living in affected areas were statistically significantly higher than people living in non-affected areas ($p<.05$) (Table 5). Particularly, education and income influence the capability of

the people in preparedness and explains the differences in level of tsunami preparedness in affected and non-affected areas. The findings are consistent with the study of Eisenman et al. (2006) that reported the impacts of a future disaster on an individual would likely vary due to personal experience and pre-event sociodemographic differences.

Direct and indirect experience provided significant differences in preparedness. Those experiences increase awareness of vulnerabilities to tsunami events and can motivate individuals to prepare. However, although both groups reported a tsunami is likely to occur in their living area, almost all of the subjects in the non-affected area and half of the subjects in affected area perceived that a tsunami is not likely to occur in the near future time. A study that was conducted in surrounding tsunami-affected areas, explains the subjects, particularly Muslims, have the opinion that a tsunami will not occur again as long as the people do not do actions that are against religious norms (ISDR/UNESCO, 2006).

Knowledge of tsunami preparedness of people living in the affected area was higher than the people living in the non-affected area. Most of the people living in the affected area had already obtained knowledge through the personal impact of the tsunami imposed on them. And, in non-affected area, the people received and observed the information about what they should know and do in order to minimize impact through the globally-networked media and the 2004 tsunami which occurred in their close neighborhood. A study conducted by ISDR/UNESCO (2006), said that the 2004 tsunami experience made most of the subjects in the affected area able to identify the warning signs of a tsunami, made them able to discern safe places for shelter and received aid from donor organizations that provided other important knowledge about

tsunami preparedness including knowledge in basic preparedness for emergency, existing warning systems and sources of the information for tsunami warnings. The people living in non-affected area received this kind of knowledge from TV or radio, reading materials related to disaster such as leaflets, books or mass media, which proved to be effective media to help disseminate information. In this study, the significant differences in mean scores for knowledge preparedness (t=15.93, p=.00) might be due to sources of information about tsunami preparedness. This is supported by another study where the people's awareness about emergency management comes from spontaneous knowledge acquired from life's experiences rather than from an official/technical source (Echevarria, Bessuges, & Basuki, 2002).

Regarding individual emergency planning, the subjects living in the affected area have higher mean scores to prepare some activities particularly activities to save oneself from tsunami events. A previous study showed the people living in affected areas can identify safe places in case tsunami occurs because the previous tsunami event did not reach that place (ISDR/UNESCO, 2006). In addition, programs from outside, such non-governmental organizations and emergency rescue services, that came after the disaster supported those that were living in affected areas to do some activities related to emergency planning for future events (ESCAP, 2008). According to Corps & FEMA (2009), “Individuals who had volunteered to help in their community during a disaster were more likely to have disaster supplies and a household plan in place, were more willing to prepare for disaster, and had more confidence in their abilities to prepare for disasters” (p.6).

The indirect tsunami experience caused the people living in non-affected areas to not obtain aid directly, and there is not enough preparation for emergency

planning, particularly activities to save oneself from a tsunami event, besides a lack of effort from local authorities. Most of the people have implemented some items in an emergency kit, because of influences since before the tsunami event, and their awareness had been increasing because of the impact of violent acts that occurred during the civil conflict such as the burning of homes of villagers accused of assisting rebels beginning in the mid-1970s and ending on 15 August 2005 (McGibbon, 2006).

The people living in affected areas have a higher mean score to prepare two items that need to be conducted, particularly in preparing to seek help from significant others. A previous study supports this finding, where the people in a high risk area are more likely to have many relatives or friend that are ready to help if a disaster approaches (ISDR/UNESCO, 2006). The preparedness of people living in the non-affected area may be influenced by a culture such as high relative relationships and mutual cooperation that are effective in encouraging the people to help each other. Furthermore, community agencies can be one alternative choice post-disaster, where a lot of community agencies are increasing their awareness to exist as a helper and are ready to help the people in need. For example in Padang, which is a tsunami-vulnerable area, there already exists a group called KOGAMI (an acronym for Tsunami Alert Community, in Indonesia), to help prepare the residents that live in that area (Samant, Tobin, & Tucker, 2008).

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

A descriptive comparative design was employed in this study to describe the level of tsunami disaster preparedness of people who live in affected and non-affected coastal areas of Indonesia and compare the tsunami disaster preparedness of these two groups of people. The affected and non-affected populations in this study were the people living in coastal areas of Aceh Province. The affected area in this study was Johan Pahlawan Sub-district, Aceh Barat District in which 15 villages were selected out of the 21 villages. Then Tapaktuan Sub-district, South Aceh District as a non-affected area, 8 villages were selected out of the 15 villages. 152 subjects of the study from each area, who met the inclusion criteria, were recruited by a stratified sampling method. This method was used to represent intervening factors such as age and gender of the group equally because some previous studies found these factors have a positive impact on people's preparedness. Data were collected between January to February 2010. Quantitative data were analyzed by using descriptive statistics, and independent t-tests.

Conclusion

The level of tsunami preparedness of people living in both study areas was at a moderate level. Regarding the mean scores for each variable of tsunami preparedness, the scores for people living in an affected area were significantly higher than those of people living in a non-affected area for knowledge, individual emergency planning and resource mobilization ($p<.05$). Except for the sub-variable

individual emergency planning, safety skills were found to be not significantly different. This was probably caused by the level of education and the lack of information provided by the official sources in affected areas, and not commonly in use in non-affected area resulted this item was at low level in both study area ($p>.05$). Direct disaster experience and indirect disaster experience can be a significant motivator that influences preparedness besides aid from outside which supports the people by creating preparedness for them. In this study, the direct and indirect experience provided differences in people's preparedness. Those experiences increase their awareness of vulnerabilities to tsunami events and can motivate individuals to prepare, however, although both of them reported a tsunami is likely to occur in the area, they said it is not likely to occur in near future. In addition, according to the sociodemographic characteristics 5 years post-tsunami, education and income particularly influence the capability of people's preparedness and helps explain the differing levels of tsunami preparedness in both study areas. There are differences for level of education, occupation, monthly income, past tsunami experience, perceived likelihood that a tsunami will occur in near future, the perceived ability of local authorities to prepare to respond to the possibility of a tsunami impact, and sources of information about people’s individual preparedness when people living in affected and non-affected areas are compared. Marital status and perceived likelihood of a tsunami occurring in the living area were found to not be statistically significantly different.

Strengths and limitations

This study was a descriptive comparative design, with a total of 304 subjects having been recruited using a multistage-stratified random sampling method from both of the study areas along the west coast of Aceh Province. Multistage-stratified random sampling was used to randomly select the setting thorough several stages and draw a sample of persons in each setting in which the researcher knows some of the variables in the population that are critical to achieving representativeness. The variables used in this study were age and gender. This study used the Individual's Tsunami Preparedness Questionnaire (ITPQ) as developed by the researcher based on related literature that standard used for evaluating tsunami preparedness such as ISDR/UNESCO. The ITPQ had high a content validity index (CVI) for English version and test-retest reliability coefficient for the Indonesian version.

In this study, the researcher only measured general information about the people's familiarity with evacuation plans, sources of warnings and existing warning systems. This then limits the results of the study to be generalized to the same level of people's understanding about the meaning of the basic information the public needs to know about tsunami evacuation and warning systems. And the researcher did not investigate how individuals keep maintaining their preparedness, because some items such as food that are perishable have an expiry date that needs to be checked and replaced regularly.

Implications and Recommendations

Nursing practice

The findings of this study show the tsunami preparedness of people living in affected and non-affected areas are at moderate levels, indicating that the tsunami preparedness is insufficient. Disaster preparedness minimizes the adverse effects of a hazard through effective precautionary actions. This is necessary to ensure appropriate and effective assistance to help people be more prepared following a disaster. The use of various media as sources of information that are available in the community particularly in non-affected areas including social networks such as households, neighborhoods, the workplace, schools, and faith-based communities and local wisdom are effective media to disseminate information related to disaster preparedness. The people should also be encouraged by nursing practitioners to be involved in the planning and mobilization of community resources preparation that are have sustainable and consistent. Furthermore, public awareness and education should also be seen as effective media for conducting long term disaster mitigation.

Nursing research

The study has recommendations for further related research. This study was conducted to investigate the level of tsunami experience of people living in affected and non-affected areas after the tsunami on December 26, 2004 at individual level. In the future, study needs to be conducted to investigate the tsunami preparedness of groups of people that have significant roles in social networks, such as neighborhood groups that can work with the community to make regulations more favorable and advocate for government agencies to be better prepared for disaster.

REFERENCES

Aazman. (2009). Padang earthquake: Death toll rises to 603. *Bernama News*. Retrieved December 1, 2009, from http://www.mmail.com.my/content/14798-padang-earthquake-death-toll-rises-603.

Aspinal, E. (2006). Violance and identity formation in Aceh under Indonesian rule. in A.Reid (Ed.), *Verandah of violance, the background to the Aceh problem* (149-176). Singapore: Singapore University Press.

Athukorala, P., & Resosudarmo, B. P. (2005). *The Indian Ocean Tsunami: economic impact, disaster management and lesson.* Paper presented at the Asean Economic Panel Conference, Keio University, Tokyo. Retrieved at November 9, 2009, from http://rspas.anu.edu.au/economics/publish/papers/wp2005/wp-econ-2005-05.

Bissell, R. A., Pinet, L., Nelson, M., & Levy, M. (2004). Evidence of the effectiveness of health sector preparedness in disaster response; the example of four earthquake. *Family Community Health*, 27, 193-203.

Blendon, R. J., Benson, J. M., Desroches, C. M., Lyon-Daniel, K., Mitchell, E. W., & Pollard, W. E. (2007). The public's preparedness for hurricanes in four affected regions. *Public Health Report, 122*. Retrieved at November 9, 2009, from www.ncbi.nlm.nih.gov/pubmed/17357359.

Burgelt, P. T., Johnston, D. M., & Paton, D. (2009). *Factors and process influencing individual and community preparedness for pandemic outbreak in New Zealand*. New Zealand: Institute of Geological and Nuclear Sciences.

Brislin, R.W. (1970). Back-translation for cross-cultural research. *Journal of Cross Cultural Psychology,* 1, 185-216.

Burn, N., & Grove, S., K. (2001). The practice of nursing research: conduct, critique, & utilization (4 ed.). Philadelphia PA: W.B. Saunders Company.

Clark, M. J. (2008). *Community health nursing advocacy for population health* (5 ed.). New Jersey: Prentice Hall.

Commission, I. O. (2008). *Tsunami Glossary 2008*. IOC Technical Series, 85. (English) Paris, UNESCO.

Corps, & FEMA. (2009). *Personal preparedness in America: finding from the 2009 citizen corps national survey august 2009* (Summary Sheet). America.

Covington, J., & Simpson, D. M. (2006). An overview of disaster preparedness literature: building blocks for an applied bay area template. Retrieved at August 20, 2009 from Center for hazards research and policy development mitigating disaster through research: http://hazardcenter.louisville.edu.

Davis, M. (2007). Coastal marine unprepared for tsunami, researcher warns. Retrieved September 5, 2008, from http://podcast.medianext.com/stations/kcbs/media/

Dekens, J. (2007a). *Herders of chitral: the lost messenger? local knowledge on disaster preparedness in Chitral district, Pakistan*. Nepal: International Centre for Integrated Mountain Development (ICIMOD). Retrieved August, 7 2009, from http://www.proventionconsortium.org/themes/default/pdfs/CRA.

Dekens, J. (2007b). *Local knowledge for disaster preparedness: a literature review*. Nepal: International Centre for Integrated Mountain Development (ICIMOD). Retrieved August, 7 2009, from http://www.preventionweb.net/files/2693.

Echevarria, J.M., Bessuges, P., & Basuki, B. (2002). *Assessment on emergency preparedness in disaster situation integrated approach on nationwide preparedness capacities and capabilities within the Republic of Indonesia* (Assessment Report).Jakarta: WHO/OCHA.

Eisenman, D. P., Wold, C., Fielding, J., Long, A., Setoadji, C., Hickey, S., et al. (2006). Differences in individual-level terrorism preparedness in Los Angeles country. *American Journal of Preventive Medicine*, 30. Retrieved at November 9, 2009, from www.ncbi.nlm.nih.gov/pubmed/16414417.

ESCAP, U. N. (2008). *Enhancing community resilience to natural disaster: Lives of children and youth in Aceh.* Bangkok: United Nations Economic and Social Commision for Asia and the Pacific.

FEMA. (2004). Are you ready? an in-depth guide to citizen preparedness. Retrieved 25 April, 2009, from www.fema.gov/areyouready.

Gregg, Houghton, Paton, Swanson, & Johnston. (2004). Community Preparedness for lava flows from Mauna Loa and Hualalai volcanoes, Kona, Hawai'i. *Bull Volcanol*, 66, 531-540.

Guha-Sapir, D., Parry, L. V., Degomme, O., Joshi, P. C., & Arnold, J. P. S. (2006). *Risk factor for mortality and injury: post-tsunami epidemiological findings from Tamil Nadu*. Belgium: Centre for Research on the Epidemiology of Disasters (CRED) School of Public Health, Chatholic University of Louvain.

lemura, H., Takahashi, Y., Pradono, M. H., Sukamdo, P., & Kurniawan, R. (2006). Earthquake and tsunami questionnaires in Banda Aceh and surrounding areas. *Disaster Prevention and Management,* 15, 21-30.

ISDR/UNESCO. 2006. *LIPI-UNESCO/ISDR Report a study to measure community preparedness in facing earthquake and tsunami disasters (Indonesian version).*Jakarta.

Johnston, D., Paton, D., Crawford, G. L., Ronan, K., Houghton, B., & Burgelt, P. (2005). Measuring tsunami preparedness in Coastal Washington, United States. *Natural Hazards,* 35, 173-184.

Keeney, G. B. (2004). Disaster preparedness: What do we do now? *The American College of Nurse-Midwives,* 49, 2-6.

Kelman, I. (2006). Warning for the 26 December 2004 tsunamis. *Disaster Prevention and Management,* 15, 178-189.

Klien, R. J. T., Nicholls, R. J., & Thomalla, F. (2004). Resilience to natural hazards: How useful is this concepts? *Environmental Hazards,* 5, 35-45.

Kurita, T., Arakida, M., & Colombage, S. R. N. (2007). Regional characteristics of tsunami risk perception among the tsunami affected countries in the Indian Ocean. *Journal of Natural Disaster Science,* 29, 29-38.

Larsson, G., & Enander, A., (1997). Preparing for disaster: public attitudes and actions. *Journal of Disaster Prevention and Management,* 6, 11-21.

Matsuda, Y., & Okada, N. (2006a). Community diagnosis for sustainable disaster preparedness. *Journal of Natural Diaster Science,* 28, 25-33.

Matsuda, Y., & Okada, N. (2006b). Relevance analysis between indirect disaster experiences and household earthquake preparedness. *Annuals of Disaster Prevention Research Institute, Kyoto University,* 49B, 155-165.

McAdoo, B., Dengler, L., Prasetya, G., & Titov, V. (2006). Smong : how an oral history saved thousands on Indonesia's Simeulu island during the December 2004 and March 2005 Tsunamis *Earthquake Spectra*, 22, 661-669.

McGibbon, R. (2006). Local leadership and the Aceh conflict in A.Reid (Ed.), *Verandah of violance, the background to the Aceh problem* (149-176). Singapore: Singapore University Press.

Miceli, R., Sotgiu, I., & Settanni, M. (2007). Disaster preparedness and perception of flood risk : a study in an alpine valley in Italy. *Environment Psychology,* 28. Retrieved at November 9, 2009, from http://www.sciencedirect.com/science.

Mishra, S., & Suar, D. (2007). Do lessons people learn determine disaster cognition and preparedness?. *Psychology and Developing Societies*, 19, 143-159.

Muhari, A., Diposaptono, S., & Imamura, F. (2007). Toward an integrated tsunami disaster mitigation: lesson learned from previous tsunami event in Indonesia. *Journal of Natural Disaster Science,* 29, 13-19.

NOAA, USGS, FEMA, NSF, Alaska, California, et al. (2001). *Designing for tsunamis : seven principles for planning and designing for tsunami hazards*. United State: National Tsunami Hazard Mitigation Program.

Obura, D. (2006). Impact of the 26 December 2004 tsunami in Eastern Africa. *Ocean & Coastal Management*, 49, 873-888.

OCHA (2005). *OCHA situation report no.29 earthquake and tsunami Indonesia, Sri Langka, Maldives, & Thailand*. Geneva.

Oxfam. (2007). *Oxfam humanitarian during disaster: The case of the tsunami in India March 2007*. India: Oxfam International.

Paton, D., Houghton, B. F., Gregg, C. E., A.Gill, D., Liesel.A.Ritchie, McIvor, D., et al. (2008). Managing tsunami risk in coastal communities: Identifying predictors of preparedness. *The Australian Journal of Emergency Management,* 23. Retrieved at November 9, 2009, from http://www.ema.gov.au/www/emaweb.

Pomeroy, R. S., Ratner, B. D., Hall, S. J., Pimoljinda, J., & Vivekanandan, V. (2006). Coping with disaster: rehabilitating coastal livelihoods and communities. *Marine Policy,* 30, 786-793.

Post, J., Zossederi, K., Strunzi, G., Birkmann, J., Gebert, N., Setiadi N.,et al. (2007). Risk and vulnerability assessment to tsunami and coastal hazards in Indonesia: Conceptual framework and indicator development. *Proceedings of the International Symposium on Disaster in Indonesia: Problems and Solutions. Padang,* July 2007.

Province, Health Department of Nanggroe Aceh Darussalam (2005). Location distribution of foreign volunteer: Health Department of Nanggroe Aceh Darussalam Province.

Queensland, E. M., Service, T. D. o. E., & Services, T. S. E. (2009). Information on preparing for emergency. Retrieved August, 7 2009, from www.emergency.qld.gov.au.

Rodriguez, H., Wachtendorf, T., Kendra, J., & Trainor, J. (2006). A Snapshot of the 2004 Indian Ocean tsunami : societal impacts and consequences. *Disaster Prevention and Management,* 15, 163-177.

Ronan, K. R., Johnston, D. M., Daly, M., & Fairley, R. (2001). School children's risk perception and preparedness : a hazards education survey. *The Australian Journal of Disaster and Trauma Studies.*

Ross, C.E., & Wu, C. (1995). The link between education and health. *American Sociological Review*, 60, 715-745.

Sagala, S., & Okada, N. (2007). Managing early warning system for tsunami prone communities: Preliminary analysis of the need for participatory approach (PRA) *Annuals of Disaster Prevention Research Institute, Kyoto University,* 50B, 195-203.

Samant, L. D., Tobin, L. T., & Tucker, B. (2008). *Preparing your community for tsunami : A guidebook for local advocates*: GeoHazards International. Retrived April 15, 2009 from http:// www.geohaz.org/contents/projects/tsunamiguide.html.

Subagyono, K., Sugiharto, B., & Jaya, B. (2005). *Rehabilitation strategies of the tsunami affected agricultural areas in Nanggroe Aceh Darussalam, Indonesia*. Paper presented at the Salt-affected Soil from Sea Water Intrusion: Strategies for Rehabilitation and Management Regional Workshop. Retrieved July, 2 2009 from http://www.cgiar.org/tsunami/publications/files/rehabilitationstrategies.pdf.

Spittal, M. J., Siegert, R. j., McClure, J., & Walkey, F. H. (2005). Optimistic bias in relation to preparedness for earthquakes. *The Australian Journal of Disaster and Trauma Studies.* Retrieved at November 9, 2009, from http://www.massey.ac.nz/~trauma/issues/2005-1/spittal.htm.

Tomabechi, N., Keiwkarnka, B., & Chompikul, J. (2007). *Flood disaster preparedness behavior among heads of households in Rural Muang District, Trang Province of Thailand*. Bangkok: Institute for Health Development, Mahidol University, Bangkok.

USGS. (2005). Surviving a tsunami-lesson from Chile, Hawai, and Japan. Retrieved October, 10 2009, from http://pubs.usgs.gov/circ/c1187.

USGS/NEIC. (2009). Everything else you want to know about this earthquake and tsunami. Retrieved 14 February 2009 from http://earthquake.usgs.gov/eqcenter.

Webb, T. (2005). *Review of New Zealand's preparedness for tsunami hazard, comparison to risk and recommendations for treatment*. New Zealand.

WHO. (2005). WHO situation report 13: World Health Organization.

Wood, N. J., Burton, C. G., & Cutter, S. L. (2009). Community variation in social vulnerability to Cascadia-related tsunamis in the U.S. Pacific Northwest. [Original Paper]. *Nat Hazards*.

APPENDICES

APPENDIX A

Informed Consent

Dear participant,

My name is Rachmalia. I am a master student of the Faculty of Nursing, Prince of Songkla University, Thailand. I am conducting a research project for my master degree study. The purpose of this study to describe and compare the level of tsunami disaster preparedness of people who live in tsunami affected and non-tsunami affected areas. The Institutional Review Board of Prince Songkla University, Thailand has approved this study. If you agree to participate in this study, you will be asked to complete two parts of questionnaires. It will take time around 30 – 45 minutes. Please do not hesitate to ask me if you find any difficulties in understanding each item. All of your answers and your personal identity will be kept confidential. All information will only be used for the purpose of this research project.

There is no risk to participate in this study. Your participation is voluntary in nature; you may withdraw from this study at any time even.There is no penalty or any effect of your decision on refusing to participate in this study.

Signature of researcher

……

Rachmalia

If you have confirmation or have question please do not hesitate to contact me or my thesis advisor (Assist.Prof.Dr. Urai Hattakit) at the following address:

Nursing Science Program

Faculty of Medicine,

Syiah Kuala University,

Darussalam – Banda Aceh 23111 Indonesia

Phone: +62517555255, Fax : +62517555249, Mobile : 08126942094

Email : rachma_lia@yahoo.com

Or

Assist.Prof. Dr.Urai Hatthakit

Faculty of Nursing, Prince of Songkla University

Hat Yai, Songkla, Thailand 90112

Telp : (074) 286401

Email: urai.h@psu.ac.th

Table B1 (Continued)

APPENDIX B

Instrument

Code: …….

Date: ……..

Place: …….....

Part 1: *Socio - Demographic Factors Questionnaire (SDFQ)*

Please answer by marking (√) in the space available or filling in the blank space that is appropriate for you.

1. Age…….years old
2. Gender: 1 ( ) Female 2 ( ) Male
3. Marital Status : 1 ( ) Single
   2 ( ) Married
   3 ( ) Divorced
   4 ( ) Widowed
4. Level of education: 1 ( ) No formal education
   2 ( ) Elementary school
   3 ( ) Junior high school
   4 ( ) Senior high school
   5 ( ) College or above
5. Occupation: 1 ( ) Fisherman
   2 ( ) Farmer
   3 ( ) Trader
   4 ( ) Business man

Table B1 (Continued)

5 ( ) Other, Identify….

6. Income / month : 1 ( ) ≤ 500,000 IDR

   2 ( ) 500,001 IDR - Rp 1,000,000 IDR

   3 ( ) 1,000,001 IDR - 2,000,000 IDR

   4 ( ) ≥ 2,000,001 IDR

7. Have tsunami experiences: 1 ( ) Yes 2 ( ) No

8. Source of the information of tsunami preparedness:

   a. Reading books or reading other disaster related to materials

      1 ( ) Yes 2 ( ) No

   b. Reading disaster related materials from the internet

      1 ( ) Yes 2 ( ) No

   c. Obtaining information related to disaster from TV or Radio

      1 ( ) Yes 2 ( ) No

   d. Participating in drill or simulation related to disaster

      1 ( ) Yes 2 ( ) No

9. Perceived likelihood and ability to cope with the impact of tsunami event:

   a. Tsunami is likely to occur in the near future time

      1 ( ) Yes 2 ( ) No

   b. Tsunami is likely to occur in the living area

      1 ( ) Yes 2 ( ) No

   c. The local authorities has good enough preparation to respond to the possibility of a tsunami impact

      1 ( ) Yes 2 ( ) No

Table B1 (Continued)

Part 2: *Individual's Tsunami Preparedness Questionnaire (ITPQ)*

Instruction:

Please answer all questions by putting mark (√) in the right column that is appropriate to you. There are 5 (five) possible options available; not at all; a little; somewhat; much; very much, that indicate the extent of being prepared in your tsunami preparedness:

Table B1

Individual's Tsunami Preparedness Questionnaire (ITPQ)

No	**Items**	**Extent of being prepared**				
		Not at all	**A Little**	**Some What**	**Much**	**Very Much**
	What are the extent to which you have prepared yourself to be knowledgeable in the nature of tsunami as the following items:					
1	Causes of tsunami					
2	Characteristics of tsunami					
3	Warning signs of tsunami					
4	Impacts of tsunami					
	What are the extent to which you have prepared yourself to be knowledgeable in the following responses when signs					

Table B1 (Continued)

No	Items	Extent of being prepared				
		Not at all	**A Little**	**Some What**	**Much**	**Very Much**
	of the tsunami are detected					
5	Evacuation plan to higher inland					
6	Emergency information					
7	Assemble a disaster supplies kit					
	What are the extent to which you have prepared yourself to be knowledgeable in basic emergency preparedness as the followings.					
8	Items of disaster supplies kit					
9	Process of developing emergency plan					
10	Identification of safety place for the shelter					
	What are the extent to which you have prepared yourself to be knowledgeable in existing warning system as follows.					
11	Traditional warning system, example *tambo*					
12	Local agreement warning system,					

Table B1 (Continued)

No	Items	Extent of being prepared				
		Not at all	**A Little**	**Some What**	**Much**	**Very Much**
	example radio-information					
13	National warning system, example Tsunami Early Warning System (TEWS) tower					
	What are the extent to which you have prepared yourself to be knowledgeable in the following sources of the information for tsunami warning					
14	Local government					
15	Meteorological and Geophysical Agency (BMG)					
16	Mass media					
17	National radio					
18	National television					
19	Religious practice place example mosque					
20	Folk story/Local knowledge					
	What are the extent to which you have					

Table B1 (Continued)

No	Items	Extent of being prepared				
		Not at all	**A Little**	**Some What**	**Much**	**Very Much**
	prepared yourself to be ready for the following activities to save yourself from tsunami events					
21	Making evacuation plan/ family plan					
22	Doing evacuation exercise in the family setting					
23	Building/modifying house that withstands the impact of tsunami					
24	Moving living place from beach to higher ground area					
	What are the extent to which you have prepared yourself to be ready in the following disaster supplies kit items					
25	A 3-day supply of water					
26	Map and evacuation route					
27	Instant foods that are imperishable					
28	Important and valuable documents					
29	Clothes					

Table B1 (Continued)

No	Items	Extent of being prepared				
		Not at all	**A Little**	**Some What**	**Much**	**Very Much**
30	Cash					
31	Alternative communication equipment, example mobile phone					
32	Important addresses / telephone numbers					
33	Family Photos					
34	First aid kit					
	What are the extent to which you have prepared yourself to be ready in the following skills relating to disaster preparedness					
35	First aid skill					
36	CPR skill					
37	Use fire extinguisher					
	What are the extent to which you have prepared yourself for the rehabilitation period of the possible disaster					
38	Saving					

Table B1 (Continued)

No	Items	Extent of being prepared				
		Not at all	**A Little**	**Some What**	**Much**	**Very Much**
39	Insurance					
40	Ground/house in the other place 40.1 Relative or friend house nearby 40.2 Shelter nearby 40.3 Open safety place 40.4 Religious practice place example mosque					
	What are the extent to which you have prepared yourself to contact the following persons for getting help when facing disaster-related difficulties					
41	Relatives					
42	Neighborhoods					
43	Friends					
44	Community agencies					

“Thank you very much for completing this questionnaire “

APPENDIX C

Tables of the Study Finding

Table C1

Mean Score, Standard Deviation and Level of Subjects' Tsunami Preparedness in Affected Area (N=152), by Each Item

Items	Mean	SD	Level
Knowledge			
The extents to which the subject had prepared himself/herself to be knowledgeable in the nature of tsunami was as the following items:			
1. Causes of tsunami	3.26	0.77	High
2. Characteristics of tsunami	3.28	0.72	High
3. Warning signs of tsunami	3.42	0.67	High
4. Impacts of tsunami	3.47	0.58	High
The extents to which the subject had prepared himself/herself to be knowledgeable in the following responses when signs of the tsunami was detected:			
5. Evacuation plan to higher inland	3.20	0.65	High
6. Emergency information	2.28	0.89	Moderate
7. Assemble a disaster supplies kit	1.88	1.15	Moderate
The extents to which the subject had prepared himself/herself self to be knowledgeable in basic emergency preparedness was as the following items:			
8. Items of disaster supplies kit	1.83	1.12	Moderate
9. Process of developing emergency plan	2.33	0.92	Moderate

Table C2 (Continued)

Items	Mean	SD	Level
10. Identification of safety place for the shelter	3.30	0.60	High
The extents to which the subject had prepared himself/herself to be knowledgeable in existing warning system was as the following items:			
11. Traditional warning system, example *tambo*	3.28	0.81	High
12. Local agreement warning system, example radio-information	3.20	0.85	High
13. National warning system, example Tsunami Early Warning System (TEWS) tower	3.65	0.53	High
The extent to which the subject have prepared himself/herself to be knowledgeable in the following sources of the information for tsunami warning			
14. Local government	3.86	0.41	High
15. Meteorological and Geophysical Agency (BMG)	2.96	0.72	High
16. Mass media	3.00	0.87	High
17. National radio	3.28	0.71	High
18. National television	3.53	0.59	High
19. Religious practice place example mosque	3.56	0.60	High
20. Folk story/Local knowledge	2.06	1.03	Moderate
Individual Emergency Planning			
The extents to which the subject had prepared himself/herself to be ready for the following activities to save himself/herself from tsunami events			
21. Making evacuation plan/ family plan	2.42	0.86	Moderate
22. Doing evacuation exercise in the family setting	1.75	1.29	Moderate

Table C2 (Continued)

Items	Mean	SD	Level
23. Building/modifying house that withstands the impact of tsunami	1.91	1.19	Moderate
24. Moving living place from beach to higher ground area	3.14	0.60	High
The extent to which the subject had prepared himself/ to be ready in the following disaster supplies kit items			
25. A 3-day supply of water	2.05	1.10	Moderate
26. Map and evacuation route	3.57	0.63	High
27. Instant foods that are imperishable	3.14	0.86	High
28. Important and valuable documents	3.87	0.35	High
29. Clothes	3.45	0.78	High
30. Cash	3.89	0.34	High
31. Alternative communication equipment, example mobile phone	1.45	1.50	Moderate
32. Important addresses / telephone numbers	2.55	0.85	Moderate
33. Family Photos	2.56	0.77	Moderate
34. First aid kit	1.62	0.75	Moderate
The extent to which the subject had prepared himself/herself to be ready in the following skills relating to disaster preparedness			
35. First aid skill	1.16	0.92	Low
36. CPR skill	0.28	0.65	Low
37. Use fire extinguisher	0.63	0.82	Low

Table C2 (Continued)

Items	Mean	SD	Level
Resources Mobilization Capacity			
The extent to which the subject had prepared himself/herself for the rehabilitation period of the possible disaster			
38. Saving	1.29	1.07	Low
39. Insurance	0.70	0.94	Low
40. Ground/house in the other place			
40.1 Relative or friend house nearby	2.61	0.66	Moderate
40.2 Shelter nearby	2.61	0.66	Moderate
40.3 Open safety place	2.61	0.66	Moderate
40.4 Religious practice place example mosque	2.61	0.66	Moderate
The extent to which the subject had prepared himself/herself to contact the following persons for getting help when facing disaster-related difficulties			
41. Relatives	2.99	0.82	High
42. Neighborhoods	3.01	0.80	High
43. Friends	2.93	1.02	High
44. Community agencies	2.24	1.46	Moderate

Table C2

Mean Score, Standard Deviation and Level of Subjects' Tsunami Preparedness in Non-Affected Area (N=152), by Each Item

Items	Mean	SD	Level
Knowledge			
The extents to which the subject had prepared himself/herself to be knowledgeable in the nature of tsunami was as the following items:			
1. Causes of tsunami	1.75	1.20	Moderate
2. Characteristics of tsunami	1.93	1.16	Moderate
3. Warning signs of tsunami	1.95	1.17	Moderate
4. Impacts of tsunami	2.17	1.26	Moderate
The extents to which the subject had prepared himself/herself to be knowledgeable in the following responses when signs of the tsunami was detected:			
5. Evacuation plan to higher inland	2.68	1.10	High
6. Emergency information	2.13	1.14	Moderate
7. Assemble a disaster supplies kit	1.68	1.32	Moderate
The extents to which the subject had prepared himself/herself self to be knowledgeable in basic emergency preparedness was as the following items:			
8. Items of disaster supplies kit	1.41	1.28	Moderate
9. Process of developing emergency plan	1.69	1.21	Moderate
10. Identification of safety place for the shelter	2.36	1.20	Moderate

Table C2 (Continued)

Items	Mean	SD	Level
The extents to which the subject had prepared himself/herself to be knowledgeable in existing warning system was as the following items:			
11. Traditional warning system, example *tambo*	1.42	1.28	Moderate
12. Local agreement warning system, example radio-information	1.70	1.20	Moderate
13. National warning system, example Tsunami Early Warning System (TEWS) tower	1.53	1.33	Moderate
The extent to which the subject have prepared himself/herself to be knowledgeable in the following sources of the information for tsunami warning			
14. Local government	1.51	1.15	Moderate
15. Meteorological and Geophysical Agency (BMG)	1.73	1.33	Moderate
16. Mass media	2.13	1.11	Moderate
17. National radio	1.91	1.18	Moderate
18. National television	2.46	1.10	Moderate
19. Religious practice place example mosque	2.41	1.24	Moderate
20. Folk story/Local knowledge	1.63	1.32	Moderate
Individual Emergency Planning			
The extents to which the subject had prepared himself/herself to be ready for the following activities to save himself/herself from tsunami events			
21. Making evacuation plan/ family plan	1.78	1.25	Moderate
22. Doing evacuation exercise in the family setting	1.16	1.20	Low

Table C2 (Continued)

Items	Mean	SD	Level
23. Building/modifying house that withstands the impact of tsunami	0.88	1.20	Low
24. Moving living place from beach to higher ground area	1.45	1.37	Moderate
The extent to which the subject had prepared himself/ to be ready in the following disaster supplies kit items			
25. A 3-day supply of water	1.57	1.28	Moderate
26. Map and evacuation route	1.10	1.21	Low
27. Instant foods that are imperishable	1.66	1.34	Moderate
28. Important and valuable documents	2.27	1.33	Moderate
29. Clothes	2.09	1.29	Moderate
30. Cash	2.09	1.20	Moderate
31. Alternative communication equipment, example mobile phone	1.32	1.21	Low
32. Important addresses / telephone numbers	1.59	1.28	Moderate
33. Family Photos	1.28	1.28	Low
34. First aid kit	1.28	1.23	Low
The extent to which the subject had prepared himself/herself to be ready in the following skills relating to disaster preparedness			
35. First aid skill	1.23	1.24	Low
36. CPR skill	0.86	1.13	Low
37. Use fire extinguisher	0.56	0.89	Low

Table C2 (Continued)

Items	Mean	SD	Level
Resources Mobilization Capacity			
The extent to which the subject had prepared himself/herself for the rehabilitation period of the possible disaster			
38. Saving	1.21	1.13	Low
39. Insurance	0.84	1.29	Low
40. Ground/house in the other place			
40.1 Relative or friend house nearby	1.57	1.21	Moderate
40.2 Shelter nearby	1.57	1.24	Moderate
40.3 Open safety place	1.82	1.19	Moderate
40.4 Religious practice place example mosque	2.09	1.29	Moderate
The extent to which the subject had prepared himself/herself to contact the following persons for getting help when facing disaster-related difficulties			
41. Relatives	1.98	1.19	Moderate
42. Neighborhoods	2.13	1.18	Moderate
43. Friends	2.02	1.15	Moderate
44. Community agencies	1.64	1.24	Moderate

APPENDIX D

Map of Aceh Province Showing the Study Areas

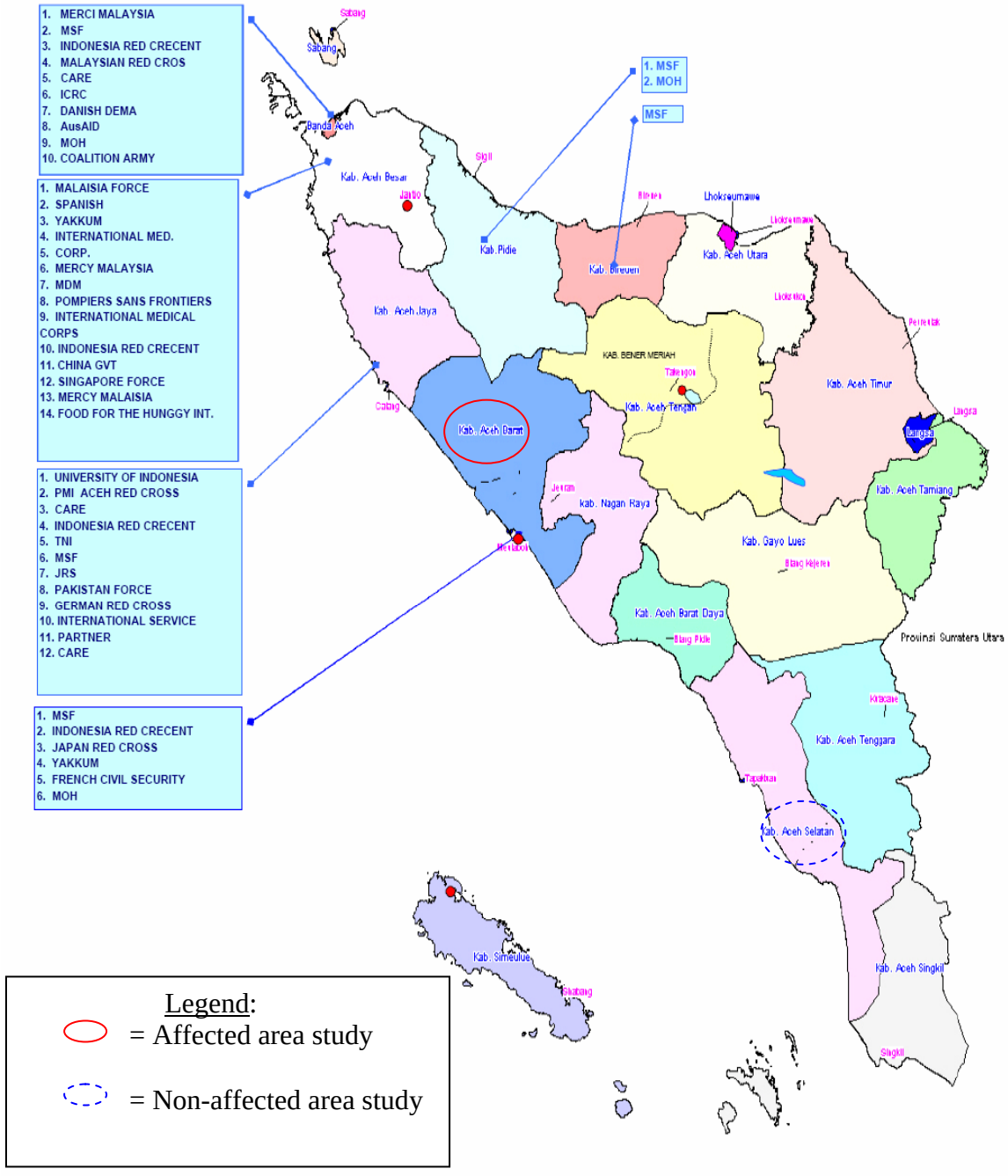

Figure D1

Map of Aceh Province Showing Location Distribution of Foreign Volunteer Post 2004 Tsunami and the Study Areas (Province, 2005)

APPENDIX E

List of Experts

Three experts validated the content validity of the Individual's Tsunami Preparedness Questionnaire, they were:

1. Sang-arun Isaramalai, RN, PhD

   Assistant Professor in Family and Community Health Nursing Department, Faculty of Nursing, Prince of Songkla University, Thailand.

2. Umaporn Boonyasopun, RN, PhD

   Assistant Professor in Family and Community Health Nursing Department, Faculty of Nursing, Prince of Songkla University, Thailand.

3. Hathairat Sangchan, RN, PhD

   Nursing Lecturer in Medical Surgical Nursing Department, Faculty of Nursing, Prince of Songkla University, Thailand.

VITAE

Name Mrs. Rachmalia

Student ID 5110420092

Education Attainment

Degree	Name of Institution	Year of Graduation
Bachelor of nursing science	Syiah Kuala University	2004

Scholarship Awards during Enrollment

Rocky Feller Foundation from the United Kingdom

Work - Position and Address

Lecturer at Nursing Program, Medical Faculty, Syiah Kuala University

Gedung Petronas, Jl. Tgk.Tanoh Abe, Darussalam, Banda Aceh, 23111 Indonesia

Phone/Fax (+62651) 7555249