



International Journal of Disaster Management

ISSN: 2527-4341

Earthquake and Tsunami Emergency Preparedness of Visually Disabled People

Mutia Fatin¹, Sofia¹ and Rina Suryani Oktari^{1,2,3,*}

¹*Faculty of Medicine, Universitas Syiah Kuala, Jl. Tgk. Syech Abdul Rauf, Darussalam,
Banda Aceh, 23111, Indonesia*

²*Graduate School of Mathematics and Applied Science, Universitas Syiah Kuala, Jl. Tgk. Syech Abdul Rauf,
Darussalam, Banda Aceh, 23111, Indonesia*

³*Tsunami & Disaster Mitigation Research Center (TDMRC), Jl. Prof. Dr. Ibrahim Hasan, Ulee Lheue,
Meuraxa, Banda Aceh, 23232, Indonesia*

**Corresponding Author: okta@unsyiah.ac.id*

Abstract— This study aims to determine the relationship between types of visually disabled people with emergency response plan preparedness. This study uses analytical methods, cross-sectional design, and questionnaires as data collection tools. The sample of this study was 54 visually disabled people who were living in Banda Aceh. This study revealed that the level of preparedness of the emergency response plan, the majority of visually disabled people has a low level of preparedness to plan an emergency response (63%), especially the total blindness group (46.3%). The Mann-Whitney test results showed that there was a statistically significant relationship between the visual impairment group and total blindness group on the preparedness of the emergency response plan ($p = 0.016$). Hence, this study suggests some recommendations, including a disaster preparedness program that is sensitive to people with disabilities, increasing the participation of people with disabilities in DRR education, and increasing the accessibility of people with disabilities to DRR teaching/learning materials.

Keywords— *visual impairment, blindness, disaster, response*

INTRODUCTION

According to World Health Organization (WHO), the estimated number of Visually Disabled People (VDP) around the world reached 285 million or 4.24% of the total population, with consist of 39 million people (0.58%) suffering from blindness and 246 million people (3.65 %) experiencing visual impairment (WHO, 2010). In Indonesia, the prevalence of VDP is more than 2.9 million people (39.53%). Aceh Province ranked 14th with the highest number of sufferers for blindness (16,636 people) and visual impairment (49,908 people) (Risesdas, 2013).

VDP are often intentionally or unintentionally neglected when an earthquake occurred. The study by Phibbs et al. (2012) on the preparedness of VDP to the earthquake that occurred in Christchurch in 2010, found that half of the respondents were not prepared to face disasters. One of the problems they encounter was the lack of preparation in the emergency response plan. This condition resulted in the domination of VDP to be victims during disasters (Gershon et al., 2013).

Another study also showed that the mortality rate for persons with disabilities, including those with visual disabilities in the 2011 earthquake and tsunami in Japan, was half of the total number of people with disabilities (1,655 people) (Sever, 2015). During the 2004 earthquake and tsunami in Aceh, the death toll reached half of

the total 145 children with disabilities registered with the Disabled Child Development Foundation (YPAC) (White, 2016).

VDP should receive special attention in disaster preparedness, particularly emergency response plans, both from the government and community (Stough and Kang, 2015). The Sendai Framework for Disaster Risk Reduction (2015-2030), also highlighted that DRR efforts require empowerment and inclusive, non-discriminatory participation, and pay special attention to people affected by disasters proportionately (UNISDR, 2015).

The inclusion of the needs and aspirations of persons with disabilities at every stage of disaster management, specifically in planning and preparedness, would significantly reduce vulnerability and increase the effectiveness of government efforts in emergency response (UN Enable, 2013). But in reality, VDP, who are vulnerable groups when a disaster occurs, have not been included in disaster management activities (Smith et al., 2012).

This study aims to assess the level of preparedness of VDP in terms of the emergency response plan for earthquake and tsunami. In the academic view, this research is expected to increase the repertoire of knowledge, especially in the field of preparedness for VDP. This research is also likely to be used as a source of data or a reference for subsequent researchers in carrying out similar research. Practically, the results of this study would be used to provide input and consideration for policymakers and practitioners to design and organize appropriate training for VDP, which aims to increase preparedness in dealing with earthquake and tsunami.

METHOD

This research was conducted in 2017 in Banda Aceh, which is an area at high risk of earthquakes and was hit by the tsunami in 2004. The population in this study were all VDP living in Banda Aceh with a total of 76 people (based on data from the Aceh Social Department). The respondents in this study were all VDP who lived in Banda Aceh and had met the inclusion criteria, which included: people with low vision (<6/18) in both eyes who could not be corrected with glasses or lenses; and aged ≥ 18 years. If there is more than one VDP in 1 family member, then the sample is the head of the family. The number of samples that met the inclusion and exclusion criteria were 54 people.

The research instruments were a questionnaire containing a number of questions about the preparedness of the emergency response plan towards earthquake and tsunami. The preparedness of the emergency response plan in this study was assessed using items that have been modified from the LIPI/ UNESCO (2006) questionnaire.

The level of preparedness was determined using an index analysis. Determination of the index value for each parameter is calculated based on the formula:

$$\text{Index} = \frac{\text{Total Real Score parameter}}{\text{Total Maximum parameter}} \times 100$$

The maximum parameter score is obtained from the number of questions in the indexed parameters (each question is worth one for the answer “yes” and zero for the answer “no”). Emergency response plan preparedness in this study is categorized into 3, i) 80-100 (High); ii) 60-79 (Moderate); iii) <60 (Low).

The instrument used for visual examination was a distance measuring rope along the 3 meters, tumbling E card (size 87.5 mm = 248 pt.). The examination was carried out with the sun's light source, and the respondent turns his back or does not face the light source. The white color card was 15x15 cm and has the black E letter with a size of 248 pt., which can be rotated back in all directions, held by the examiner level/eye level of the respondent and within 3 meters of the respondent standing/sitting. This E measure was to find out if the respondent able to see 3/60 shown from a distance of 3 meters.

The examination was performed by asking the respondent to see the E letter. Respondents were expected to show the direction of the foot of the E letter correctly three times in a row or four correct answers in 6 times questions of the E letter.

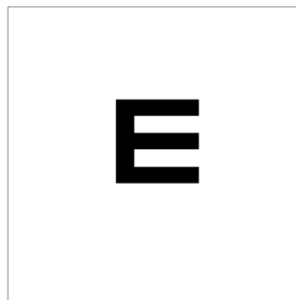


Figure 1. Tumbling E card for Visual Examination

If the respondent incorrectly shows the direction of the E letter showed (maximum three times wrong from a total of 6 questions), the respondent is considered unable to see the E letter. The eye examination started with the respondent's right eye. After information about the right eye was filled in the form, then continue with the left eye examination. The interpretation of visual measurement results is as follows: i) Able to see large E letter (from distance of 3m); and ii) Not able to see large E letter (from distance of 3m). Code 1 means the respondent is classified in the visual impairment group, and code 2 means classified in the total blindness group (Rajavi et al., 2011; Ove et al., 2017).

RESULTS AND DISCUSSION

Overview of VDP Population in Banda Aceh

The number of VDP in Banda Aceh is 76 people, which spread across nine sub-districts (Fig. 2) as follows: 22 people (Baiturrahman), 14 people (Banda Raya), 12 people (Kuta Alam), 10 people (Ulee Kareng), 5 people (Syiah Kuala), 4 people (Lueng Bata), 4 people (Meuraxa), 3 people (Kuta Raja) and 2 people (Jaya Baru). Men (46 people) predominantly dominate VDP in Banda Aceh. The average age is productive age, between 20 to 65 years.

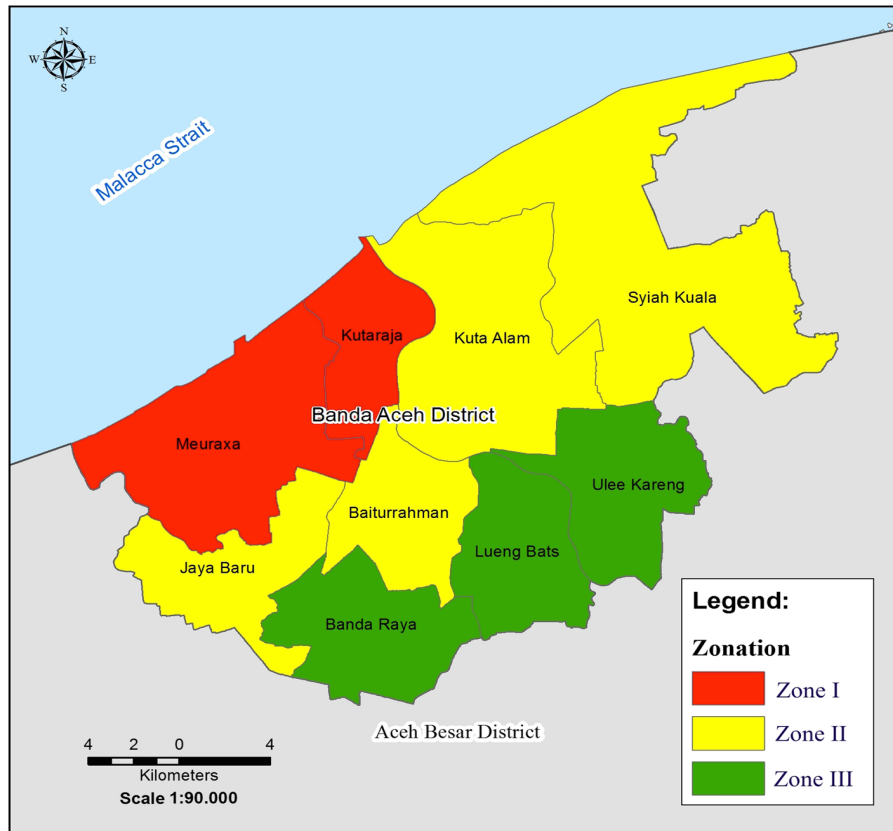


Figure 2. Map of Banda Aceh with Tsunami risk zone (Syamsidik et al., 2017)

VDP still find it difficult to work in government agencies or state-owned and private companies. Although the Indonesian government has issued various forms of policy regarding employment opportunities for VDP, it doesn't guarantee that they will be given the same opportunity to work for government agencies, state-owned enterprises or private companies in Banda Aceh.

One obstacle to the employment opportunities for VDP is the incompatibility of the skills of the workers with visual disability with the occupational requirements and working conditions. The lack of education and skills training for VDP in Banda Aceh has prevented them from meeting the requirements of state institutions and private companies. Consequently, more VDP prefer to work in the service sector, such as masseurs. The unemployment rate is also quite high among VDP in Banda Aceh.

Characteristics of Respondents

Total respondents in this study is 54 VDPs. In approaching the respondents, researchers supported by the Indonesian Blind Association (PERTUNI) of Banda Aceh. Characteristics of respondents are provided in the following table:

Table 1. Demographic characteristics of respondents (N=54).

Characteristics of Respondents	Frequency (n)	Percentage (%)
Age:		
20 - 29	7	13
30 - 39	21	39
40 - 49	17	31
50 - 59	7	13
≥ 60	2	4
Gender:		
Male	35	64,8
Female	19	35,2
Occupation:		
Unemployed	19	35,2
Masseur	30	55,56
Other	5	9,24

In table 1 shows that the majority of respondents age is 30-39 years (39%), based on gender of the majority of respondents, are male (64.8%), and based on occupation, the majority of respondents are masseurs (55.56%). Figure 3 illustrates the types of VDP in Banda Aceh; the majority of VDP are total blindness (61.2%).

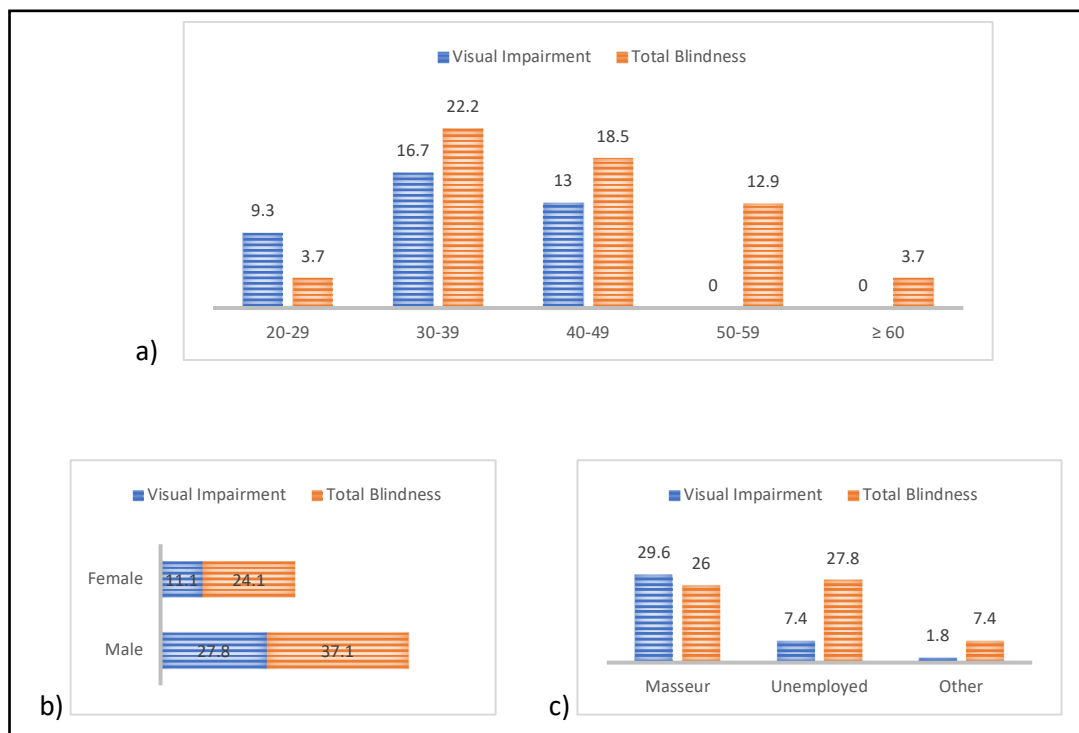


Figure 3. Percentage distribution of types of blind people based on age (a), gender (b) and occupation (c) (N=54).

The age of VDP with visual impairment and total blindness groups is similar, ranging from 30-39 years (Fig. 3a). The gender in the types of VDP, both visual impairment and total blindness groups, are equally dominated by males (Fig. 3b). In terms of occupation (Fig. 3c), the majority of visual impairment group worked as masseurs (29.6%), while the total blindness group is unemployed (27.8%). In the total blindness group, almost all who do not work become beggars on the streets.

Preparedness of the Emergency Response Plan of VDP

The following Table 2 describes the level preparedness of the emergency response plan for VDP in Banda Aceh.

Table 2. Distribution of Preparedness Level of the Emergency Response Plan (N=54)

Characteristic	Level of Preparedness							
	Medium				Low			
	Visual impairment		Total Blindness		Visual impairment		Total Blindness	
	n	%	n	%	n	%	n	%
Total	13	24	7	13	11	20,4	25	46,3
Age								
20-29	3	5,5	1	1,8	2	3,7	1	1,8
30-39	5	9,3	4	7,4	4	4	8	14,8
40-49	2	3,7	3	5,6	5	5	7	13
50-59	0	0	0	0	0	0	7	13
≥ 60	0	0	0	0	0	0	2	3,7
Gender								
Male	8	14,8	5	9,3	7	7,4	15	27,8
Female	4	7,4	3	5,6	2	3,7	10	18,5
Occupation								
Unemployed	10	18,5	4	7,4	6	11,1	10	18,5
Masseur	2	3,7	4	7,4	2	3,7	11	20,4
Other	1	1,8	0	0	0	0	4	7,4

Table 2 reports the level of preparedness of the emergency response plan, the majority of VDP has a low level of preparedness to plan an emergency response (63%), especially the total blindness group (46.3%). The visual impairment group that is not ready (20.4%) on average is > 30 years old and unemployed. This situation may be caused by the hopelessness caused by the total blindness group. Individuals with disabilities tend to have difficulties adjusting positively so that they emerge feeling give up easily, feel inadequate, and withdraw from relationships.

A total of 54 respondents involved in this study stated that they had not yet planned family preparedness for disasters; only a small proportion had done so. There are several things that VDP might be able to do. However, the results of the questionnaire (Fig. 3) showed that there was only one thing that was most prepared by the respondents, namely preparing important and valuable documents (88.9%). Whereas alternatives for the other answers were only a few respondents who prepared cash, clothing (12.6%), agreed on an evacuation place (7.4%), prepared ready to eat meals (3.7%), and first aid kit (3.7%). Respondents said that during a panic situation, they only thought about how to save themselves. Besides, they consider that the preparedness kit is not too important. In fact, in preparing such items, it requires money, while most of the blind people have a low income.

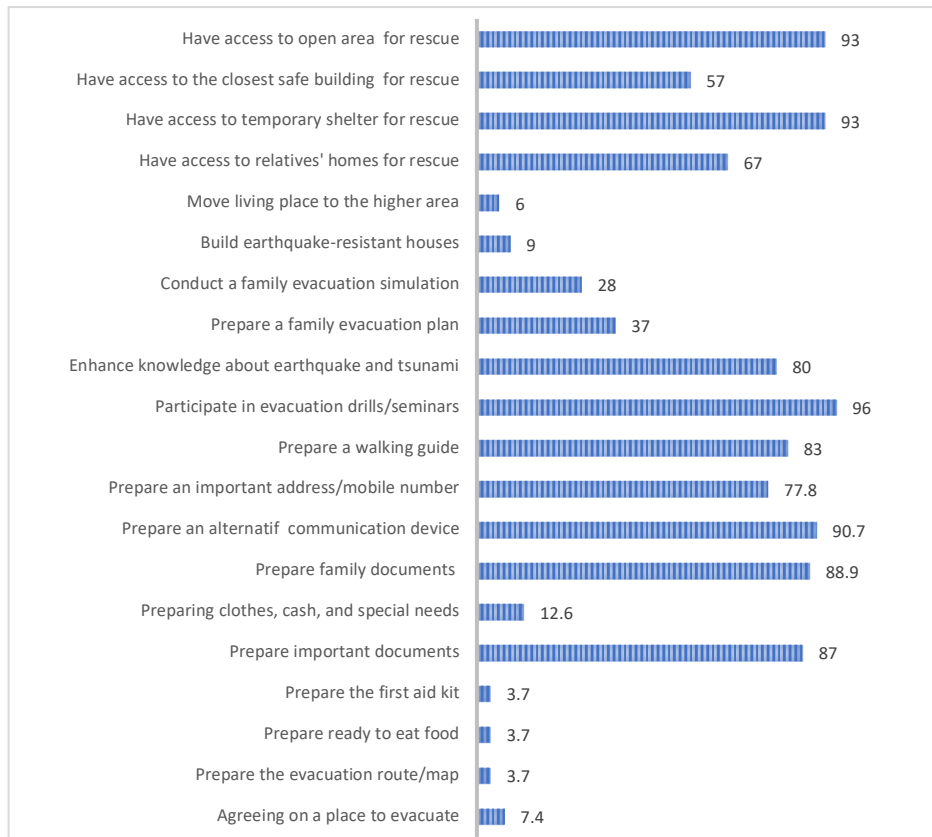


Figure 4. Percentage distribution of respondent's answers "yes" to emergency preparedness plans (N=54)

Although the respondent generally did not prepare alternative communication devices such as HT/radio/mobile phone for earthquake and tsunami alert, they already have the equipment that can be used if at any time disaster conditions occur (90.7%). They also claimed to have a list of important telephone numbers such as hospitals, district police stations, the electricity company, and others (77.8%). As many as 83.4% of VDP had also prepared walking sticks and had followed evacuation drills or simulations (96.3%).

The most common action taken by the respondent to prepare for the earthquake and tsunami is to increase knowledge (80%). This knowledge was obtained through disaster seminar activities that were often held in Banda Aceh. About 37% have made plans for evacuation or family evacuation and conducted a family evacuation simulation exercise (28%). In contrast, the other choice of action has a small proportion of respondents, namely building earthquake-resistant houses (9%), moving living place to the higher area (6%). These last two choices of actions require a large financial capability. Therefore, not many respondents have chosen this action.

In the event of an earthquake and tsunami, the respondents claimed to have known where they would save themselves. The highest choice is to evacuate in a safe open field (93%). The second most choice is that they will go to a relative's or closest friend's house (67%). But they are still uncertain of the buildings around them whether safe or not. The number of respondents who said they would save themselves to the closest safe building or building is 57%.

Table 3. Distribution of respondent's answer to emergency preparedness plans based on type of VDP

Questions	Visual Impairment		Total Blindness	
	n	%	n	%
Agree on a place to evacuate	4	19	0	0
Prepare the evacuation route/map	1	4,8	1	3
Prepare ready to eat food	1	4,8	1	3
Prepare the first aid kit	1	4,8	1	3
Prepare important documents	21	100	26	78,8
Prepare clothes, cash, and special needs	3	14,3	4	12,1
Prepare family documents	21	100	27	81,8
Prepare an alternative communication device	19	90,5	30	90,9
Prepare an important address/mobile number	18	86	24	72,7
Prepare a walking guide	17	80,9	28	84,8
Participate in evacuation drills/seminars	20	95,2	32	96,9
Enhance knowledge about earthquake and tsunami	18	85,7	25	75,8
Prepare a family evacuation plan	8	38	12	36,4
Conduct a family evacuation simulation	8	38	7	21,2
Build earthquake-resistant houses	3	14,3	2	6
Move living place to the higher area	2	9,5	1	3
Have access to relatives' homes for rescue	15	71,4	21	63,6
Have access to temporary shelter for rescue	20	95,2	30	90,9
Have access to the closest safe building for rescue	8	38	23	69,7
Have access to open area for rescue	20	95,2	30	90,9

According to Table 3, it can be seen that the majority of the total blindness group are more unprepared in emergency response plans. The majority of the total blindness group did not prepare a place for evacuation (0%). There is also limited respondent (3%), who prepare evacuation routes/maps, ready to eat meals, first aid kits, and plans to move to the highlands. Only 6% of respondents that has to build earthquake-resistant houses. Few of them have prepared clothes, cash, and emergency equipment (12.1%), participated in evacuation simulations (21.2%), and conducted family evacuation plans (36.4%). These are things that must be improved to enhance the preparedness of emergency response plans for VDP.

The visual impairment group has better preparedness toward earthquake and tsunami. Several items that need to be improved are preparations of evacuation place, evacuation route/map, ready to eat food, first aid kits, clothing, and money. This group also needs to prepare family evacuation, conduct evacuation simulation, build earthquake-resistant houses, living in a higher place, and have access to the safer place/building for evacuation. All the deficiencies of the visual impairment group can be addressed if their social and economic welfare is improved.

Relationship between the type of VDP and emergency response plan preparedness

Bivariate analysis in this study was conducted to determine the relationship between types of VDP with earthquake and tsunami disaster preparedness response plans. The analysis was performed using the *Mann-Whitney* statistical test, where $p < 0.05$ was considered significant.

Table 4. Mann-Whitney U Test Results

		Level of preparedness		Total	p
		Moderate	Low		
Type of blind people	Visual impairment	12 (57.1%)	9 (42.9%)	21	0.016*
	Total blindness	8 (24.2%)	25 (75.8%)	33	
Total		20	34	54	

*The *Mann-Whitney* statistical testThe value of $p \leq 0.05$ shows a significant difference

Table 4 shows a p value of 0.016, which means that there are statistically significant differences in the preparedness of emergency response plans between the two groups of VDP. The majority of visual impairment groups are better prepared than the total blindness group.

The psychological well-being of an early adult individual who is visually disabled, states they have some limitations that may be experienced. The first limitation is lacking the control of the environment and the self in relation to it. This condition could affect the information received in social interactions. The second limitation is losing the ability to get around, and the third limitation is lacking in range and variety of experiences. These limitations will illustrate the different impacts on the types of VDP (Brouwer et al., 2008; Leissner et al., 2014; Swenor et al., 2015). These limitations also have an impact on their preparedness in dealing with earthquake and tsunami disaster.

Other studies also stated that VDP perceive themselves as someone helpless and incompetent; this results in loss of self-esteem (Nyman et al., 2012). If compounded by the negative attitude of the community towards VDP, it will cause the individual concerned to become hopeless.

Regulation of Head of National Disaster Management Agency (Perka BNPB) No. 14 of 2014 states that every household with a disability member must have a preparedness plan at the household level. This regulation stipulates that blind people should also have preparedness in facing disasters.

Disaster Risk Reduction (DRR) learning is very important to be introduced earlier to VDP. DRR learning will increase the capacity of VDP in preparedness and reduce their vulnerability to disasters. The capacity of VDP can be strengthened by increasing the knowledge and practice of self-habitation in taking appropriate preparedness steps.

CONCLUSION

This research has important implications for preparing vulnerable groups, especially VDP, in increasing preparedness in the face of the earthquake and tsunami. This study revealed that the level of preparedness of the emergency response plan, the majority of VDP has a low level of preparedness to plan an emergency response, especially the total blindness group.

VDP is part of vulnerable groups, not only because of their shortcomings but also because of some problems faced by VDP when disasters occur. Hence, this study suggests some recommendations, including a disaster preparedness program that is sensitive to people with disabilities, increasing the participation of people with disabilities in DRR education, and increasing the accessibility of people with disabilities to DRR teaching/learning materials.

ACKNOWLEDGEMENTS

The authors would like to thank the Indonesian Blind Association (PERTUNI) of Banda Aceh and those who have supported the implementation of this research. The corresponding author would like to acknowledge the Integrated Research on Disaster Risk (IRDR) for the opportunity granted as IRDR Young Scientist.

REFERENCES

- Badan Litbangkes Kementrian Kesehatan Republik Indonesia. (2013). Riset kesehatan dasar 2013. *Jakarta: Badan Penelitian dan Pengembangan Kesehatan*, 125.
- Brouwer, D. M., Sadlo, G., Winding, K., & Hanneman, M. I. (2008). Limitations in mobility: experiences of visually impaired older people. *British Journal of Occupational Therapy*, 71(10), 414-421.
- Gershon, R. R., Kraus, L. E., Raveis, V. H., Sherman, M. F., & Kailes, J. I. (2013). Emergency preparedness in a sample of persons with disabilities. *American journal of disaster medicine*, 8(1), 35-47.
- Leissner, J., Coenen, M., Froehlich, S., Loyola, D., & Cieza, A. (2014). What explains health in persons with visual impairment?. *Health and quality of life outcomes*, 12(1), 65.
- LIPI-UNESCO (2006). Kajian Kesiapsiagaan Masyarakat Dalam Mengantisipasi Bencana Gempa Bumi & Tsunami. *LIPI-UNESCO, Jakarta*.
- Nyman, S. R., Dibb, B., Victor, C. R., & Gosney, M. A. (2012). Emotional well-being and adjustment to vision loss in later life: a meta-synthesis of qualitative studies. *Disability and rehabilitation*, 34(12), 971-981.
- Oye, J., Mactaggart, I., Polack, S., Schmidt, E., Tamo, V., Okwen, M., & Kuper, H. (2017). Prevalence and Causes of Visual Impairment in Fundong District, North West Cameroon: Results of a Population-Based Survey. *Ophthalmic epidemiology*, 24(6), 394-400.
- Peraturan Kepala BNPB No. 14/2014 tentang Penanganan, Perlindungan dan Partisipasi Penyandang Disabilitas dalam Penanggulangan Bencana
- Phibbs, S. R., Woodbury, E., Williamson, K. J., & Good, G. A. (2012). Issues experienced by disabled people following the 2010-2011 Canterbury earthquake series.
- Rajavi, Z., Katibeh, M., Ziaei, H., Fardesmaeilpour, N., Sehat, M., Ahmadi, H., & Javadi, M. A. (2011). Rapid assessment of avoidable blindness in Iran. *Ophthalmology*, 118(9), 1812-1818.
- Sever, R. (2015). Extra-fragile in disaster: People with Disabilities in a bombarded zone. In *Disaster management: Enabling resilience* (pp. 201-226). Springer, Cham.
- Smith, F., Jolley, E., & Schmidt, E. (2012). *Disability and disasters: The importance of an inclusive approach to vulnerability and social capital*. Haywards Heath, UK: Sightsavers.
- Stough, L. M., & Kang, D. (2016). The Sendai Agreement and disaster risk reduction: Conceptual influences from the field of disability studies. *Natural Hazards Observer*, 40(5), 4-9.
- Swenor, B. K., Simonsick, E. M., Ferrucci, L., Newman, A. B., Rubin, S., Wilson, V., & Health, Aging and Body Composition Study. (2015). Visual impairment and incident mobility limitations: the health, aging and body composition study. *Journal of the American Geriatrics Society*, 63(1), 46-54.
- Syamsidik, Oktari, R. S., Munadi, K., Arief, S., & Fajri, I. Z. (2017). Changes in coastal land use and the reasons for selecting places to live in Banda Aceh 10 years after the 2004 Indian Ocean tsunami. *Natural Hazards*, 88(3), 1503-1521.

- UN Enable. (2013). Disability, natural disasters, and emergency situations: A need to include persons with disabilities.
- UNISDR. (2015). Sendai framework for disaster risk reduction 2015–2030. In *Proceedings of the 3rd United Nations World Conference on DRR, Sendai, Japan* (pp. 14-18).
- White, G. F. (2016). The Sendai Agreement and Disaster Risk Reduction. *Natural Hazards Observer*, 40(5).
- World Health Organization. (2012). Global data on visual impairments 2010. *Geneva: WHO*, 1-5.