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Original Research Article

Awareness and preparedness for disasters amongst residents in dry, hilly, and delta regions of Myanmar

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ABSTRACT

Background: Because of Myanmar's location, many residents are in disaster risk zones. This study aimed to explore the disaster-related awareness and preparedness of the residents from the dry, hilly, and delta regions.
Methods: This research was a survey design, a cross-sectional approach, and used a survey questionnaire. By applying the RCDP clusters and hazard profile, 13 (19%) villages from hilly, 100 (53%) villages from dry, and 27 (28%) villages from the delta region were proportionately and randomly selected. From which,1800 household heads were randomly culled. The data collected through the face-to-face interview were entered into EpiData and analyzed in STATA 15.
Results: All samples of residents were composed of 6.7% from hilly, 76.5% from dry, and 16.8% from the delta region. Residents of 72.4% and 71.5% (dry region), 54.3% and 53.4% (hilly region), and 88.6% and 87.6% (delta region) were aware of the types and associated risks of the common disasters, respectively. Regarding disaster preparedness, approximately one-third have prepared for evacuation, emergency response, disaster kits, safe areas (shelter), reconstruction/rehabilitation, about one-fifth for emergency response operations, risk assessment, and risk reduction planning, and less than 10% for capacity building, awareness-raising, and information management. More than 50% have planned for preparedness after returning homes. Overall, good awareness and preparedness proportions were 38.2% and 13.9%.
Conclusions: Overall, the three regions' disaster awareness and preparedness levels were unsatisfactory, which highlights that National Natural Disaster Management Committee should effectively apply the information media, provide training/advocacies and support safe community initiatives.

Keywords: Disaster, Awareness, Preparedness, Residents in the disaster-affected regions

INTRODUCTION

Because of Myanmar's location, many residents are in disaster risk zones. They frequently experience one or more types of disasters such as floods, coastal and beach erosion, cyclones and strong wind in the delta region, landslides, soil erosions, forest fires, riverine folds and inundation, earthquakes in the hilly area and floods, earthquakes, lightning, droughts and industry and technology-induced hazards in the dry region. Myanmar is one of the world's disaster venerable countries, bagged the second spot among 189 climate-change-affected countries, ranked one out of five most disaster esteemed countries in Asia, and stood third in a high probability of disaster occurrence in ASEAN (Association of South East Asia Nations). In the delta region of Myanmar, there were 140,000 deaths, 800,000 displacements due to cyclone Nargis in 2008, 45 deaths and 101,923 homeless people due to Cyclone Giri in 2010, and 120,000 residents in

Rakhine were affected due to Cyclone Mahasen in 2013.[1-3] In the hilly region of Myanmar, more than 74 people were killed by Tarlay Earthquake in 2011, more than 40,000 cultivated lands and 125,000 people were affected due to heavy rains and floods in 2021.[4] In 2015, from half of all Myanmar townships, 172 residents were killed, and approximately 1.7 million were temporarily displaced due to floods.[3] According to the reports between 1980 and 2011, of yearly disaster events, 50% were floods that affected the delta and hilly regions, 23% were storms and mainly affected the residents in the delta region, and 15% were earthquakes that primarily affected the residents in the dry region.[5] Between 2005 and 2016, most residences in Myanmar were affected for 12 frequencies by earthquakes of more than five magnitudes. In 2016, all residents in Myanmar experienced the adverse consequences of the El Nino phenomenon.[3]

A disaster is a circumstance in which the ongoing and competent processes of the residents are interrupted, and the residents themselves are challenged to cope with the event and often need external assistants.[6,7] In Myanmar, most residents in the dry, hilly, and delta regions are venerable to some forms of disasters. Still, the residents and community leaders lack effective disaster preparedness strategies, especially in the plains and hilly areas.[1] Therefore, every residence needs to be aware of the types and probabilities of the most common disasters and be prepared for the least detrimental impacts on the residents and their lives, facilities, and services. As discussed by a systematic review of Rogayan and Dollete, previous extensive literature is available for messaging the community's disaster-related knowledge, attitude, and practice levels across the globe. Still, their information is slightly different according to the study's origin, study population, and specific focus of disaster types.[8] Here, the researchers hoped that this study would reveal much-informed evidence mainly concerned with the types and possibilities of disasters regularly occurring in three different residences of Myanmar.

Aim and objectives

This study primarily aimed to explore the residents' awareness of dry, hilly, and delta regions on preventing hazards from disasters and examine their disaster-related preparedness. This study will inform the National Natural Disaster Management Committee (NNDMC) with better insights into the different awareness levels and disaster-related preparedness conditions of three divergent regions to manage the gaps for future effective disaster preparedness programs among residences.

METHODS

This research used a survey design, a cross-sectional approach, and a survey questionnaire. This design was suitable for describing the residents' characteristics regarding disaster awareness and preparedness at the current time. This research was framed in July 2019, and the approval was confirmed in September 2019. Unfortunately, although the data collection process was started in October 2019, it ended in October 2021 due to the COVID-19 pandemic.

Definition of regions

In this study, the researchers referenced four agro-ecological zones of Myanmar under the RCDP (resilient community development project) clusters; Central Dry Zone, Coastal Zone, Deltaic Zone, and Mountainous Zone.[9] The researchers assumed that the residents in the Coastal and Deltaic Regions of Myanmar might have similar experiences regarding types and possibilities of disasters. Therefore, the study area of this research was partitioned into three regions: the dry region, the representative of the central dry zone, the hilly region, the representative of the mountainous zone, and the delta region, the representative of both coastal and deltaic zones. Accordingly, Naga self-administrative region (upper sagaing) and Chin state were grouped in the hilly region. The lower Sagaing region was in the group of the dry region, and Ayeyarwady and Tanintharyi regions were grouped in the Delta region.

Selection of research sites

In selecting the research sites, three zones of the RCDP clusters forementioned in (Figure 1) were based. According to the RCDP clusters and their hazard profile, 17 townships (seven townships in the hilly region, four townships in the dry region, and six townships in the delta region) were considered includable as the targeted research areas of this study. After randomly selecting one out of all included townships in each region, Hakha township from Chin State, Mingin township from lower Sagaing Region, and Thayetchaung township from Ayeyarwady Region were the research sites of this study. Furthermore, the researchers applied the RCDP hazard profile to exercise the second stage of selecting research areas. In this stage, all disaster-affected villages from each township were proportionately and randomly selected, and accordingly, 13 (19%) villages from Hakha, 100 (53%) villages from Mingin, and 27 (28%) villages from Thayetchaung were the representative of the research site.

Selection of study population

This study targeted the household heads and, if not applicable, considered others to be interviewed. Besides, the researchers excluded the residents working volunteer work in the disaster-related programs, did not live in the selected sites, lived less than 12 months before the data collection period, and were left away during the study time. A random method was employed to choose 1800 heads of resident households, and any other socio-demographic backgrounds were not restricted.

Name of Region	RCDP States/Regions/Township	Affected Village Number	Affected Population (Estimation in 2019)	Types of potential natural disasters
Hilly Region	Chin (Falam)	179	40082	
	Chin (Hakha)	69	25106	
	Chin (Tedim)	130	81572	
	Chin (Thantlang)	86	42266	
	Upper Sagaing (Lahe)	101	47235	
	Upper Sagaing (Lay Shi)	70	14172	
	Upper Sagaing (Nanyun)	99	55902	
Dry Region	Lower Sagaing (Paungbyin)	178	101545	
	Lower Sagaing (Mawlaik)	77	44546	
	Lower Sagaing (Kalewa)	125	48617	
	Lower Sagaing (Mingin)	189	104004	
Delta Region	Ayeyarwady (Bogale)	574	291268	
	Ayeyarwady (Labutta)	506	285898	
	Ayeyarwady (Pyapon)	212	250299	
	Tanintharyi (Launglon)	110	138839	
	Tanintharyi (Thayetchaung)	98	114891	
	Tanintharyi (Yebyu)	139	113591	

Riverine floods and inundations
Landslides
Earthquakes
Wildfires
Storms and strong-winds
Droughts
Coastal and beach erosion
Tsunamis and storm-surges
Strong-winds and cyclones

Figure 1: Characteristics of three regions (plain, hilly and delta) in Myanmar according to the RCDP cluster.

Data collection tool

A questionnaire on disaster awareness and preparedness was developed based on the collective information of the previous studies. The survey questionnaire was structured into three sections. The first section collected the residents' background characteristics such as age, sex, marital status, education level, and occupation. The second section was structured to explore the residents' awareness, including the common disaster types experienced, disaster risks, preventive measures, functions of an emergency response team, importance of first aid training, and sources of the weather report. Part A of the third section investigated the preparedness activities before the disaster (preparedness before disaster strikes, supplies in the Emergency kit, ways to prevent disasters, and risk reduction measures). Part B of the third section included the information regarding preparation during the disaster emergency response operations; ways of emergency response, meeting with the family to draw a disaster plan, strategies of a disaster plan, things to prepare during the disaster, and things to bring when going to shelter. Finally, part C of the third section examined the reconstruction/rehabilitation activities, functions, and activities after the disaster. After pre-testing the survey questionnaire for face validity and understandability among 90 residents from Pathein township, Cronbach's alpha values of the section 1, 2, 3 (A), 3 (B), and 3 (C) were 0.87, 0.88, 0.78, 0.80, and 0.77 respectively.

Data collection and analysis

The required data were collected through house-by-house and face-to-face interview techniques by considering the privacy and safety of the residents. The collected data were entered into EpiData Version 3.1, analyzed in STATA 15, and the outcome information was presented with numbers, percentages, and 95% confidence intervals.

RESULTS

Description of study residents

The participation rate was 95.8% (1726/1800), 6.7% (116/1726) from Hakha, 76.5% (1320/1726) from Mingin, and 16.8% (290/1726) from Thayetchaung.In four age groups of the residents (<30 years, 30-39 years, 40-49 years, 50-59 years and >60 years), the respective percentages were 14.9%, 18.7%, 22.2%, 21.8% and 22.4%. Among all respondents, the numbers and proportions of male and female household heads were 1120 (65%) and 604 (35%). Of all respondents, 82.9% (1431/1726) were married, 40.6% (701/1726) were dependent, 23.4% (404/1726) were daily wage workers, 27.5% (474/1726) were business owners, and 8.5% (147/1726) were employees.

Table 1: Disaster awareness of the study residents from dry, hilly and delta regions (n=1726).

Awareness on	Dry region			Hilly region			Delta region			Total		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI	
Types of disaster												
Storms (n=1,479)	83.4	81	85.6	92.6	84.7	96.6	92.4	88.3	95.1	85.6	83.6	87.6
Floods (n=1,562)	89.9	87.9	91.7	88.2	79.9	93.3	92	87.6	94.9	90.5	88.4	92.6
Volcanic eruptioNs (n=1,003)	58.2	55.1	61.2	73.6	62.9	82	45.1	38.7	51.6	58.1	54.1	62.1
Forest fires (n=1,004)	57.3	54.2	60.4	83.3	73.5	89.9	45	38.6	51.6	58.2	54.1	62.3
Earthquakes (n=1,436)	80.6	78	83	94.1	86	97.6	81.1	75.5	85.7	83.2	79.3	87.1
Droughts (n=1,265)	75.6	72.8	78.2	78.2	68.1	85.8	55.4	48.8	61.7	73.3	69.7	76.9
Others (n=296)	16.2	14	18.6	12	6.7	20.5	18	13.5	61.7	17.2	14.3	20.1
Being risky for disasters												
Aware (1260)	71.5	69.8	73.2	53.4	51.7	55.1	87.6	84.6	90.6	73	69.4	76.6
Unaware (466)	28.5	25.7	31.3	46.6	43.3	49.9	12.4	11.3	13.5	27	25.6	28.4
Disaster preventive measures												
Stay in evacuation zones (n=545)	32.4	29.6	35.4	29.8	21.1	40.3	29.7	24.2	35.9	31.8	29.3	34.4
Have an emergency plan (n=341)	21.7	19.2	24.4	20.6	13.2	30.7	17.4	13	22.9	20.8	18.7	23.2
Prepare an evacuation plan (n=642)	38.3	35.3	41.3	32.7	23.6	43.5	38.9	32.7	45.4	38	35.4	40.7
Keep disaster supply kits (n=548)	30.7	27.9	33.7	23.4	15.6	33.5	37.8	31.7	44.2	31.5	29	34.1
Others (n=83)	4.4	3.3	5.9	0.5	0.1	3.5	7.2	4.5	11.4	4.6	3.6	5.9
Necessaries during disaster												
Drinking water (n=1511)	87.6	85.4	89.5	91.2	82.4	95.8	85.4	80.2	89.4	87.4	85.5	89.1
Food (n=1522)	88	85.9	89.9	86.6	76.9	92.6	87.7	82.7	91.5	87.9	86	89.5
Blankets (n=883)	53.1	49.9	56.2	52.4	41.7	62.8	38.8	32.7	45.3	50.5	47.8	53.2
Clothing (n=1162)	67.2	64.2	70.1	64.6	53.6	74.2	64.2	57.7	70.2	66.5	63.9	69
First aid kits (n=931)	53.7	50.5	56.8	70	59.4	78.8	48.8	42.3	55.3	53.9	51.1	56.6
Insect repellents (n=571)	34	31.1	37	43.5	33.4	54.2	26.1	20.7	32.2	33.2	30.7	35.8
Flashlight (n=1102)	64.6	61.5	67.5	62.4	51.5	72.3	59.3	52.7	65.5	63.5	60.8	66.1
Radio (n=845)	51.3	48.2	54.4	51.2	40.6	61.7	41.6	35.3	48.1	49.6	46.9	52.3
Phones (n=982)	56.6	53.5	59.6	77.8	67.7	85.5	47	40.5	53.5	56.3	53.5	58.9
Cash (n=1319)	75.6	72.9	78.2	93.6	86.6	97.1	72.7	66.6	78.1	76.3	73.9	78.5
Medicines (n=1243)	70.5	67.6	73.2	85.7	76.4	91.8	74.5	68.4	79.7	72.2	69.7	74.5
Baby food and diapers (n=872)	52.9	49.8	56	50.3	39.7	60.8	38	31.9	44.5	50.1	47.4	52.9
Extra Batteries (n=609)	37.7	34.7	40.7	41	31.1	51.7	18	13.5	23.5	34.4	31.9	37
Sleeping bag (n=768)	46.5	43.4	49.6	44.8	34.6	55.5	32.1	26.3	26.3	43.8	41.2	46.6
Others (n=123)	6.7	5.3	8.5	9	4.3	18.1	12.4	8.6	17.6	7.9	6.5	9.5
Function of emergency response team												
Immediate assistants (n=1082)	59.2	54.6	63.8	63.4	58.6	68.2	78.4	73.8	83	62.7	55.4	70
Maintain good health (n=1015)	54.6	50.3	58.9	66.7	62.1	71.3	74.8	70.4	79.2	58.8	50.8	66.8
Save the lives (n=1229)	69.5	62.7	76.3	72.3	66.9	77.7	78.6	71.9	85.3	71.2	65.3	78.9
Support the morale (n=610)	34.5	29.8	39.2	36.5	33.8	39.2	38.8	31.7	45.9	35.3	30.3	40.3
Importance of first-aid training												
Managing injuries (n=1062)	61.3	55.3	67.3	61.8	53.8	69.8	62.5	58.2	66.8	61.5	55.7	67.3
Emergency care (n=1091)	62.4	56.4	68.4	63.8	58.8	68.8	66.6	60.9	72.3	63.2	58.3	68.1
Reducing injuries (n=1106)	63.1	57.1	69.1	64.4	60.2	68.6	68.1	63.8	72.4	64.1	59.2	69
Decreasing deaths (n=1107)	62.9	55.8	70	65.1	60.3	69.9	69.2	66.2	72.2	64.1	57.8	70.4
Good governance (n=204)	12.4	8.3	16.5	6.2	2.1	10.3	11.3	6.5	16.1	11.8	7.6	16
Policy development (n=152)	8.9	5.5	12.3	6.6	2.2	11	9.1	4.6	13.6	8.8	4.7	12.9
Well planning (n=606)	34.5	23.8	42.2	36.1	28.9	43.3	37.7	33.1	42.3	35.1	31.8	38.4
Cooperation/coordination (n=163)	9.3	3.7	14.9	9.8	4.1	15.5	10.1	4.4	15.8	9.4	5.8	13
Timely information (n=1006)	56.6	51.1	62.1	60.1	54.9	65.3	65.1	61.1	69.1	58.3	55.9	60.7
Availability of health services (n=1057)	58.8	51.3	66.3	65.5	60.8	70.2	70.8	63.3	78.3	61.2	55.4	67
Sources of weather information												
Television (n=1539)	88.9	82.8	95	89.3	86.2	92.4	90.1	83.3	96.9	89.2	85	93.4
Radio (n=1106)	60.5	54.4	66.6	61.6	54.8	68.4	80.9	71.8	90	64.1	48.4	79.8

Continued.

Awareness on	Dry region			Hilly region			Delta region			Total		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI	
Newspapers/Journals (n=132)	6.9	2.5	11.3	11.1	5.1	17.1	9.8	4.7	14.9	7.7	4.7	10.7
Internet (n=1389)	78.5	72.7	84.3	79.8	71.1	88.5	89.6	83.6	95.6	80.5	76.3	84.7
Social Mobilizers (n=66)	1.2	0.2	2.2	3.3	0.8	5.8	15.8	8.9	22.7	3.8	1.1	6.5
Others (n=235)	13.8	9.1	18.5	16.3	11.8	20.8	11.6	8.4	14.8	13.6	9.2	18
Overall awareness level												
Good (n=660)	38.9	35.9	42.1	45.1	34.9	55.6	31.3	25.6	37.7	38.2	35.3	40.7
Poor (n=1066)	61.1	57.9	64.1	54.9	44.2	65.1	68.7	62.3	74.4	61.8	59.3	64.7

Disaster awareness of study residents

Among study residents, 72.4% in the dry region, 54.3% in the hilly region and 88.6% in the delta region could mention the common disaster types they experienced, and 71.5% in the dry region, 53.4% in the hilly region and 87.6% in the delta region were aware of being risky for disasters. In examining the awareness of disaster preventive measures, the answers of study residents in the dry, hilly and delta regions were that staying in the evacuation zones (32.4%, 29.8%, 29.7%), having an emergency plan (21.7%, 20.6%, 17.4%), preparing an evacuation plan (38.3%, 32.7%, 38.9%), and keeping disaster supply kits (30.7%, 23.4%, 37.8%) respectively. Besides, the necessaries during disaster answered by the study residents in the dry, hilly and delta regions were drinking water (87.6%, 91.2%, 85.4%), food (88%, 86.6%, 87.7%), blankets (53.1%, 52.4%, 38.8%), clothing (67.2%, 64.6%, 64.2%), first aid kits (53.7%, 70%, 48.8%), insect repellents (34%, 43.5%, 26.1%), flashlight (64.6%, 62.4%, 59.3%), radio (51.3%, 51.2%, 41.6%), phones (56.6%, 77.8%, 47%), cash (75.6%, 93.6%, 72.7%), medicines (70.5%, 85.7%, 74.5%), baby food and diapers (52.9%, 50.3%, 38%), and extra batteries (37.7%, 41%, 18%) independently. The study residents' responses to the awareness questions regarding the functions of an emergency response team were the provision of immediate assistants (59.2%, 63.4%, 78.4%), maintaining good health (54.6%, 66.7%, 74.8%), saving the lives (69.5%, 72.3%, 78.6%) and supporting the morale (34.5%, 36.5%, 38.8%), respectively in the dry, hilly and delta regions. In regard to the importance of first-aid training for reducing disaster-related risks, the residents answered that the first-aid training is useful in managing injuries (61.3%, 61.8%, 62.5%), providing emergency care (62.4%, 63.8%, 66.6%), reducing injuries (63.1%, 64.4%, 68.1%) and decreasing deaths (62.9%, 65.1%, 69.2%), distributively in the dry, hilly and delta regions. In regard to awareness of the study residents in the dry, hilly and delta regions about key components to reduce disaster health risks, the responses were good governance (12.4%, 6.2%, 11.3%), policy development (8.9%, 6.6%, 9.1%), well planning (34.5%, 36.1%, 37.7%), cooperation and coordination (9.3%, 9.8%, 10.1%), timely information (56.6%, 60.1%, 65.1%), and availability of healthcare services (58.8%, 65.5%, 70.8%) independently. Concerning the sources of the weather report, from the dry, hilly and delta regions, the awareness of the study residents included television (88.9%, 89.3%, 90.1%), radio (60.5%, 61.6%, 80.9%), newspapers/journals (6.9%, 11.1%, 9.8%), the Internet (78.5%, 79.8%, 89.6%), and social mobilizers (1.2%, 3.3%, 15.8%). Each correct answer was rated by 1 point to calculate the overall disaster-related awareness score. After rating all answers of the study resident singly, those who got 60% and above of the total scores were awarded good awareness. Accordingly, of the study residents from the hilly, dry, and delta regions, 38.9%, 45.1%, and 31.3% were good at disaster-related awareness, respectively. Overall, only 38.2% of all samples had good awareness levels (Table 1).

Disaster preparedness of study residents

Preparedness before disaster; (Table 2) was constructed to demonstrate the distribution of disaster preparedness status among residents in the three different regions. More than one-third of study residents from all regions had a plan to live in the evacuation zone. Around one-fifth had an emergency plan, and approximately one-third had an evacuation plan. The study residents reported a prepared disaster kit of 28.6%, 21.8%, and 34.7% in the dry, hilly, and delta regions. The residents listed 14 items as basic requirements of a disaster kit and prepared for 1-5 items in 27.2%, 20.3%, 34.2%, 6-10 items in 11.3%, 11.2%, 18.8% and 11-14 items in 4.8%, 3.5%, and 6.1% for all dry, hilly, and delta regions, respectively. For other activities prepared by the study residents from the dry, hilly, and delta regions, their respective proportions were 21.4%, 13.1%, 24.1% for only flood preparedness, 12.4%, 7.4%, 14.6% for developing and strengthening disaster response skills, 9.6%, 7.8%, 11.7% for fostering the exchange system of communication and information, 9.1%, 5.9%, 12.9% for stockpiling food and other necessaries, 6.2%, 2.9%, 4% for search and rescue procedures, 8.5%, 2.7%, 7.5% for safest places from disaster and 7.6%, 3.9%, 6.9% for information management. In assessing how to prepare for disaster risk reduction, the particular proportions of the study residents from the dry, hilly, and delta regions were 25.4%, 24.4%, 24.4% for assessment of nature and potential of disaster risk, 21.5%, 19.5%, 19.5% for risk reduction planning, 20.1%, 23.5%, 17.6% for the disaster risk-based action plan, 34.4%, 30.9%, 46% for the community meeting, volunteer selection and material requirements, and 13.4%, 15.2%, 14.4% for community-based disaster management policy.

Table 2: Distribution of preparedness status before disaster among residents from dry, hilly and delta regions (n=1726).

Preparedness for	Dry region			Hilly region			Delta region			Total		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI	
Live in an evacuation zone (n=637)	36.5	33.6	39.6	44.6	34.4	55.3	35.6	29.6	42.1	36.9	34.3	39.6
An emergency plan (n=377)	21.8	19.3	24.4	30.3	21.4	40.9	17.7	13.2	23.3	21.6	19.4	23.9
An evacuation plan (n=538)	30.4	27.6	33.3	41.1	31.1	51.8	27	21.6	33.2	30.5	28.1	33
Disaster kit (n=504)	28.6	23.9	33.3	21.8	13.4	30.2	34.7	28.6	40.8	29.2	26.4	32
1-5 items of disaster kit (n=302)	27.2	22.3	32.1	20.3	13.1	27.5	34.2	27.7	40.7	27.9	24.8	31
6-10 items of disaster kit (n=117)	11.3	9.9	12.7	11.2	8.7	13.7	18.8	12.9	24.7	12.6	10.1	15.1
11-14 items of disaster kit (n=85)	4.8	2.1	7.5	3.5	1.3	5.7	6.1	2.2	10	4.9	1.9	7.9
Flood preparedness (n=353)	21.4	19	24.1	13.1	7.5	21.8	24.1	18.9	30.2	20.4	19.2	21.6
Capacity building (n=203)	12.4	10.5	14.6	7.4	3.5	15.0	14.6	10.4	19.9	11.7	10.7	12.7
Awareness-raising (n=155)	9.6	7.9	11.7	7.8	3.7	15.6	11.7	8.1	16.6	8.9	6.2	11.6
Stockpiling (n=160)	9.1	7.5	11.1	5.9	2.6	12.7	12.9	9.1	18.1	9.3	7.3	11.3
Search and rescue strategies (n=89)	6.2	4.8	7.9	2.9	1.0	8.0	4	2.1	7.4	5.2	3.5	6.9
Safe area (n=131)	8.5	6.9	10.5	2.7	0.8	7.0	7.5	4.7	11.8	7.6	5.6	9.6
Info of management (n=111)	7.6	6.0	9.4	3.9	1.5	9.6	6.9	4.2	11.0	6.4	4	8.8
Preparedness for disaster risk reduction												
Risk assessment (n=434)	25.4	22.7	28.2	24.4	16.4	34.6	24.4	19.3	30.3	25.1	22.8	27.6
Risk reduction planning (n=364)	21.5	19	24.2	19.5	12.5	29.1	19.5	14.9	25.2	21	18.9	23.3
Action plan (n=344)	20.1	17.6	22.8	23.5	15.7	33.5	17.6	13.2	23.1	19.9	17.7	22.2
Mobilization resources (n=627)	34.4	31.5	37.5	30.9	22	41.4	46	39.6	52.6	36.3	33.7	39
Policy development (n=237)	13.4	11.4	15.7	15.2	9	24.4	14.4	10.4	19.6	13.7	11.9	15.7
Listen to radio (n=1354)	76	73.2	78.6	81.6	72	88.4	84.9	79.6	89	77.9	75.6	80.1
Keeping abreast (n=906)	52.1	49	55.2	61.4	50.6	71.1	52.9	46.4	59.3	52.9	50.2	55.6
Preparing to evacuate (n=904)	53	49.9	56.1	46.6	36.2	57.3	46.7	40.3	53.2	51.5	48.8	54.2
Staying away from the disaster-affected areas (n=1007)	59.1	56	62.1	51.6	40.9	62	57.7	51.1	63.9	58.3	55.6	61
Planning for the children and dependent people (n=980)	58.9	55.8	62	53.1	42.5	63.5	47.1	40.6	53.6	56.5	53.7	59.1

Table 3: Distribution of preparedness status during disaster among residents from dry, hilly and delta regions (n=1726).

Preparedness for	Dry region			Hilly region			Delta region			Total		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI	
Emergency response operations												
Monitoring potential hazards (n=300)	19.2	16.8	21.8	12.9	7.5	21.2	13.2	9.3	18.3	17.7	15.7	19.9
Disseminating information (n=355)	22.4	19.8	25.1	11.1	6.4	18.8	20.8	16	26.7	21.3	19.2	23.7
Early warning (n=387)	24	21.4	26.9	12.3	7.2	20.2	22.4	17.4	28.4	23	20.8	25.4
Rescue and evacuation (n=409)	24.7	22.1	27.5	17.8	11.1	27.3	25.8	20.4	31.9	24.4	22.1	26.9
Ways for emergency response												
Safe area management (n=388)	23.7	21.1	26.5	16.6	10.3	25.7	22.3	17.3	28.2	23	20.8	25.4
Health and environmental sanitation (n=450)	13.6	11.6	15.9	9.7	5.2	17.3	10.1	6.7	14.9	12.7	11	14.7
Impact assessment (n=248)	14.2	12.2	16.6	10.8	6	18.6	14.3	10.2	19.6	14	12.2	16
Emergency response (n=450)	26.9	24.2	29.8	21.5	13.9	31.6	25.5	20.1	31.6	26.3	24	28.8
Discussion points for preparing emergency plans among family members												
Locations of the safest areas	35.6	32.7	38.7	25.4	17.2	35.9	38.6	32.5	45.2	35.5	32.9	38.1

Continued.

Preparedness for	Dry region			Hilly region			Delta region			Total		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI	
Escape routes (n=498)	31.1	28.3	34.1	22.9	15.1	33.1	23.6	18.5	29.7	29.3	26.8	31.8
The closet shelter (n=563)	34.1	31.2	37.1	24.6	16.6	34.9	35.1	29.1	41.6	33.6	31.1	36.3
Single point of contact (n=373)	23.2	20.6	26	17.7	11.1	27	21.6	16.7	27.5	22.5	20.3	24.9
Plans for pets (n=255)	17.1	14.9	19.7	10.6	5.6	19.3	9.5	6.3	14.1	15.4	13.5	17.5
Readiness to preparing during disasters												
Ensuring important documents (n=1406)	80.2	77.6	82.5	89.9	81.4	94.8	87.1	82.2	90.9	82	79.9	84
Basic safety measures (n=819)	48.7	45.6	51.8	55.2	44.4	65.5	43.8	37.5	50.4	48.3	45.5	51
Non-perishable emergency supplies (n=1065)	60.1	57	63.1	69.4	58.5	78.5	70.3	64.1	75.8	62.5	59.8	65.1
Disaster supply kit (n=929)	52.8	49.7	55.9	59	48.1	69	56.1	49.6	62.5	53.8	51.1	56.5
Medicines (n=1043)	58.4	55.3	61.5	75.9	65.5	83.9	68.8	62.6	74.4	61.4	58.8	64
Practicing and maintaining a plan (n=295)	17.2	15	19.7	21.4	14.3	30.9	10.4	7.1	14.9	16.3	14.4	18.3

Table 4: Distribution of preparedness status after disaster among residents from dry, hilly and delta regions (n=1726).

Preparedness for	Dry Region			Hilly Region			Delta Region			Total		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI	
Functions after disaster												
Estimation of damage and needs (n=485)	27.1	24.4	29.9	26	17.8	36.3	35.4	29.4	41.8	28.5	26.1	31
Planning for development (n=382)	22.7	20.2	25.4	24.5	16.4	34.8	22.9	17.8	28.9	22.9	20.7	25.2
Reconstruction and rehabilitation plan (n=506)	31.2	28.4	34.2	28.3	19.6	38.9	28.9	23.2	35.3	30.6	28.2	33.2
Preparedness after returning home												
Assessment of area safety (n=1088)	62.9	59.9	65.9	85.1	76.1	91.1	54	47.4	60.4	62.8	60.1	65.4
Deciding the time to return home (n=1088)	62.9	59.9	65.9	85.1	76.1	91.1	54	47.4	60.4	62.8	60.1	65.4
Observation of outside fields (n=1012)	57.9	54.8	60.9	74.7	64	83	56.9	50.4	63.2	58.8	56.1	61.5
Preparedness for wild and poisonous animals (n=943)	56.9	53.8	60	53.7	42.9	64	53.4	46.9	59.8	56.1	53.4	58.8
Preparing food safety (n=1071)	60.7	57.6	63.7	79.9	69.7	87.3	63.7	57.3	69.6	62.5	59.8	65.1
Managing water sources (n=1012)	58.4	55.3	61.5	74	63.3	82.4	55.7	49.2	62	59	56.3	61.6
Overall preparedness level												
Good (n=238)	15.2	13.1	17.6	12.2	6.9	20.6	9	5.8	13.7	13.9	12.1	15.9
Poor (n=1488)	84.8	82.4	86.9	87.8	79.4	93.1	91	86.3	94.2	86.1	84.1	87.9

Continuously, planning for risk reduction was assessed through additional items such as listening to the radio, keeping abreast, preparing to evacuate, staying away from the disaster-affected areas, placing the children and dependent people away from the disaster-affected areas. Their particular proportions of the independent items were displayed in (Table 3) according to the three different regions.

Preparedness during disaster

The preparedness activities during the disaster were assessed through two main headings, such as emergency response operations and ways to emergency response. When measuring four categories of preparing emergency response operations, 19.2%, 12.9%, and 13.2% of the study residents from the dry, hilly, and delta regions have monitored potential hazards. 22.4%, 11.1%, 20.8%, have planned how to disseminate disaster information, 24%, 12.3%, 22.4% have prepared for a timely and meaningful warning system, and 24.7%, 17.8%, 25.8% have planned for community-initiative critical operations.

Further, the other four categories were assessed for the preparedness ways for emergency response among the study residents in the dry, hilly, and delta regions

independently. Their isolated responses were arrangement of safe area (23.7%, 16.6%, 22.3%), sanitary management of health and environment (13.6%, 9.7%, 10.1%), assessment of disaster impacts (14.2%, 10.8%, 14.3%) and systematic response to emergency occurrence (26.9%, 21.5%, 25.5%). The discussion points included in preparing emergency plans among family members, the preparation responses of the study residents according to their respective regions (dry, hilly, and delta) were the locations of the safest areas (35.6%, 25.4%, 38.6%), escape routes (31.1%, 22.9%, 23.6%), the closet shelter (34.1%, 24.6%, 35.1%), single point of contact (23.2%, 17.7%, 21.6%), and plans for pets (17.1%, 10.6%, 9.5%). Additionally, the readiness to prepare during disasters mentioned by the study residents in the dry, hilly, and delta regions was the quantity and quality assurance of the important documents (80.2%, 89.9%, 87.1%), basic and common safety measures (48.7%, 55.2%, 43.8%), non-perishable emergency supplies (60.1%, 69.4%, 70.3%), disaster supply kit containing essential items (52.8%, 59%, 56.1%), medicines (58.4%, 75.9%, 68.8%) and practicing and maintaining plan (17.2%, 21.4%, 10.4%) respectively.

Preparedness after disaster

Three main preparations were independently assessed concerning the preparedness after the disaster. The disaster-related damage/needs assessment was (27.1%, 26%, 35.4%), post-disaster recovery was (22.7%, 24.5%, 22.9%), and reconstruction/ rehabilitation was (31.2%, 28.3%, 28.9%) in the dry, hilly, and delta regions respectively. Further, the preparedness activities done after returning home were examined through five questions. The assessment of area safety and deciding the time to return home (62.9%, 85.1%, 54%), observation of outside fields (57.9%, 74.7%, 56.9%), preparedness for wild and poisonous animals (56.9%, 53.7%, 53.4%), preparing food safety (60.7%, 79.9%, 63.7%) and managing water sources (58.4%, 74%, 55.7%) were reported among those residing in the dry, hilly and delta regions respectively.

Each preparation point was assigned 1 point to determine the overall disaster-related preparedness conditions. Afterwards, those obtaining 60% and above in total scores were defined as good preparation. Correspondingly, 15.2% of the study residents from the Dry region, 12.2% from the Hilly region, and 9% from the Delta region were determined as good preparedness. The reported proportion of overall good preparedness was 13.9%.

DISCUSSION

Since the widespread death and destruction of the 2004 tsunami and the 2008 Cyclone Nargis in Myanmar, disaster awareness and preparedness of the community might be increasing. But the scientific evidence was less available for describing how the residents at risk of disaster are aware of and what they prepared for the disaster risk reduction management. This work was a scientific effort and specially designed to report the distributions of disaster awareness and preparedness activities among the people at risk of disasters. In recent years, disaster response mechanisms and risk-reduction programs have been accelerated in Myanmar through joint implementation of government and international organizations. Therefore, the discussion mainly focuses on the effectiveness of these mechanisms and programs within the study regions. Additionally, the researchers wanted to compare the disaster awareness and preparedness conditions between the study regions and other disaster-prone regions of ASEAN countries. Among the three regions we studied, many residents were aware of the common disaster types and risks, but no resident in the hilly region mentioned the disaster type of landslide. In 2015, many residents experienced the devastation of landslides that destroyed many rural roads, crucial bridges, water sources, and electric supply systems in the hilly area.[10] In this finding, the remarkable improvement in overall disaster awareness of those living in three regions was not found because only one-third had good awareness levels on average, which may be due to more strenuous efforts on their economy rather than a disaster. Also, a report of the United Nations Development Programme showed that more than 70% of residents in the Chin State and more than half of the residents from the dry and delta regions poorly participated in the minimum preparedness actions of the disaster due to the influences of poverty.[11] Thus, the community-level training and community-based initiatives on disaster awareness promotion still need to be strengthened. The programmers of disaster awareness promotion should consider supporting the community to get more affordability, accessibility, and responsibility and choose more collective approaches in promoting the community's disaster awareness.

Besides, the three study regions noted variable and low awareness proportions of disaster preventive approaches, including the importance of disaster emergency and evacuation planning and supply kits. A recent systematic review by Rezaldi et al concluded that many communities residing in the ASEAN countries had improved their disaster awareness on risk reduction, emergency, and evacuation actions and policies because of the development and widespread availability of electronic disaster information media.[12] However, the result of this study slightly deviated from their conclusion. When comparing the disaster awareness levels of Indonesian and Laos communities, this study also showed a low level among the study sites. These differences might be because many Indonesian communities' awareness is promoted under the National disaster management authority (BNPB) through electronic and printed media that provide timely disaster-related information about types, likelihoods, risks, impacts, and other forecasts before, during, and after a disaster.[13] Besides, most Laos

communities have better awareness, and they also have abilities to check the accuracy, clearness, and appropriateness of the disaster information sources.[14] When comparing the overall disaster awareness levels of the residents in the study regions with the Singapore community, better awareness of disaster was noted among the vast majority of Singaporeans. This might be because the disaster information sharing services of the Singapore Civil Defence Force are timely, real-time updates, modernized, effective, and speedy. Because of the full cooperation of the operators and repetitive presentations of disaster information in popular places (e.g., Marina Barrage Sustainable Singapore Gallery) in Singapore, the increased awareness levels of their communities are more remarkable.[15]

However, the Myanmar National Disaster Management Committee (MNDMC) has been recognized as a sufficient and high stage in conveying good disaster information and building good disaster response strategic guidelines among ASEAN countries.[12] The MNDMC has been applying all available disaster information media, including bulletins, maps, the hydrologic modelling system, social media, websites, message systems of phones, radio and television programs, and other printed media, for promoting disaster awareness and dealing with the disaster crisis through the community. initiatives.[16]Nonetheless, the reasons for low awareness of disasters among the study sites should be explored through further empirical research, and the effectiveness of current disaster information media should be evaluated. As to Rezaldi et al for being the successful promotion of disaster awareness, the information provided by media should have penetrating power without any limitation of distance, space, money, and time, enough frequencies of productions and distributions, highest coverage of different audients, easy understandability, accessibility and affordability, and high attractions.[12]

This study showed that most study residents were aware of things to bring when going to shelters. However, this study also reported that about half of the residents in the dry and hilly regions were unaware of some activities of the disaster emergency response team. Also, more than one-third of the study residents were unaware of the importance of first-aid training. In Myanmar, the humanitarian country team (HCT) widely disseminated standard operation procedures and provided action-oriented, community-based training on disaster emergency response. In addition, they have organized many rapid response teams through an inter-sectoral approach since 2014.[17] There might be some weaknesses in the disaster-associated activities of the HCT, and robust monitoring and evaluation measures should be strengthened. In this study, there were very low proportions of the study residents who were aware of critical components of disaster risk reduction. Besides, newspapers and social mobilizers were less effective, and social media, televisions, and radios were highly used for disaster awareness promotion in three regions. This evidence was closely related to Heinkel et al which revealed that 79.5% of their study households received disaster information from television channels.[18] Therefore, MNDMC should develop and update disaster information media such as Facebook, Pages, Websites, Instagram, TV Channels, and Radios with more budgets, frequencies, and coverage for effective awareness programs of disasters. Regarding preparedness before the disaster, findings were variable among three regions. Approximately one-third of the study residents have prepared for evacuation, emergency response, and disaster kits, while approximately one-fifths have arranged for the flood. A few study residents have found other necessary preparations for capacity building, awareness-raising, search and rescue strategies, information management, risk reduction plan, action plan, and policy development. More than half had prepared for disaster risk reduction activities such as collecting information, keeping abreast, preparing to evacuate and staying away from the disaster-affected areas. 16-20% of respondents monitored potential hazards and alarming systems during the disaster, 11-27% prepared for environmental safety and injuries, and 14-37% designed for rescue routes, shelters, and pets. Concerning preparedness after the disaster, study residents prepared about 26%-31% for damages and needs, 20-26% for development, 28-34% for construction/rehabilitation, and about 60% for water management. The overall disaster preparedness activities among residents of this study were unsatisfactory levels (13.9%) when comparing the disaster preparedness of Filipinos (more than 31%).[19] However, the disaster preparations for the particular activities were variable between this study and a similar Philippine study. For instance, the Philippine study reported that 28.9% of their study participants had participated in disaster-related training[19,] whereas this study disclosed the participation rate of capacity building was less than 12%. More proportions in preparing disaster kits and other emergencies were reported in this study (approximately 30%) than in the Philippines (19.5%).[19] In designing a warning system, around 23% was shown in this study, while 6.3% was demonstrated in the Philippine study.[19] A recent Myanmar study by Heinkel et al on 440 households residing in the disaster risk zone of Yangon reported that 71.6% had prepared for one or more activities of disaster preparedness; the majority had collected the essential medicines necessary for their families. About 26% had prepared emergency first-aid kits.[18] If we compared the results of our study with a study of Heinkel et al, some results were consistent, but some were slightly different. For instance, many proportions of this study population had mainly prepared for emergency and evacuation, escape routes, shelters, and water supply systems. At the same time, health-related preparedness and alternative cooking facilities were more likely to be planned among Yangon households in Heinkel et al study.[18] Besides, food-related preparedness was similarly found among around 20% in our investigation and Heinkel et al investigation.[18]

However, some inconsistent results between this study and Heinkel et al study might be due to the differences in study sites, sampling frames, sample size, and characteristics of samples.

CONCLUSION

Most of the study residents were aware of the prevailing disaster types and associated risks and the critical things necessary for their families during a disaster. However, few were aware of evacuation and emergency plans, and many were less familiar with disaster risk reduction essential components. Likewise, a few prepared for an emergency, search and rescue strategies, safe areas, disaster kits, risk reductions, impact assessments, action plans, and policy development. Also, a few participated in capacity building, awareness-raising, and information management activities. Overall, disaster awareness and preparedness levels were unsatisfactory in all three regions. Thus, this study recommended that the NNDMC should effectively apply the information media, adopt the appropriate models, and provide training and advocacies for disaster awareness promotion. Further, this committee should continuously support the safe community initiatives of disaster preparedness for the community-oriented disaster management capacities. Additionally, the HCT should promote a culture of disaster prevention in schools emphasized by the media, and the disaster management agencies should energetically pursue it.

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