

Factors associated to disaster preparedness among nursing university students in Japan

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Abstract

Objectives: In Japan, large-scale natural disasters such as earthquakes, tsunamis and floods frequently occur, often having devastating effects on people's lives. For this reason, it is imperative that people be prepared for disasters at an individual, family and community level in Japan. This study aims to evaluate factors associated to individual disaster preparedness among nursing university students in Japan.

Methods: An anonymous self-administered questionnaire survey was conducted among nursing university students in July, 2017 in Japan. The questionnaire was prepared based on questions used in previous studies by the Cabinet Office, which included perception of natural disasters and actual behaviors related to disaster preparedness.

Results: The questionnaire was distributed to 215 nursing university students, and 170 were analyzed in this study. Although 91.4% of respondents showed concern for disasters and 81.2% respondents for disaster preparedness, only 50.0% respondents were aware of the location of evacuation area closest to their current residential area and 17.6% respondents had some prearranged communication method with family in the event of disaster. Respondents living alone were less likely to know the location of evacuation area (AOR: 0.217; 95% CI: 0.103, 0.459; $P < 0.001$) than respondents who lived with their family, and respondents with experience of training/lecture on disaster preparedness were more likely to know the location of evacuation area (AOR: 3.418; 95% CI: 1.448, 8.064; $P = 0.005$). Respondents who recognized the importance of disaster preparedness (AOR: 4.084; 95% CI: 1.430, 11.683; $P = 0.009$) were more likely to have arranged with their family how to communicate with each other in the event of disaster.

Conclusions: Participating in training/lecture regarding disaster preparedness contributed to actual disaster preparedness such as knowing the location of evacuation area. However, there was no contribution of participation in training/lectures on other behaviors of preparedness such as prearrangement of communication methods with family, preparation of emergency items, and registration in disaster notification services. As persons whose professional skills will be sought in pre- and post-disasters, it is essential to strengthen the capabilities of nursing university students through training on disaster preparation in order that they can effectively prepare for future disasters.

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Introduction

Incidence of natural disasters and damage by disasters have increased in the recent decade, and the number of people who have been affected by natural disasters has increased from 278 million in 1990 to

376 million in 2015 worldwide^{1,2)}. In 2017, 318 natural disasters occurred in the world, which resulted in a total of 9,503 deaths, 96 million people afflicted, and US\$314 billion in economic damage³⁾. These numbers of deaths and people afflicted were lower than the last

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10-year average, but economic losses were higher³⁾. This trend has been observed not only in the world, but also in Japan, where large-scale natural disasters such as earthquakes, tsunamis and floods frequently occur, and damage people's lives⁴⁾.

According to the study conducted by the Cabinet Office, Government of Japan, although more than 60% of people anticipate a possibility of occurrence of a large scale natural disaster in the near future, less than 40% of people prepared for disaster. In addition, there was a tendency of older people to be more prepared against disaster compared to younger people⁵⁾. There is a serious gap between prediction of natural disasters and practical action of disaster preparation among the Japanese population, despite living in a county with high density of natural disasters - not only earthquakes, but also typhoons, heavy downpours, inundations, landslides, tsunamis, volcanic eruptions among others⁶⁾.

Medical-health professionals including nurses are expected to undertake the role of providing treatment and care/support from the early stages immediately after a disaster to middle/long-term stages after disaster. Disaster nursing has officially been included in the curriculum of Japanese nursing education over the last 10 years, due to increasing importance in and needs for nurses' role and function in the occurrence of disasters. A previous study showed that nursing students did not take practical preparatory actions against disasters, although they showed concern regarding disasters and had learnt about disaster preparedness⁷⁾ as a general, non-nursing student young population⁵⁾. On the other hand, there was a difference in actual disaster preparedness including knowledge about location of evacuation area and confirmation of communication methods with family in the event of disasters among nursing students by characteristics of their residential areas with different disaster experiences including earthquakes and typhoons⁸⁾. This tendency was also observed in disaster education at elementary, junior high and high schools⁹⁾.

It is required to be prepared for disasters at an individual, family and community level in Japan. Nursing students are further expected to be prepared against disasters not only in areas with frequent and critical disasters, but also in any area of Japan because their profession requires them to be closely concerned with disaster issues and be firsthand supporters in the event of disaster. To this effect, this study aims to evaluate the factors associating to individual

disaster perceptions and preparedness in addition to experiences of participating in training/lecture and actual disaster experience among nursing university students in Japan.

Methods

An anonymous self-administered questionnaire survey was conducted among first, second and third year nursing university students in July, 2017 in Nagasaki city that is the seat of Nagasaki prefecture, Japan. Nagasaki prefecture is located facing the East China Sea, making the area prone to flood damage caused by the frequent typhoons and torrential rains. Earthquakes are also a constant threat; seismic intensity 5 was observed in the southern part of Nagasaki prefecture in the disastrous earthquake that hit Kumamoto prefecture in 2016.

The questionnaire was prepared based on questions used in the previous studies "A study on disaster perception and preparedness in everyday life" in 2016 and "Public opinion poll on disaster preparedness" in 2013 conducted by the Cabinet Office, Government of Japan. The questionnaire included perception of natural disasters, self-rated possibility of being affected by disasters and importance of disaster preparedness by a visual analog scale (0-10), actual emergency supplies (0-12) and behaviors prepared including knowing evacuation area close to their residential area in the event of disasters, prearrangement of communication methods with family in event of disaster and registration in some type of disaster notification services such as applications that alert of impending earthquakes/other natural disasters, in addition to living conditions and experiences of participating in training/lecture on disaster preparedness. Actual emergency supplies were evaluated by the number of self-reported items selected from a list of possible supply items.

Chi-square test and logistic regression analysis were performed to assess factors associated to actual disaster preparedness. Analyses were performed using IBM SPSS ver. 22. In all analyses, $P < 0.05$ was taken to indicate statistical significance.

This study was approved for publication by the ethical review board of our institution (Reference number: 18110803). The study participants were informed about the objectives of the study, both orally and in writing, and were asked to participate voluntarily. Submission of the completed questionnaire was considered to indicate agreement to participation in the study.

Results

The questionnaire was distributed to 215 nursing university students, of which 169 respondents were valid for analysis in this study. Table 1 shows the demographic characteristics of the respondents. More than half of the respondents (62.7%) lived alone, and 74.6 % had participated in the training/lecture on disaster preparedness. Although 91.7% respondents indicated concern on disasters and 81.7% on disaster preparedness, only 50.3% respondents reported as knowing the location of evacuation area close to their current residential area and 17.8% respondents reported as having some prearrangement with family on how to communicate with each other in the event of disaster.

The mean and standard deviation (SD) of self-rated possibility of being affected by disasters measured by visual analog scale (0-10) were 7.34 ± 1.930 (range: 2-

10), and self-rated importance of disaster preparedness measured by visual analog scale (0-10) were 6.85 ± 2.223 (range: 2-10). In accordance with the mean, the self-rated possibility of being affected by disasters and importance of disaster preparedness were categorized as “high” for scores of 7 or over and “low” for less than 7. The mean and SD of number of items prepared for disasters (0-12) were 1.36 ± 1.694 (range: 0-9). Respondents with experience of participating in training/lecture on disaster preparedness more likely reported their preparedness of emergency supplies (1.49 ± 1.790) than those without experience of training/lecture (0.97 ± 1.298), but the associations were not statistically significant (t-test, $P=0.109$).

Major supply items prepared for disasters were flashlight (33.5%) and drinking water (21.3%), but 45.3% of respondents had not prepared any emergency supplies for disasters. Twenty four (14.1%)

Table 1. Demographic characteristics of study participants (N=169)

	n	%
Living condition		
Living with family	57	33.7
Living alone	106	62.7
Others	2	1.2
No response	4	2.4
Participating in training/lecture on disaster preparedness		
No	37	21.9
Yes	126	74.6
No response	6	3.6
Concern (perception) on disasters		
No/not much	14	8.3
Yes	155	91.7
Concern (perception) on disaster preparedness		
No/not much	19	11.2
Yes	138	81.7
No response	12	7.1
Knowledge of location of evacuation area		
No	84	49.7
Yes	85	50.3
Prearrangement of communication method with family in event of disaster		
No	139	82.2
Yes	30	17.8

Table 2. Self-reported preparedness of supply items for disasters and registrations in disaster notification services (N=169)

	n	%
Items prepared for disasters		
Fire extinguisher	11	6.5
Store food	27	16.0
Store drinking water	36	21.3
Portable radio	16	9.5
Flashlight	57	33.5
Medicine	29	17.2
Valuables	24	14.2
Reserve battery	12	7.1
No any item prepared	77	45.3
No response	2	1.2
Registrations in disaster notification services		
Registration in disaster notice e-mail	10	5.9
Registration in disaster notice application	19	11.2
No any registration in disaster notification services	140	82.4
No response	5	3.5

respondents were registered in some type of disaster notification services (Table 2).

Table 3 reports factors related to knowledge and preparedness regarding evacuation in the event of disasters that have been analyzed by chi-square test. Living with family ($P<0.001$) and having participated

in training/lecture on disaster preparedness ($P=0.003$) were significantly related to knowledge about location of evacuation area close to their residential area. There was a statistically significant number of respondents who reported higher recognition of importance on disaster preparedness ($P=0.002$), preparing at least

Table 3. Relationship between nursing students' characteristics and knowledge on location of evacuation area and prearrangement of communication method with family in event of disaster (N=169)

	Knowing location of evacuation area		P	Prearrangement of communication method with family in event of disaster		P
	n	%		n	%	
Living condition						
Living with family	42	73.7	<0.001	9	15.8	0.624
Living alone	41	38.7		20	18.9	
Participating in training/lecture on disaster preparedness						
No	11	29.7	0.003	7	18.9	0.749
Yes	72	57.1		21	16.7	
Self-evaluation of possibility to be affected by disasters						
Low (< 7)	21	48.8	0.825	7	16.3	0.770
High (≥ 7)	64	50.8		23	18.3	
Self-evaluation of importance regarding disaster preparedness						
Low (< 7)	41	53.9	0.391	6	7.9	0.002
High (≥ 7)	44	47.3		24	25.8	
Knowing location of evacuation area						
No				16	19.0	0.661
Yes				14	16.5	
Prearrangement of communication method with family in event of disaster						
No	71	51.1	0.661			
Yes	14	46.7				
Preparedness of supply items						
No	34	44.2	0.142	7	9.1	0.006
Yes (at least one item)	50	55.6		23	25.6	
Registration in disaster notification services						
No	70	50.0	0.706	21	15.0	0.030
Yes (at least one registration)	13	54.2		8	33.3	

"No response" was excluded from analysis. Chi-square test was conducted.

Table 4. Relationship between nursing students' characteristics and preparedness of items and registrations in disaster notification services (N=169)

	Items		P	Registrations		P
	n	%		n	%	
Living condition						
Living with family	32	57.1	0.600	7	12.5	0.587
Living alone	56	52.8		16	15.7	
Participating in training/lecture on disaster preparedness						
No	18	50.0	0.524	5	14.3	0.959
Yes	70	56.0		18	14.6	
Self-evaluation of possibility to be affected by disasters						
Low (< 7)	22	51.2	0.677	5	11.9	0.562
High (≥ 7)	68	54.8		19	15.6	
Self-evaluation of importance regarding disaster preparedness						
Low (< 7)	42	56.8	0.508	10	13.5	0.713
High (≥ 7)	48	51.6		14	15.6	
Knowing location of evacuation area						
No	40	48.2	0.142	11	13.6	0.706
Yes	50	59.5		13	15.7	
Prearrangement of communication method with family in event of disaster						
No	67	48.9	0.006	16	11.9	0.030
Yes	23	76.7		8	27.6	
Preparedness of supply items						
No				4	5.3	0.002 ^a
Yes (at least one item)				20	23.3	
Registration in disaster notification services						
No	66	47.8	0.001			
Yes (at least one registration)	20	83.3				

"No response" was excluded from analysis. Chi-square test or Fisher's exact test^a was conducted.

1 supply item for disaster ($P=0.006$) and showing at least 1 registration in some disaster notification services ($P=0.030$), and had some prearrangement with family as to how to communicate with each other in the event of disaster. However, the living condition, participation in training/lectures on disaster preparedness, recognition of possibility of suffering from disasters and conceived importance regarding disaster preparedness did not relate to the preparation of supply items or registration in a disaster notification service (Table 4).

Table 5 demonstrates factors associated to knowledge of location of evacuation area and prearrangement of communication methods with family in event of disaster that were analyzed by logistic regression analysis. Respondents who live alone were less likely to know the location of evacuation area (AOR: 0.217; 95% CI: 0.103, 0.459; $P<0.001$) than respondents living with family, and respondents with experience of training/

lecture on disaster preparedness were more likely to know the location of evacuation area (AOR: 3.418; 95% CI: 1.448, 8.064; $P=0.005$), regardless of recognition of possibility to be affected by disasters and importance regarding disaster preparedness. Respondents who recognized the importance of disaster preparedness (AOR: 4.087; 95% CI: 1.430, 11.683; $P=0.009$) were more likely to have confirmed with family how to communicate with each other in the event of disaster, regardless of living condition, participating training/lecture on disaster preparedness, and recognition of possibility to be affected by disasters. However, none of the factors including living condition, participation in training/lecture on disaster preparedness, recognition of possibility to be affected by disasters and importance regarding disaster preparedness showed significant association with preparedness of emergency supplies and registration of disaster notification services (Table 6).

Table 5. Factors associated to knowledge on location of evacuation area and prearrangement of communication method with family in event of disaster (N=162)

	Knowing location of evacuation area		P	Prearrangement of communication method with family in event of disaster		P
	AOR	95% CI		AOR	95% CI	
Living condition						
Living with family	1			1		
Living alone	0.217	0.103, 0.459	<0.001	1.190	0.470, 3.012	0.713
Participating in training/lecture on disaster preparedness						
No	1			1		
Yes	3.418	1.448, 8.064	0.005	0.896	0.334, 2.401	0.827
Self-evaluation of possibility to be affected by disasters						
Low (< 7)	1			1		
High (≥ 7)	1.096	0.475, 2.531	0.829	0.748	0.247, 2.265	0.607
Self-evaluation of importance regarding disaster preparedness						
Low (< 7)	1			1		
High (≥ 7)	0.889	0.431, 1.832	0.749	4.087	1.430, 11.683	0.009

“No response” was excluded from analysis. Logistic regression analysis was conducted.

Table 6. Factors associated to preparedness of items for disasters and registrations in disaster notification services

	Items (n=161)		P	Registrations (n=157)		P
	AOR	95% CI		AOR	95% CI	
Living condition						
Living with family	1			1		
Living alone	0.821	0.421, 1.600	0.562	1.241	0.471, 3.266	0.662
Participating in training/lecture on disaster preparedness						
No	1			1		
Yes	1.212	0.569, 2.584	0.618	0.942	0.316, 2.806	0.915
Self-evaluation of possibility to be affected by disasters						
Low (< 7)	1			1		
High (≥ 7)	1.258	0.578, 2.739	0.563	1.863	0.548, 6.331	0.319
Self-evaluation of importance regarding disaster preparedness						
Low (< 7)	1			1		
High (≥ 7)	0.769	0.389, 1.520	0.450	0.916	0.353, 2.374	0.856

“No response” was excluded from analysis. Logistic regression analysis was conducted.

Discussion

This study showed that participating in training/lecture on disaster preparedness was associated to knowing about location of evacuation area close to residential area, but there was no significant association between experience of training/lecture participation and other preparedness including way of communicating with family in the event of disaster, preparing emergency supplies and behaviors. Nursing students who lived alone were significantly more likely to not know the location of evacuation area in the event of disaster.

Less than 20% of nursing students in this study had prearranged a communication method with family in event of disaster. In fact, most of them and their family are thought to have cell phones and/or smartphones, and they would most probably communicate by their mobile devices in case of disaster regardless of prearrangement. However, the authors cannot confirm the nursing students' perception on communication method with family in event of disaster in the context of this study. The authors assumed from the study findings that less than 20% of nursing students had experience of talking with their family on how to communicate in the event of disaster, not only prearranging communication methods, but also other measures in case of no cell phone/smartphone lines, for example agreeing on a meeting point.

A previous study conducted among chairperson of neighborhood association, district welfare commissioner, and local governmental officers including firefighters and police officers in 2006 reported that disaster preparedness was associated to actual knowledge about preparedness rather than recognition of disaster risk¹⁰⁾. The study was performed before the East Japan great earthquake disaster in 2011 and the Western Japan heavy rain disaster in 2018, therefore recognition of disaster risk and importance of disaster preparedness among the Japanese population may have been lower than in the current day. However, we still need to deem that even among such community leaders, acquisition of practical knowledge on disaster preparedness is required for taking action towards disaster preparation. A study performed among community residents in 2014 demonstrated that individual awareness and recognition of importance of disaster preparedness were high, but their daily communication between neighbors regarding mutual help in the event of disaster was insufficient¹¹⁾. Actual experiences of being a victim of disaster and actual

occurrence of disasters in the neighboring regions could be a motivation for considering disaster preparedness among medical-health and welfare professionals¹²⁾. Although awareness and recognition regarding importance of disaster preparedness are high, taking substantial action towards disaster preparation may be difficult among people including nursing students as demonstrated in this study.

As shown in the aforementioned study, acquiring practical knowledge regarding disaster preparedness was found to be essential to perform actual preparation for disaster¹⁰⁾. However nursing students did not show actual disaster preparedness with the exception of knowledge of location of evacuation area in this study, although they could obtain disaster related knowledge through participation in lecture/training. Since nursing students are expected to take a role of providing care as healthcare professionals in the future event of disasters, they are required to be proactively motivated to take professionally instigated actions. A previous study demonstrated that continuous participation in voluntary activities in disaster affected areas improved nursing students' self-esteem¹³⁾. In addition to lecture-based training and/or hands-on practice related to disaster preparedness, participation in volunteering activities in actual disaster-affected areas with adequate educational instruction and management is a possible opportunity to improve nursing students' capacity to prepare for disasters and to perform at disaster settings.

Providing training opportunities to improve individual capacity of disaster preparedness and resilience against disasters at community levels including schools and educational institutions is required to strengthen actual disaster preparedness in addition to trainings at a professional level, including nursing education. The report of a study group on enhancement of basic nursing education in 2007¹⁴⁾ demonstrated that the acquisition of basic nursing knowledge regarding support of victims by disasters and disaster-affected communities is one of the essential qualifications required in pre-service nursing education in Japan. Although it may not be possible for every nursing student to experience of participation in volunteer activities in the disaster-stricken areas, at least pre-service nursing educational programs should include some type of education regarding care and support for victims of disasters and in disaster-stricken areas. It is desirable that disaster nursing educations take into account interactive, participatory

and practical contents including exercises and simulation as well as lectures^{15),16)}. At the same time, community-based disaster preparedness and community resilience against disaster should also be strengthened¹⁷⁾, because improvement of disaster preparedness at an individual level may be difficult depending on individual perception and value against disaster. A previous study showed that participants of disaster prevention training course were influenced by disaster prevention education in the local community or workplace more than in schools¹⁸⁾. Considering the current degree of disaster preparedness on an individual level, it is proposed that communities should prioritize constructing a safe and resilient community, because disaster preparation efforts at individual levels cannot be depended upon.

This study has several limitations. First, this study was conducted in only one nursing university in Japan. The authors did not evaluate a difference regarding perception of disaster preparedness with nursing students in another area, young people with different educational background, and different generations of Japanese population. Second, the authors did not assess the relationship between formal nursing educational contents regarding disaster nursing and the learning outcomes. Therefore, it is not appropriate to generalize the findings of this study to all nursing students in Japan. Third, this was a cross-sectional study, and the authors did not evaluate a detail of the study participants' actual experiences with disasters. Forth, the data were self-reported, and the authors did not objectively assess knowledge and actual disaster preparedness. Thus, this study could not comprehensively assess nursing students' capacity against disasters and disaster preparedness.

Conclusions

Participating in training/lecture regarding disaster preparedness contributed to actual disaster preparedness such as knowing about location of evacuation area. However, substantial disaster preparedness should be strengthened by training on practical disaster preparedness among nursing university students, whose professional role will be sought in pre- and post-disasters.

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