


Disaster Nursing Knowledge and Competencies Among Nursing University Students Participated in Relief Activities Following the 2016 Kumamoto Earthquakes

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Abstract

Objective: This study examined disaster nursing knowledge and competencies among university nursing students who participated in relief activities following the 2016 Kumamoto earthquakes.

Methods: Participants were university nursing students involved in disaster relief activities. Of the 260 individuals to whom a self-report questionnaire was distributed at nursing universities and hospitals located in Kyushu, southwestern Japan, 201 participants returned the questionnaires by mail (response rate 77.3%), of which 108 questionnaires were complete (valid response rate 41.5%). Questions involved experiences related to their volunteer activities, their motive for volunteering, type of relief activities performed, and use of disaster nursing knowledge and competencies.

Results: We identified four categories of disaster nursing competencies: “understanding and implementation of assistance to victims in collaboration with other members of the disaster response team,” “understanding the natural disaster’s influence on victims,” “ethical practice in a disaster recovery area,” and “understanding of their role within the disaster relief organization.” Those who had completed a disaster nursing program had superior measures of performance across all four competencies compared with those who had not yet completed the program.

Conclusions: Four domains of disaster nursing knowledge and competencies used by university nursing students during the 2016 Kumamoto earthquake relief activities were identified. Those who had completed a disaster nursing program had higher competencies than were those who were either currently or not yet enrolled in it.

Keywords

disaster nursing, competency, nursing student, disaster relief

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Introduction

Natural disasters are frequent worldwide phenomena that cause significant loss of life, economic loss, and environmental damage (Usher & Mayner, 2010; Wenji, Turale, Stone, & Petrini, 2015). Disaster relief volunteers are essential for recovery and reconstruction in affected areas. During the 11 months following the Great East Japan Earthquake of 2011, 930,000 people were involved in volunteer disaster relief activities. Following the 2016

Kumamoto earthquakes, 120,000 people had participated in disaster relief activities by the end of December 2017.

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Disaster relief volunteers can be loosely classified into two groups: expert volunteers (i.e., those who have professional knowledge, skills, or certification) and nonexpert volunteers (Sakihama, 2017). Coordination of disaster relief volunteers based on their skills and attributes would lead to efficient, effective, and highly mobile relief activities in the affected areas (Ojima & Volunteer Research Group, 2008).

Because the need for health-care services increases following natural disasters, securing medical professionals and paraprofessionals to assist in the recovery process is critical. Nurses compose a large portion of the overall population of health-care professionals and they play prominent roles in disaster relief (World Health Organization & International Council of Nurses, 2009). Many nurses are actively involved in disaster relief activities as expert volunteers. Nursing students could also play a significant role in volunteer disaster relief activities (Cusack, Arbon, & Ranse, 2010), bringing invaluable knowledge and skills as trained professionals that could help fill expert volunteer roles in the aftermath of a disaster. Previous research reported that nursing students provided assistance such as observation of physical and psychological health, hygiene promotion, foot bathing, and health consultation at the scene of natural disasters (Cusack et al., 2010; Tomizawa et al., 2014). They used acquired knowledge and skills when engaging in disaster relief (Kashiwaba & Okudera, 2014), and it has been suggested that they could assist qualified nursing personnel in such situations because of their knowledge and skill in nursing, problem-solving and critical-thinking skills, and interpersonal skills (Nakajima, Owatari, & Okumura, 2013).

Competency is typically defined as “an underlying characteristic of a person which is causally related to effective or superior performance in a job or role” (Everts, 1987, p.3). In nursing domains, competencies are defined as “a level of performance demonstrating the effective application of knowledge, skill and judgement” (International Council of Nurses [ICN], 1997, p.44). Competencies are viewed as a reflection of a range of skills (cognitive, technical or psychomotor, and interpersonal), as well as a range of personal attributes and attitudes (Alexander & Runciman, 2003). The ICN established the conceptual framework of competencies specific to the context of disaster relief in line with the ICN’s definition of nursing competencies and the existing literature (Hutton, Veenema, & Gebbie, 2016; World Health Organization & International Council of Nurses, 2009). These competencies reflect the specialized role and activities of nurses in disaster relief efforts.

Competencies are promoted by education and training program and clinical experience. Thus, expected competencies will vary by level of education, practice

area, and experience level. The aforementioned definitions of competencies released by the ICN are for generalist nurses and do not apply to nursing students. For nursing students, there is neither a general concept of their competencies nor a specific concept relating to disaster relief nursing competencies.

Nursing students are expected to play an important role in health-care delivery during disaster response as they gain increasing professional knowledge and skills. However, their knowledge and skills specifically in disaster nursing, understanding of nurses’ roles during disasters, and knowledge of disaster preparedness are inadequate. They also lack experience in disaster drills, and their level of competencies will vary by duration of academic training (Cusack et al., 2010; Jennings-Sanders, Frisch, & Wing, 2005; Schmidt et al., 2011). Despite these limitations, nursing students could be key responders in the event of natural disasters. Therefore, research is needed to examine the professional competencies and knowledge they can contribute during disaster response. The findings would contribute to improving disaster nursing education program for nursing students and to examining measures for the appropriate allocation of nursing student volunteers in the event of natural disasters.

This study sought to identify the disaster nursing knowledge and competencies among university nursing students who participated in relief activities following the 2016 Kumamoto earthquakes.

Methods

Design and Participants

A cross-sectional study design was employed. Participants were recruited from among those who participated in volunteer disaster relief activities while they were university nursing students after the Kumamoto earthquakes. In July 2017, participants were recruited using available sampling from three university nursing programs located in Kyushu—the most southwesterly of Japan’s main islands, and the island on which Kumamoto is located. Assuming that students who were in their fourth year at the time of the earthquake would already be practicing nurses, we also asked for cooperation from hospitals in the Kyushu with over 400 beds using available sampling. The reason why available sampling was employed was that as Kumamoto is located in Kyushu, a lot of nursing university students in Kyushu area were assumed to take part in relief activities following the 2016 Kumamoto earthquakes. After obtaining written consent to participate from these facilities, anonymous self-report questionnaires were distributed to 260 individuals through the universities and hospitals. Of these, 201 individuals responded by mail

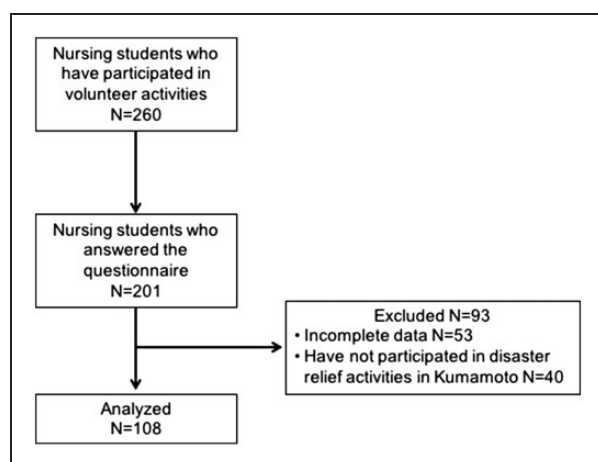


Figure 1. Flow chart: number of students who were eligible for the analysis of this study and were excluded from the analysis.

(response rate 77.3%). Of these, 93 questionnaires were excluded (53 were incomplete in the disaster nursing knowledge and competencies questionnaire and 40 were from those who had not participated in Kumamoto disaster relief activities), leaving data for 108 participants with complete data in the disaster nursing knowledge and competencies questionnaire for analysis (valid response rate 41.5%) (see Figure 1).

Measures

Participants' general characteristics. Data were collected on the demographic variables of sex and academic level (i.e., freshman through senior status) at the time the Kumamoto earthquakes occurred.

Experience related to disaster volunteerism. Participants were asked about previous volunteer experience (1 = *yes* or 2 = *no*), when and how often they were involved in disaster volunteer activities in Kumamoto, and whether they completed a disaster nursing program at their university (1 = *already completed*, 2 = *currently enrolled*, and 3 = *not yet enrolled*).

Reason for participating in disaster volunteer activities in Kumamoto. This questionnaire was developed based on previous research (Kobayashi, Shirakawa, & Tatishi, 2014; Yoshihara, Ide, & Makioka, 2012) in order to assess the participation motives of disaster volunteers following the Kumamoto earthquakes. The questionnaire consisted of nine items, including "I would like to support earthquake victims," "My friends asked me to take part in disaster volunteering," or "I would like to use the knowledge and skills I've learned as a nursing student." Respondents rated each item on a scale of 1 (*strongly disagree*) to 4 (*strongly agree*).

Relief activities in Kumamoto. We assessed the relief activities that student volunteers engaged in using a 17-item questionnaire based on previous research (Kotera et al., 2016; Nakajima et al., 2013; Sakai et al., 2016). Items included "removed rubble," "promoted exchange among local residents," and "performed health checks." Participants were asked to select all applicable response options.

Disaster nursing knowledge and competencies among nursing students. The ICN launched the framework of disaster nursing competencies (World Health Organization & International Council of Nurses, 2009), and the 21st Century Center of Excellence program at the University of Hyogo (University of Hyogo COE, 2006) examined core competencies for disaster nursing. Although these two frameworks of disaster nursing competencies were developed for emergency nurses, there was no available tool or scale to assess disaster volunteer competencies among nursing students and therefore we devised a 38-item questionnaire to assess the knowledge and competencies nursing students required for disaster nursing. We reviewed the relevant research literature and held in-depth discussions about questionnaire items in order to create item pools related to disaster nursing knowledge and competencies among nursing students. Respondents were asked to rate each item on this questionnaire from 1 (*I couldn't do*) to 5 (*I could do*).

Statistical Analysis

First, we calculated descriptive statistics for experience related to disaster volunteering, reason for participating in disaster volunteer activities in Kumamoto, relief activities in Kumamoto, and participants' characteristics. Second, we performed item analysis to examine the item distributions and internal consistency. Third, we conducted an exploratory factor analysis to assess the factor structure of disaster nursing knowledge and competencies among nursing students. We used unweighted least squares with an oblique rotation method. The factor loadings above the .3 cutoff were acceptable. Finally, to compare the disaster nursing knowledge and competencies scores by enrolment status in a disaster nursing program, we performed an analysis of variance. SPSS Statistics 24.0 for Mac was used for the data analysis. Statistical significance was set at $p < .05$ (two-tailed).

Ethical Considerations

This study was approved by the ethics committee of the authors' institutions (No. 29-13). Written permission was obtained from the participating universities and hospitals. Participants were informed of the voluntary

nature of participation in the study, assured of their right to refuse to participate or withdraw at any time, and assured of confidentiality during handling and dissemination of obtained data.

Results

Participants' Characteristics

As shown in Tables 1 and 2, 88.9% of the 108 university nursing students in the sample were women. Most respondents were freshmen and juniors (both 36.4%), while seniors composed 22.4% of the sample at the time the Kumamoto earthquakes occurred. In total, 84.0% of students had previous volunteer experience, 57.4% answered "one time" when asked about the frequency of their disaster volunteer activities in Kumamoto, 41.7% of students had completed a disaster nursing program, and 38.0% had not completed it yet.

Table 2 presents the ranking of the relief activities that volunteer students engaged in within the affected area (multiple answers). The most common activity was distribution of relief supplies (39.8%). Other common activities included serving as a conversation partner with affected people (36.6%), sorting relief supplies (35.5%), and maintaining the evacuation center (30.1%).

Table 1. Sample Characteristics.

	N	%
Sex		
Female	96	88.9
Male	12	11.1
Academic level at the time of the Kumamoto earthquake		
Freshman	39	36.4
Sophomore	5	4.7
Junior	39	36.4
Senior	24	22.4
Previous volunteer experience		
Yes	89	84.0
No	17	16.0
Frequency of involvement in volunteer disaster relief activities in Kumamoto		
1	62	57.4
2	24	22.2
3	7	6.5
4	7	6.5
≥ 5	8	7.4
Disaster nursing program enrolment status		
Already completed	45	41.7
Attending	22	20.4
Not yet enrolled	41	38.0

Note. Some percentages do not equal 100% because of missing data.

Reason for Participating in Disaster Volunteer Activities in Kumamoto

As shown in Table 3, more than half of the participants agreed strongly with the statements "I would like to support earthquake victims" (62.0%) or "I would like to engage in reconstruction support activities in affected areas" (53.7%). Half of respondents (50.0%) answered "strongly agree" or "agree" in response to "I would like to use the knowledge and skills I've gained as a nursing student."

Disaster Nursing Knowledge and Competencies Among Nursing Students

Table 4 shows the item distribution of disaster nursing knowledge and competencies among university nursing students. While floor effects were not found, ceiling effects were found on four items: "I was able to make efforts to protect personal information," "I was able to secure my own safety," "I was able to take care of my own health," and "I was able to take necessary precautions to prevent contracting an infection considering the circumstances in the affected area." After excluding those four items, exploratory factor analysis was performed on the remaining 34 items. As one item showed less than 0.3 factor loading and 11 items had higher than 0.3 factor loadings onto two factors, these items were excluded. Next, four factors were extracted, which were "understanding and implementation of assistance to victims in collaboration with other members of the disaster response team," "understanding of the natural disaster's

Table 2. Relief Activities that Student Volunteers Performed.

	N	%
Distributing relief supplies	37	39.8
Conversational partner with affected people	34	36.6
Sorting of relief supplies	33	35.5
Maintaining evacuation centers	28	30.1
Removing rubble	27	29.0
Cleaning up houses	24	25.8
Serving hot meals	20	21.5
Learning support	17	18.3
Conducting health checks	10	10.8
Providing health consultation	9	9.7
Confirming safety	7	7.5
Providing footbaths and hand massage	6	6.5
Promoting exchange among local residents	5	5.4
Conducting a needs survey	5	5.4
Participating in recreation and events	2	2.2
Removing mud	1	1.1

Note. Multiple response choices.

Table 3. Reason for Volunteering for Disaster Relief Volunteer in Kumamoto.

	N	%
I would like to support earthquake victims		
Strongly disagree	0	0.0
Disagree	2	1.9
Agree	39	36.1
Strongly agree	67	62.0
I would like to engage in reconstruction support activities in affected areas		
Strongly disagree	0	0.0
Disagree	5	4.6
Agree	45	41.7
Strongly agree	58	53.7
My friends asked me to take part in disaster relief volunteering		
Strongly disagree	18	16.7
Disagree	24	22.2
Agree	46	42.6
Strongly agree	20	18.5
Teachers asked me to take part in disaster relief volunteering		
Strongly disagree	84	77.8
Disagree	16	14.8
Agree	3	2.8
Strongly agree	5	4.6
My family or friends were affected by the Kumamoto earthquake		
Strongly disagree	18	16.7
Disagree	21	19.4
Agree	26	24.1
Strongly agree	43	39.8
I would like to view the current situation in the affected areas		
Strongly disagree	16	15.1
Disagree	23	21.7
Agree	31	29.2
Strongly agree	36	34.0
I would like to use the knowledge and skills I've gained as a nursing student		
Strongly disagree	15	13.9
Disagree	39	36.1
Agree	33	30.6
Strongly agree	21	19.4
I was required to participate in relief activities as part of class or club activities		
Strongly disagree	98	90.7
Disagree	9	8.3
Agree	1	0.9
Strongly agree	0	0.0

Note. Some percentages do not equal 100% because of missing data.

influence on victims,” “ethical practice in a disaster recovery area,” and “understanding of my role within the disaster relief organization.” Each factor had a Cronbach’s $\alpha \geq .70$.

Disaster Nursing Knowledge and Competencies by Learning State of Implementation of Disaster Nursing

To compare the disaster nursing knowledge and competencies scores by enrolment status in a disaster nursing program, ANOVA was conducted (Table 5). The scores for “understanding and implementation of assistance to victims in collaboration with other disaster response team members” and “understanding of the disaster’s influence on victims” were significantly higher for those who had already completed the program than those who were currently enrolled or had not yet completed it.

The scores for “ethical practice in a disaster recovery area” and “understanding of my role within the disaster relief organization” were significantly higher for those who had already completed the disaster nursing program than those who were currently enrolled in it.

Discussion

The main findings of our study can be summarized as follows. The motives of many participants for their participation in disaster relief activities were their willingness to support the victims, to engage in reconstruction support activities in affected areas, and to use the knowledge and skills they had gained as nursing students. These results are consistent with those of previous studies (Chan et al., 2010; Yonge, Rosychuk, Bailey, Lake, & Marrie, 2010). The academic level at which students complete a disaster nursing program and whether the program is compulsory or elective varied by university, with around 40% of respondents not having taken the program despite having a strong interest in disaster relief volunteering.

Although 50.0% reported a desire to use acquired nursing knowledge and skills in the affected area, many participants engaged in activities that required no nursing knowledge or skills. Because they were nursing students without nursing certification, it is possible that they were viewed as unable to independently perform professional tasks. Last, the four domains of nursing students’ disaster nursing competencies that were identified in this study are consistent in part with the disaster nursing competencies released by the ICN or identified by University of Hyogo COE.

Various health professionals, governmental organizations, private organizations, and volunteers are involved in disaster relief activities. Each must understand their own role and the roles of other responders in order to work collaboratively. Nurses are expected to collect information on health needs, rapidly assess victims based on disaster situations, and make judgments related to nursing care needs (Al Thobaity, Plummer, & Williams, 2017; Loke & Fung, 2014). Our results indicated that the participants, regardless of their status as

Table 4. Exploratory Factor Analysis of Disaster Nursing Competencies Among Nursing Students.

		I	II	III	IV
<i>Understanding and implementation of assistance to victims in collaboration with other disaster response team members ($\alpha = .918$)</i>					
18	I was able to assess nursing care needs and collect information based on victims circumstances	.891	-.197	-.005	.071
24	I was able to provide information about victims' physical and psychological health problems to other medical professionals	.869	-.072	.045	-.159
20	I was able to assess nursing care needs based on developmental stage	.797	-.133	.053	.093
22	I was able to understand the importance of identifying victims in need of support at early stages and collaborate with other specialized organizations	.724	.061	.123	-.135
27	I was able to seamlessly collaborate with people from other professions involved in relief activities	.722	.041	.022	.027
26	I was able to recognize the roles of other people and professionals involved in relief activities	.680	.216	-.093	-.009
14	I was able to understand the roles of nurses and their tasks for victims' support	.664	.116	.025	-.025
17	I was able to collect needed information depending on victims' situations	.662	.083	-.106	.152
36	I was able to inform responders that I performed disaster volunteer activities	.387	.282	-.109	.177
<i>Understanding natural disasters' influence on victims ($\alpha = .862$)</i>					
16	I was able to understand the changing needs of victims' health	.020	.839	-.126	.092
30	I was able to understand the necessity of maintaining living environments to promote health	-.178	.818	.125	-.015
15	I was able to understand the changing of victims' living conditions	-.102	.773	.065	.112
23	I was able to understand the impact of disasters on psychological and physical health	.150	.740	-.070	-.214
32	I was able to recognize how to support victims' daily living according to their health needs	.260	.440	.101	.048
34	I was able to understand the resources needed by those in need of support during disasters	.063	.398	.219	-.002
<i>Ethical practice in a disaster recovery area ($\alpha = .939$)</i>					
1	I was able to protect victims' human dignity and rights	.003	-.016	.993	.027
2	I was able to treat victims ethically	.057	.073	.818	0.020
<i>Understanding my role within the disaster relief organization ($\alpha = .767$)</i>					
9	I was able to understand the roles of disaster volunteer organizations	-.015	-.017	-.014	.848
8	I was able to tell others engaged in relief activities about how I could assist in disaster relief	.010	-.010	.083	.706

student, could possess such competencies and use them during disaster volunteer activities.

This survey identified "understanding of the natural disaster's influence on victims" among university nursing students. Nurses also must understand the impact of disasters on community residents' overall health and daily

living conditions, as well as the support they need. They must then provide rapid and appropriate care for victims (World Health Organization & International Council of Nurses, 2009). As previous papers have suggested (Cusack et al., 2010), it is reasonable to assume that university nursing students acquire such knowledge and

Table 5. Disaster Nursing Knowledge and Competencies by Enrolment Status in a Disaster Nursing Program.

	I	II	III	<i>F</i>	<i>p</i>	Post hoc (Tukey)
	Completed <i>N</i> = 45	Currently enrolled <i>N</i> = 22	Nnot yet enrolled <i>N</i> = 41			
	Mean (<i>SD</i>)	Mean (<i>SD</i>)	Mean (<i>SD</i>)			
Understanding and implementation of assistance to victims in collaboration with other disaster response team members	30.82 (6.92)	25.5 (8.06)	26.13 (8.67)	5.12	.007**	I-II* I-III*
Understanding of natural disasters' influence on victims	25.24 (3.17)	21.27 (5.12)	22.45 (3.66)	9.90	.000***	I-II*** I-III***
Ethical practice in a disaster recovery area	8.55 (1.46)	7.14 (2.27)	8.02 (1.60)	5.11	.008**	I-II**
Understanding of their role within the disaster relief organization	7.36 (1.46)	7.27 (2.31)	7.05 (1.90)	.32	.720	I-II*

Note. Analysis of variance (ANOVA) with post hoc Tukey test.

****p* < .001, ***p* < .01, **p* < .05.

competencies through standard nursing education, including nursing skills, nursing processes, and practical nursing training.

Disaster responders are required to protect victims' human dignity and rights while adhering to ethical and moral principles (Davis, 2014; World Health Organization & International Council of Nurses, 2009). Nurses may face ethical problems that conflict with usual emergency nursing case, difficulties respecting victims' privacy, and unimaginable patient care decisions in times of scarce resources and supplies (Davis, 2014; Noguchi et al., 2017). Most nursing students learn nursing ethics in the early stages of university-based training. As more than 60% of our sample were in their sophomore year or beyond, they had been trained to behave ethically and legally. In regards to first-year students, they may potentially possess competencies of respecting human rights and giving consideration to ethical concerns because they were interested in nursing fields and took part in disaster relief activities. Thus, university nursing students could utilize the competency of "ethical practice in a disaster recovery area" during disaster volunteer activities.

This study found that university nursing students involved in disaster relief might have an "understanding of their role within the disaster relief organization." This would indicate that they have the autonomy and self-expression required when participating in volunteer activities. Nurses must understand their own roles accurately, be able to adapt their knowledge, skills, and abilities for the disaster situation, and inform other disaster responders of what they can do to help. Competencies such as this are critical for effective and efficient disaster

relief activities (Al Thobaity et al., 2017; World Health Organization & International Council of Nurses, 2009) as they could promote smooth coordination among health-care professionals. University nursing students who are capable of understanding their own abilities and roles in disaster situations could be important supporters during disaster responses.

Participants who had completed a disaster nursing program showed better understanding and implementation of assistance to victims in collaboration with other disaster response team members, better understanding of the natural disaster's influence on victims, more ethical practice in a disaster recovery area, and better understanding of their role within the disaster relief organization. Past studies claimed that disaster nursing classes imparted knowledge applicable to disaster volunteer activities (Pattillo & O'Day, 2009). In the disaster nursing education program commonly found in Japanese universities, many aspects of disaster nursing are presented. They include the influence of natural disasters on health, information collection and assessment in affected areas, nurses' roles and responsibilities in disaster situations, ethical problems during treatment, and multidisciplinary collaboration during disaster response (Matsumoto, Takahira, Katahono, Yoshida, & Utsumi, 2006; Sawada, Kojo, Nakayama, & Tsugeno, 2015; Yamamoto, 2013). However, we did not ask about the contents of the disaster nursing programs the participants took. Further research is needed to examine the effect of undergraduate disaster nursing education on performance of disaster relief activities.

This study found that our participants were equipped with competencies similar to those required of nurses

engaging in disaster response. These competencies may be gained through undergraduate nursing education programs. In addition, classes in disaster nursing could contribute to nursing students' ability to assist in disaster relief. It is recommended that a unified disaster nursing education curriculum be established that promotes competencies to flexibly apply students' knowledge and skills in the context of disaster relief. A nursing education program based on the framework of ICN disaster nursing competencies had superior educational effects for nursing students (Chan et al., 2010). Adapting this program for university nursing students in Japan is desirable.

Identifying disaster nursing competencies used by university nursing students via this survey might make it possible to accurately assess nursing student volunteers' capabilities and allocate them optimally in disaster situations.

Limitations and Future Study

As the results of this study were based on a cross-sectional design, no causal relationship could be concluded between disaster nursing knowledge and competencies and student nurses' motives to participate or enrolment status in a disaster nursing program. Future research using a longitudinal design is needed to identify and examine causal relationships. These findings cannot be generalized because the data were collected exclusively from university nursing students in southwestern Japan who were involved in relief activities following the 2016 Kumamoto earthquakes, and our target sample might not accurately reflect the population of interest as this study employed available sampling. In addition, the sample size may be too small, and further studies are needed to confirm our results across a larger sample using probability sampling.

Conclusion

Our research identified four domains of disaster nursing knowledge and competencies used by university nursing students during relief activities following the 2016 Kumamoto earthquake. Those who had completed a disaster nursing program displayed greater understanding of providing assistance to victims in collaboration with other disaster response team members and a better understanding of natural disasters' influence on victims. This group of respondents also had more ethical practice in the affected area and a greater understanding of their role within the disaster relief organization than those who were currently enrolled in the program.

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Author Contributions

M. S., H. I., E. Y., and Y. K. contributed to the concept and design of this study; M. S., H. I., Y. K., T. Y-M., and Y. Y. contributed to data acquisition; M. S. carried out the statistical analysis, and drafted and completed the manuscript; H. I. and E. Y. contributed to interpretation of data and critically reviewed the manuscript; all authors read and approved the final manuscript.

Declaration of Conflicting Interests

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