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Exploring Disaster Safety Awareness in Nursing Students: A Q-Methodology Study in South Korea

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Abstract

Strengthening nursing students' disaster safety competencies requires targeted educational strategies. This study explored how nursing students perceive disaster safety and examined the defining features of each perception type in South Korea. Using an exploratory Q methodology approach, which investigates subjective viewpoints, 30 nursing students in their 20s from C city participated. They sorted 30 statements into a predefined grid to express their perspectives. Data were analyzed through correlation and factor analysis. The research was conducted from June to December 2020. Four distinct patterns of disaster safety awareness emerged. These were classified as: Type 1 – emphasizing national responsibility, Type 2 – emphasizing individual responsibility, Type 3 – preparedness-focused, and Type 4 – education-focused. Disaster safety perceptions among Korean nursing students fall into four main categories: national responsibility, individual responsibility, preparedness-oriented, and education-oriented. These insights can serve as a foundation for designing more effective nursing education programs on disaster preparedness.

Keywords: Nursing students, Disaster preparedness, Safety awareness, Q methodology

Introduction

A disaster occurs when the demand for resources exceeds what is immediately available [1, 2] and can be defined as an event that overwhelms local capacities, often requiring national or international assistance [3]. Disasters are happening with increasing frequency worldwide, including large-scale events in South Korea, with the number of occurrences rising each year [4].Nurses play a critical role during disasters, providing care to individuals unable to manage their health needs in disaster-affected environments [5]. Prior to disasters, it is essential to identify potential problems at both individual and community levels and to prepare strategies aimed at saving lives. Nurses are central to disaster response, as they are responsible for assessing the additional needs of affected populations and contributing across all stages of disaster management [6].

With the global rise in disaster severity, the role of nurses in disaster care has gained greater emphasis, and there is a growing demand to enhance nurses' disaster response capabilities [7, 8]. Effective disaster nursing requires specialized knowledge and skills, particularly in situations with limited resources and suboptimal working conditions, which are unlike controlled clinical settings [9-11]. Previous studies have shown that nurses' disaster response competencies are closely linked to prior disaster-related education or experience [7].

However, nursing students, who represent the future workforce, often lack awareness of disasters and the role of nurses during such events [12].

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Therefore, it is crucial for nursing education to equip students with the knowledge and skills required to respond efficiently in disaster situations [12, 13]. Disaster preparedness should be integrated into nursing curricula, as disasters often originate locally, and nurses must be ready to respond effectively [14].

Despite this need, disaster education is limited in many nursing schools, and research on nursing students' disaster knowledge remains insufficient [14-16]. In Korea, nurses and nursing students often have unclear or incomplete understanding of disaster nursing and may experience panic during actual disasters [15]. To design effective disaster preparedness programs, it is important to systematically cultivate disaster awareness among undergraduate nursing students [9, 17]. Studies suggest that disaster awareness should begin during undergraduate education, as it strongly correlates with disaster preparedness [18, 19]. Moreover, disaster education can help nursing students develop critical thinking, social responsibility, and professional values necessary to handle complex situations in future practice [20].

Given this context, it is important to first explore how nursing students perceive disaster safety. This study employs Q methodology to examine subjective perspectives on disaster safety among nursing students. The main aim was to identify different types of disaster awareness among nursing students and to describe the characteristics of each type. The findings are expected to provide foundational evidence for designing effective nursing education strategies to prepare nurses for diverse disaster scenarios.

Materials and Methods

Study design

This exploratory study used Q methodology, a research approach designed to systematically and scientifically investigate subjective perspectives, to examine nursing students' disaster safety awareness. Q methodology identifies and describes multiple viewpoints on a particular topic, analyzing the correlations between participants based on subjective attributes. Unlike conventional R-methodology, where variables are treated as test items, Q methodology allows participants to structure and rank statements according to their own perspectives, thereby expressing their individual viewpoints [21]. Factor analysis is then applied to classify shared perspectives, revealing the patterns of subjectivity among participants.

Study procedure

Composition of concourse and q-sample

To develop the concourse, this study conducted a literature review on disasters and in-depth interviews with nursing students. In Q methodology, the concourse refers to the complete set of subjective statements related to the study topic. Semi-structured questionnaires were used during the interviews to gather a range of subjective opinions, with participants chosen to ensure diverse perspectives [21]. Data collection continued until thematic saturation was reached.

For the in-depth interviews on disaster safety, participants were randomly selected from 30 nursing students in their first, second, and third years, all in their twenties and residing in city C. Individual interviews were conducted over a two-week period from August 1 to August 15, 2020. From these interviews, 86 subjective statements (the concourse) were initially extracted.

Since Q samples typically consist of 40–60 items [21], duplicate or overlapping statements were removed. To refine the Q-sample, three nursing professors collaborated with the researcher to revise and clarify the wording of the statements. After several rounds of discussion and adjustments, 30 statements were finalized as the Q-sample, ensuring that each item clearly reflected the participants' subjective perspectives **(Table 1)**.

Table 1. Q statement

1–15	16–30
1. Managing disasters is challenging because of a declining young population caused by an aging society.	16. Personal fortune plays a key role during a disaster.
2. Disaster response becomes harder when residents lack a solid system for emergency communication and mutual support.	17. One can protect personal belongings during a disaster.
3. Local governments struggle with disaster management due to inadequate equipment, personnel, and funding.	18. Stockpiling essential supplies at home is crucial when disasters limit access to resources.
4. The absence of sufficient evacuation centers and infrastructure complicates disaster management.	19. I am familiar with evacuation strategies and scenarios for various disasters.
5. Disaster handling is hindered by a shortage of fire stations, medical clinics, and hospitals.	20. Both central and local governments play vital roles in ensuring safety and managing disasters.
6. Schools must include disaster safety training as a core part of their curriculum.	21. Media coverage of disasters contributes to improving safety awareness.
7. Disasters are inevitable events.	22. Regular disaster drills and training are essential.

8. I could also lose my life in a disaster.	23. I routinely inspect emergency exits and escape paths wherever I go.
9. Disasters are happening more often and with greater intensity.	24. I maintain a network of emergency contacts for disaster situations.
10. Disasters hinder national economic progress.	25. I am capable of guiding people nearby to evacuate during a disaster.
11. The government works to avert disasters and safeguard citizens from risks.	26. Every individual's accountability is crucial for overall safety and disaster response.
12. Advance education and preparation via disaster training are sufficient for readiness.	27. Most accidents and disasters stem from ignorance that should be addressed through education.
13. Policies and laws on disasters help establish safety protocols.	28. It is acceptable to allocate higher taxes toward disaster prevention and safety measures.
14. Neglecting safety awareness can cause an increase in disasters.	29. Disasters and safety incidents under government watch often result from agency negligence and lapses.
15. Irresponsibility and greed are the primary causes of most accidents and disasters.	30. South Korea possesses an effective framework of administration and laws for handling disasters.

P-set selection

A convenience sample of 30 participants, including those who had taken part in the initial interviews, was recruited to form the P-set. The study's purpose and procedures were explained to all participants, who provided voluntary informed consent. Participants were also informed that they could withdraw from the study at any time without any negative consequences.

Q-sort

Q-sorting involves participants organizing statements from the Q-sample according to a predefined distribution table and assigning scores to each item. The normal distribution used in Q-sorting allows participants to place a limited number of statements at the extreme ends, representing strong agreement or disagreement, while most statements are positioned closer to the center to indicate relative neutrality [21-23].

Data collection, including general characteristic questionnaires, Q-sorting, and follow-up interviews, took approximately one hour per participant and was conducted over one month in September 2020. Each Q-sample item was written on a numbered paper card (Q-card) from 1 to 30. Participants first sorted the cards into three categories: agreement (+), neutral (0), and disagreement (-). Statements in the agreement category were then ranked from strongest agreement (+4) to neutral (0), and statements in the disagreement category were ranked from strongest disagreement (-4) to neutral (0), following the Q-distribution table **(Figure 1)**.

After completing the sorting, participants were asked questions to clarify their reasoning and feelings behind the placement of statements, particularly those at the extreme ends of the distribution. This helped provide additional insights for interpreting the Q-factors and understanding the participants' perspectives on disaster safety. On average, the Q-sorting process, questionnaire completion, and interview required 40 minutes. The overall study period extended from June to December 2020.

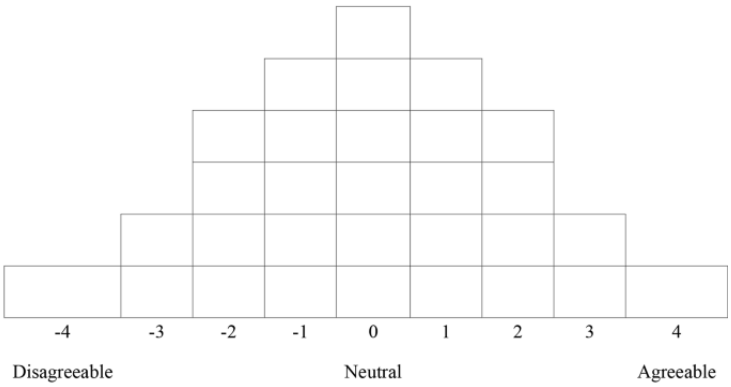

Figure 1. Card arrangement distribution table

Data analysis

The Q-sort data were analyzed using principal component extraction with Varimax rotation in the PQ Method program (GNU General Public License). Each of the 30 Q-statements was scored from −4 (strongest disagreement) to 0 (neutral) to 4 (strongest agreement) based on each participant's sorting. Analysis involved correlation and factor analysis.

Determining the number of factors considered both statistical criteria, such as Eigenvalues, and theoretical relevance, as conceptual meaning is often more important than relying solely on statistical thresholds [23].

Principal component analysis with Varimax rotation was applied to identify factors, determine their eigenvalues, and calculate cumulative variance. Each factor was examined to identify distinctive characteristics. Factor interpretation relied on statements with absolute Z-scores of 1.0 or higher, which guided the naming and conceptual description of each type [24].

Ethical considerations

The study received approval from the Institutional Research Board of K University (KHSIRB-19-012). Participants were informed about the study's purpose and procedures and provided voluntary consent. They were assured that they could withdraw at any time without penalty.

Results and Discussion

During factor analysis, three participants (P-19, P-25, and P-27) were classified as complex types because their responses aligned with two or more factors and could not be clearly interpreted; these cases were excluded from further analysis. Among the remaining 27 participants, 26 were female and had prior disaster education experience, while the single male participant had no disaster education experience. Participants' ages ranged from 21 to 26 years. Religious affiliations included 2 Buddhists, 2 Catholics, 4 Protestants, and 19 non-religious individuals.

Those with disaster experience had encountered events such as typhoons, earthquakes, and floods. Participants emphasized the importance of disaster education through university courses, public service campaigns, formal instruction, practical field training, and private education **(Table 2)**.

Table 2. General characteristics and factor weights of P samples by type

Type	ID	Factor weights	Gender	Age	Disaster education	Religion	Disaster experience and type	Desired type of disaster education
Type1	P-6	0.52	F	26	Yes	None	Typhoon	③
(n = 13)	P-7	0.60	F	21	Yes	None	None	②, ③, ⑤
	P-11	0.68	F	21	Yes	None	Typhoon	④
	P-12	0.84	F	21	Yes	None	Typhoon, Flood	②, ③
	P-13	0.88*	F	21	Yes	Buddhism	Typhoon, Flood, Earthquake	②, ③
	P-14	0.67	F	21	Yes	Presbyterian	Typhoon, Earthquake	②, ③, ④, ⑤
	P-15	0.50	F	21	Yes	Catholic	Typhoon, Flood and Earthquake	③, ④
	P-16	0.65	F	21	Yes	None	Typhoon, Earthquake	④, ⑤
	P-17	0.60	F	22	Yes	None	Typhoon, Earthquake	③, ④
	P-18	0.55	F	21	Yes	None	None	②, ③, ④
	P-21	0.60	F	21	Yes	None	Typhoon, Earthquake	②, ④
	P-22	0.71	F	21	Yes	Presbyterian	Typhoon	②, ③
	P-26	0.64	F	21	Yes	Presbyterian	Typhoon	②, ③
Type2	P-2	0.72	F	23	Yes	None	Typhoon	⑤
(n = 6)	P-10	0.47	F	21	Yes	None	Typhoon	③, ④
	P-20	0.74*	M	24	None	Presbyterian	None	③, ④
	P-24	0.70	F	23	Yes	None	None	③, ④
	P-28	0.62	F	21	Yes	Catholic	Typhoon	③, ④
	P-29	0.60	F	21	Yes	Buddhism	Typhoon	⑤
Type3	P-3	0.73*	F	23	Yes	None	Typhoon	⑤
(n = 2)	P-9	0.72	F	21	Yes	None	None	②
Type4	P-1	0.70	F	23	Yes	None	Earthquake	①, ③, ⑤
(n = 6)	P-4	0.57	F	23	Yes	None	None	①, ③
	P-5	0.63*	F	23	Yes	None	None	①, ③, ④, ⑤
	P-8	0.53	F	21	Yes	None	None	④, ⑤
	P-23	0.59	F	21	Yes	None	Earthquake	②, ③, ④
	P-30	0.62	F	22	Yes	None	Typhoon	③, ④

* Typical of types
① University lecture ② Public advertisement ③ Regular education
④ Field training ⑤ Private training

The analysis revealed four distinct patterns of disaster awareness among nursing students. Thirteen students were classified as the "national responsibility type," six as the "individual responsibility type," two as the "preparedness-focused type," and six as the "education-oriented type." The four factors together accounted for 61% of the total variance, and their Eigenvalues are detailed in **Table 3**.

Examination of the relationships between the types showed that Type 2 (individual responsibility) and Type 4 (education-oriented) were moderately correlated, with a coefficient of r = 0.50, while Type 2 and Type 3 (preparedness-focused) showed minimal correlation at r = 0.04 **(Table 4)**. The moderate similarity between Type 2 and Type 4 may be attributed to the elective nature of disaster education in Korean nursing programs, whereas the low correlation between Type 2 and Type 3 reflects the focus of Type 3 on infrastructure and preparedness rather than personal responsibility.

Table 3. Eigen value and variance by type

	Type1	Type2	Type3	Type4
Eigen values	10.80	2.76	2.44	2.19
Variance (%)	24	16	8	13
Cumulative (%)	24	40	48	61

Table 4. Correlations among the types

	Type1	Type2	Type3	Type4
Type1	1.00			
Type2	0.48	1.00		
Type3	0.13	0.04	1.00	
Type4	0.48	0.50	0.19	1.00

Analysis of the types

Type 1: National responsibility type

Type 1 included 13 of the 27 participants, all of whom were female. Their ages ranged from 21 to 26 years, and all had prior disaster education experience. Religious affiliations were one Buddhist, one Catholic, three Protestants, and eight non-religious **(Table 2)**.

Participants in this group emphasized the central role of the government in ensuring disaster safety. They believed that the state bears primary responsibility for providing adequate facilities, personnel, and resources to protect the public. However, they acknowledged that individual disaster preparedness among citizens, including themselves, was limited.

Key statements reflecting this perspective included concerns about insufficient medical personnel during national crises, such as the COVID-19 pandemic, and the expectation that the government should fulfill its constitutional duty to protect citizens' rights (P=13). Other participants expressed a desire for fair support from the state as taxpayers. Based on these features, this group was designated the "national responsibility type."

Table 5. Z score of type

Q statement	Type1	Type2	Type3	Type4
1. Managing disasters is challenging because of a declining young population caused by an aging society.	-1.20			-1.37
3. Local governments struggle with disaster management due to inadequate equipment, personnel, and funding.		-1.09		
4. The absence of sufficient evacuation centers and infrastructure complicates disaster management.	1.12		1.86	
5. Disaster handling is hindered by a shortage of fire stations, medical clinics, and hospitals.	1.85			
7. Disasters are inevitable events.	1.46	2.23	-1.24	
8. I could also lose my life in a disaster.	1.87	1.40	-1.86	1.16
9. Disasters are happening more often and with greater intensity.		1.02		
11. The government works to avert disasters and safeguard citizens from risks.	1.24		1.86	1.85
12. Advance education and preparation via disaster training are sufficient for readiness.			1.51	
13. Policies and laws on disasters help establish safety protocols.		-1.11		
14. Neglecting safety awareness can cause an increase in disasters.		1.22	1.55	
16. Personal fortune plays a key role during a disaster.		-1.12	-1.56	-2.63
18. Stockpiling essential supplies at home is crucial when disasters limit access to resources.			1.24	-1.58
20. Both central and local governments play vital roles in ensuring safety and managing disasters.			-1.24	1.01
22. Regular disaster drills and training are essential.		1.49	1.68	

23. I routinely inspect emergency exits and escape paths wherever I go.	-1.87			
24. I maintain a network of emergency contacts for disaster situations.	-1.62	-1.52	-1.24	-1.30
25. I am capable of guiding people nearby to evacuate during a disaster.	-1.50			
28. It is acceptable to allocate higher taxes toward disaster prevention and safety measures.	-1.21	-1.66		
29. Disasters and safety incidents under government watch often result from agency negligence and lapses.		-2.03		

Type 2: Individual responsibility type

Six participants (five females and one male) were categorized as Type 2, aged 21 to 24 years. Most had previous disaster education, except for one representative participant (P-20). Religious affiliations included one Buddhist, one Catholic, one Protestant, and three non-religious individuals **(Table 2)**.

Participants in this type emphasized personal responsibility in disaster situations. They highlighted the importance of regular training, personal ethics, and individual preparedness to survive disasters. Despite prior education, many acknowledged their own limitations in coping with disaster scenarios, which could potentially result in life-threatening situations. Representative statements included concerns about negligent behavior by individuals or companies exacerbating disaster impacts, underscoring the need for consistent personal training. Others noted that increasing individualism worsens disaster outcomes, advocating for cooperation and mutual support. This group was thus labeled the "individual responsibility type."

Type 3: Preparedness-oriented type

Type 3 included two female participants, aged 21 and 23, both non-religious **(Table 2)**. This group focused on the necessity of preparation for disasters. They emphasized stockpiling supplies, maintaining resources, and ensuring both individual and national readiness. Participants believed that proper preparation could enable survival during a disaster. For example, one participant (P-3) mentioned having a personal survival kit and checking supplies regularly. They also stressed that, given the unpredictability of disasters and potential national unpreparedness, individuals must proactively prepare to reduce confusion and improve response outcomes. This type was named the "preparedness-oriented type."

Type 4: Education-oriented type

Six participants, all female and aged 21–23, were classified as Type 4, none of whom had prior disaster education **(Table 2)**. This group emphasized the critical role of education in disaster preparedness. They highlighted the need for regular, structured training provided at the national or local government level. Participants believed that systematic education could increase survival rates during emergencies and foster awareness of potential risks. They pointed out that current disaster education in nursing programs is insufficient and suggested incorporating training across various educational levels, from schools to universities, as well as private programs. A representative participant (P-5) emphasized the importance of integrating disaster education into early schooling to ensure lasting awareness. This group was designated the "education-oriented type."

Undergraduate nursing education should cultivate the ability to respond effectively to diverse situations in the clinical field, grounded in professional ethics and a sense of humanity [25]. Disaster education, including practical exercises and advanced training, is recognized as a critical component of nursing curricula [26]. However, international organizations such as the WHO and ICN have noted that current undergraduate programs are insufficient for preparing nurses to participate in disaster relief [27, 28]. Kim and Lidia [27] highlighted the need for basic competencies and knowledge in undergraduate programs to enable rapid and effective disaster response. Adequate preparation equips nurses to act in challenging, unexpected circumstances [26].

This study provides insights into nursing students' perceptions of disasters, serving as foundational data for developing disaster nursing competencies. Across all four types, participants acknowledged personal limitations in disaster preparedness and emphasized the importance of formal disaster education. The COVID-19 pandemic highlighted this gap, reinforcing students' recognition of their need for training and preparedness.

Type 1 participants, in particular, focused on government responsibilities and roles during disasters. Their responses suggest that disaster management paradigms may need to shift to better account for changing public perceptions and behaviors during large-scale events [6, 29]. These findings underscore the importance of governmental accountability and the integration of public needs into disaster management systems. Nursing students highlighted the need for systematic education programs supported by sufficient human and material resources to cultivate disaster awareness and competency. In response, national initiatives should aim to develop robust systems that prepare future nurses to serve effectively at the frontline of disaster response.

The findings of this study highlighted distinct aspects of disaster awareness among nursing students. Type 2 participants emphasized personal responsibility, competence, and ethical awareness. Nursing competency in this context refers to the integration of professional knowledge, ethical understanding, personal insight, and practical skills [30]. Previous research by Labrague *et al.* [7] indicated that disaster-related experience and awareness

significantly influence nurses' ability to perform disaster care. Recognizing personal competence as critical, as observed in Type 2, reflects a proactive attitude toward disaster management and supports earlier findings that nursing students are motivated to actively engage in disaster response [31]. Similarly, studies by Eom and Hwang [32] found that individuals who have experienced disasters often perceive disaster response as a personal responsibility. These results suggest that educational programs designed to enhance individual qualities—such as moral reasoning, resilience, and personal preparedness—could strengthen disaster awareness and nursing capacity.

Type 3 participants focused on the importance of active preparation for survival. They emphasized the shared responsibilities of both individuals and the government in disaster preparedness, including strategic planning, organization, training, resource management, and coordinated response systems [33]. This perspective indicates public demand for the development of multifaceted social, political, and economic strategies to mitigate disaster-related damage [34].

Type 4 participants underscored the importance of disaster-related education. The National Student Nurses' Association (NSNA) recommends that nursing students receive disaster preparedness training as part of individual, family, and professional education [7, 35]. Despite most participants reporting prior exposure to disaster education, they still perceived it as insufficient. This underscores the need to assess the educational needs of nursing students and to develop a structured, systematic curriculum [13]. Evidence from studies by Jung *et al.* [36] and Kang and Piao [37] confirms that targeted disaster education programs enhance nursing students' competencies and practical knowledge. Implementing structured disaster education is therefore essential for preparing future nurses to perform effectively in disaster situations. In Korea, efforts are ongoing to develop community-based disaster nursing education programs [38]. Considering that disasters affect millions annually, systematic education can contribute to improved outcomes for affected populations.

Overall, the findings emphasize that undergraduate nursing programs should cultivate a professional value system grounded in ethics and humanity, while equipping students with practical skills to respond effectively to diverse disaster scenarios [25]. Disaster nursing education should address not only individual and family care but also community-wide disaster response. Clear learning objectives and structured educational strategies are necessary to achieve this [38-40].

This study provides a foundational understanding of nursing students' perceptions of disaster safety and highlights the critical role of nurses during emergencies. The results can inform the design of targeted nursing education strategies to enhance disaster preparedness and competency. Future research should focus on developing and experimentally testing educational interventions to evaluate their effectiveness in improving disaster nursing capacity.

Limitations

This study has several limitations. Since the participants were nursing students from a single city, caution is required when generalizing the findings to all nursing students across South Korea [41, 42]. Future research should include a larger and more geographically diverse sample to enhance the generalizability of the results. Additionally, environmental factors, such as the frequency and type of disasters in the participants' local area, may have influenced their perceptions, which should be considered in interpreting the findings.

Conclusion

Each year, millions of people are affected by disasters, highlighting the critical need for disaster nursing education to improve outcomes for affected populations. The findings of this study underscore the urgent necessity of developing disaster education programs that address the diverse needs of nursing students in undergraduate programs. This research provides foundational data that can guide institutions in enhancing nursing students' disaster preparedness and competencies while meeting public expectations.

Based on the results, several recommendations are proposed. First, disaster nursing education programs should be designed with reference to the types of disaster awareness identified in this study and applied effectively in nursing training. Second, further in-depth research is needed to explore these awareness types more comprehensively. Third, given the regional variability of natural disasters in addition to national-scale events such as the COVID-19 pandemic, future studies should replicate and expand this research to account for differing local contexts.

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