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Review

Disaster preparedness among nurses of developing countries: An integrative review

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ABSTRACT

Background: Nurse preparedness and prompt response are essential to save lives and reduce the consequences of disasters and emerging pandemics. This paper aimed to synthesize the available evidence that demonstrates the adequacy on disaster preparedness among nurses in developing countries.

Methods: Five stages of the integrative review approach were employed. Seventeen articles from 2010 to 2019 were selected using different databases after a quality appraisal performed by two researchers independently. The findings were summarized and synthesized based on the themes concerning disaster preparedness among nurses.

Results: The major themes emerged were disaster knowledge and perceived self-preparedness. Nurses were found to have a weak-to-average or a low-to-moderate level of disaster preparedness based on their knowledge and perception. Education and training were discovered to be vital factors, often requiring a variety of strategies, for the enhancement of the nurses' preparedness level.

Conclusion: This review concludes that nurses in developing countries remain inadequately prepared on all domains of disaster nursing competencies. Therefore, providing well-designed disaster nursing educational packages, training manuals, and support to attend disaster drills or partake in actual disaster events are essential to the enhancement of disaster preparedness and the retention of relevant skills among nurses in all sectors.

1. Introduction

The frequency and intensity of natural disasters [1] and global pandemics [2] are in an increasing trend. Currently, the pandemic caused by coronavirus [COVID-19] has affected 42,565,766 people and caused 1,150,620 deaths around the world [3]. Therefore, health care professionals, particularly nurses, are facing challenges to provide care and protect themselves from COVID-19 infection [4]. The impact of a disaster on the lives of humans and their health, environment, infrastructure, and health system resources is evident [5]. Developing countries are those that require external assistance; have a high population growth, low living standards, and productivity; lack well-developed industry; and are dependent on cultivation and exports for a sustainable economy [6]. Therefore, people from developing countries, in particular, are more vulnerable to disasters and suffer greater consequences due to them because of their poor economy [7,8] and governance, external pressures, and foreign debt [8]. Other factors that lead people of developing countries into vulnerability are the developmental stage of the country and its policies [9], poor infrastructures and sanitation, population density, and scarce human health workforce and resources [7]. Furthermore, the scarcity of human health resources is a prime public health concern in a disaster situation [10].

Conceptually, preparedness for disasters usually involves planning and coordinating meetings; developing written communication or standard operating procedures; training staff, volunteers, and community members; organizing simulated drills and exercises; and ensuring the availability of functional emergency equipment [11]. In addition, disaster preparedness should be a continuous process that needs review and revision responding to changes in the environment, staffing patterns, and information and technology [12]. However, in the current review, disaster preparedness was operationally defined based on disaster nursing competencies focusing on mitigation/prevention, preparedness, response, and recovery/rehabilitation [13] as measured by the nurses' knowledge, skills, and perception regarding disaster preparedness and management. Nurses can perform a dynamic role in every phase of the disaster cycle and link the required resources [14]. Therefore, nurses need to be well-prepared and have sufficient knowledge concerning effective disaster response [15].

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Table 1
Article Searching Strategies Based on PEO Elements and Settings.

PEO Elements	Examples
Participants	Nurses, Nursing Personnel, Registered Nurses, Public Health Nurses, Occupational Health Nurses, School Health Nurses
Exposure	Factors Associated, Related, Contributing, Facilitating, Factors Predicting or Predictors
Outcome	Disaster Preparedness Disaster Competencies Disaster Management Readiness Knowledge/Perception on Disaster Preparedness
Settings	Developing Countries: Based on the classification of the International Statistical Institute by gross national income [GNI] per capita according to the World Bank Atlas [19]

Considering the lack of disaster and emergency preparedness among nurses and other health care professionals, ICN and WHO [12] developed the ICN framework of disaster nursing competence, which was reviewed by ICN experts in 2019, in order to facilitate the production of a disaster nursing workforce that is able to respond and deliver humanitarian support in the context of a disaster. This framework further emphasizes the necessity of disaster training, drills, exercise, and disaster management courses for nurses, especially in countries with an emerging economy where disaster events occur most frequently [12]. Consequently, it is recommended to strengthen the ability of nurses of developing countries to plan for and responding to a disaster [16].

The nurses' disaster preparedness is a key factor in the proper response to the increasing frequency of disasters worldwide as well as the efforts to decrease their negative consequences among the affected population. However, a previous systematic review found that nurses were unsatisfactorily prepared and did not have confidence in responding effectively to disasters [17]. Additionally, Samuel (2019) highlighted the experts' opinions regarding the lack of overall preparation to deal with a global pandemic [2]. Therefore, nurses should be afforded and encouraged to engage in continuous educational programs and disaster-related training to prepare them to take care of disaster victims effectively and efficiently [17]. However, the assessment of the current state of disaster preparedness among nurses in developing countries is little known. Therefore, it is essential to identify the adequacy on disaster preparedness among nurses in such countries and add to the evidence concerning the necessary areas for improvement in order to ensure the adequate preparation of nurses for disasters.

2. Aim

This review aimed to analyze and synthesize the adequacy of disaster preparedness among nurses of developing countries. Research articles from 2010 to 2019, after the development of the disaster nursing competencies framework by ICN and WHO [12], were searched.

3. Design

An integrative review was carried out applying the five stages of the integrative review approach based on the updated methodology proposed by Whittemore and Knafl [18]. These stages are (1) identification of problems: research questions and objective, (2) searching literature: searching strategies and eligibility criteria, (3) evaluation of data: quality assessment of data, (4) analysis of data: data extraction and analysis, and (5) presentation of data: data synthesis [18].

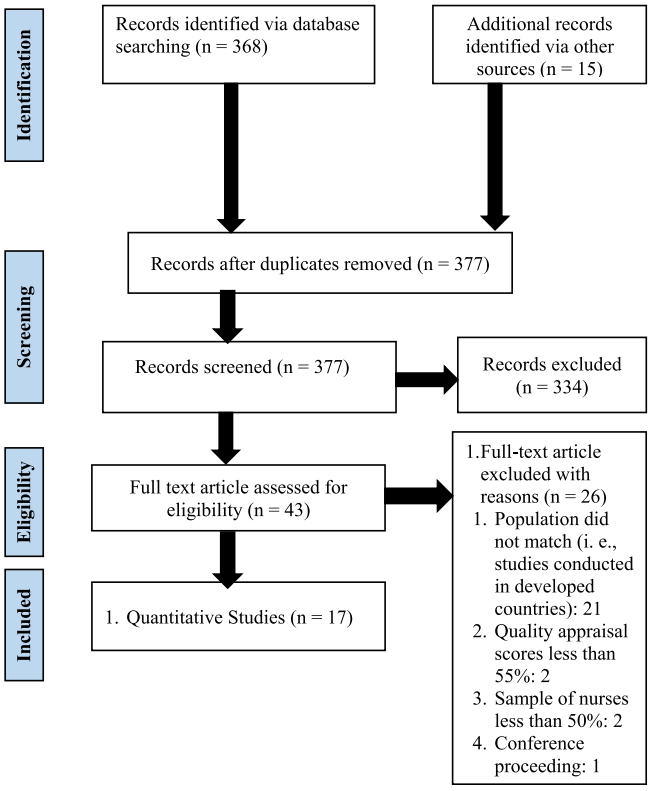

Fig. 1. PRISMA flow diagram for article selection.

3.1. Searching strategies

The searching strategies applied to search for research articles were ("Disaster Preparedness" OR "Disaster Competencies" OR "Disaster Management Readiness") AND (Nurses OR "Nursing Personnel" OR "Registered Nurses" OR "Public Health Nurses" OR "Occupational Health Nurses" OR "School Health Nurses") AND ("Developing Countries"). Furthermore, the other search strategies were ("Factors Associated with" OR "Factors Related to" OR "Contributing Factors" OR "Facilitating Factors" OR "Factors Predicting" OR "Predictors of") AND ("Disaster Preparedness" OR "Disaster Competencies" OR "Disaster Management Readiness") AND ("Nurses" OR "Nursing Personnel" OR "Registered Nurses" OR "Public Health Nurses" OR "Occupational Health Nurses" OR "School Health Nurses") AND ("Developing Countries"). The searching strategies based on the PEO elements are presented in Table 1.

3.2. Eligibility criteria

The studies that: (a) involved nurses working in any area, i.e., hospital, community, industrial, and school settings; (b) had nurses as at least 50 percent of its subjects and; (c) measured disaster preparedness or disaster competencies or disaster management readiness and its associated factors; (d) were conducted using a suitable research design (i.e., meta-analysis, experimental, quasi-experimental, descriptive and qualitative studies); and (e) were available in a peer-reviewed full-text journal. Only articles published in English were searched from February to December 2019 because of language comprehensibility. However, the unpublished dissertations, gray literature, and reports were excluded.

3.3. Study selection

The researchers adopted a three-phase process for the selection of articles as per the PRISMA guidelines proposed by Shamseer et al. [20]. In the first phase, the researchers identified the keywords using the Medical Subject Headings [MESH] 2019 Thesaurus and ProQuest Thesaurus, and finalized the selection of the key words to be used in searching the literature after assessing the title and abstract of the articles, and the index terms used in databases to retrieve the articles. In the second phase, the researchers independently searched for articles using the SCOPUS, ProQuest, PubMed, CINAHL, Ovid, The JAMA Network, and BMJ, and google scholar databases along with websites found via google. In the third phase, the lists of references of the selected articles were also reviewed independently in order to search for supplementary articles. Then the Mendeley-reference management software was used to store the full-text articles, and later, these articles were gathered together (n = 383).

Using the Mendeley-reference management software, six articles were removed because of duplications in the databases. Therefore, 377 articles were screened, and 43 articles were found relevant based on the objectives and research questions and reviewed thoroughly by the researchers independently. Subsequently, the researchers reached a consensus to exclude 26 articles. The article selection process following the PRISMA flow diagram is shown in Fig. 1.

3.4. Quality appraisal

Nineteen articles were then critically evaluated for quality and relevance using an evidence leveling system [21,22] and the quality appraisal tool described by Kmet, Lee, and Cook [23]. The cutoff point for retaining the articles for the integrative review was more than 55 percent [23] reached by consensus between the researchers. Two articles were excluded due to the determination of being low-quality or having appraisal scores <55. Finally, the researchers selected 17 articles that met the eligibility criteria (Table 2 in the Appendix) for the integrative review without any conflict or disagreement between them. The researchers analyzed the selected articles for risk of bias by focusing on the studies' strengths, limitations, eligibility, and the way of reporting outcomes.

3.5. Data extraction and analysis

The data were extracted using the data collection instruments mentioned by de Souza, da Silva, and da Carvalho [24]. The literature was grouped geographically and presented using a structured table (Table 3 in the Appendix). Thematic analyses were performed using data reduction by classifying the evidence into sub-categories based on content, displaying the data in a table, and comparing the data from retrieved literature following the guidelines proposed by Whittemore and Knafl [18].

3.6. Data synthesis

The quantitative evidence was synthesized according to the protocol described by Whittemore and Knafl [18] by grouping the concepts based on commonalities and differences revealed in the 17 articles. The initial codes were identified, then all codes were compared, and potential themes were formulated and finalized by both researchers.

4. Results

4.1. Description of the studies

Of the 17 studies, 16 applied a cross-sectional descriptive study design. Only one study was carried out using a quasi-experimental design. The details of findings are demonstrated in the data extraction Table 3. Eleven studies were conducted in the Asia-Pacific Region [i.e., Pakistan, India, Nepal, Bhutan, Laos, Solomon Islands, Bangladesh, Cambodia, Indonesia, and, Philippines] [15,25–34]. Four studies were conducted in the Middle East (i.e., Iran and Jordan) [35–38], and two studies were from Africa (i.e., Ethiopia and Egypt) [39,40].

The selected articles were conducted in different years using two main sampling techniques. Eleven studies used the non-probability sampling technique [26–28,30–34,36,38,39] and the other six studies employed the probability sampling technique [15,25,29,35,37,40]. Sixteen studies adopted a cross-sectional research design and collected data using questionnaires; the remaining study did not [26]. John and Jothy [26] conducted an educational intervention program on disaster preparedness for nurses with a one-month follow-up using a questionnaire. Most of the studies used researcher self-developed questionnaires. However, three studies [32,34,36] used the Disaster Preparedness Questionnaire developed by Tichy et al. (2009), one study [28] used the Disaster Preparedness Questionnaire developed by Fung et al. (2008), and the other studies used the Disaster Preparedness Evaluation Tools (DPET) developed by Schultz et al. (2012) [25] and Al Khalaileh et al. (2010) [35].

In these studies, the sample size ranged from 150 to 1341. Ten studies focused on nurses in the hospital settings [15,25,27,30,33,36–40]. Meanwhile, three studies were conducted among hospital and community nurses [28,32,34], and two studies each were conducted among (a) community health nurses [31,35] and (b) nurses in the hospital, community, school, and industry [26,29].

4.2. Themes

Four main themes related to disaster preparedness among nurses in developing countries were identified: (1) knowledge on disaster preparedness, (2) perceived self-preparedness on disasters, (3) training/education on disaster management and required strategies, and (4) factors associated with the nurse's disaster preparedness.

4.2.1. Theme 1: Knowledge on disaster preparedness

The overall knowledge on disaster preparedness ranged from a weak, or poor, or low to a moderate level. Nurses from the Asia-Pacific Region in particular (i.e., Bangladesh, Bhutan, Cambodia, Laos, Nepal, and Solomon Islands) had insufficient knowledge and skills related to disasters [34]; the same was true for nurses in Pakistan [25,27] and Ethiopia [40]. Jordanian nurses and other health care professionals had a moderate level of knowledge concerning preparation for catastrophe management [35]. However, another study yielded different findings; 65.4 percent of Pakistani nurses had a good knowledge level related to disasters and their management[33]. Similarly, Nepalese nurses had a moderate level of knowledge regarding disasters caused by earthquakes; to be more specific, their knowledge was of a high level regarding the recovery phase but of a low level as it regards the response phase [15].

In addition, knowledge on disaster preparedness was mostly at a moderate-to-high level in some specific content such as triage [37], basic first aid, oxygen administration, and artificial respiration [38]. However, studies in some countries highlighted the need for further education for an adequate preparation to deal with disasters due to low

levels of knowledge on first aid, field triage, basic and advanced cardiac life support [28], and assessment, triage as well as wound management in an earthquake response [15]. A lack of knowledge related to epidemiology, decision-making[38], and detection of early warning signs [40] were mostly found.

4.2.2. Theme 2: Perceived self-preparedness on disasters

The studies included in this review explored the perception of disaster preparedness based on the nurses' self-assessment and level of satisfaction or familiarity, which yielded differing findings. The overall perception of disaster preparedness ranged from a low or poor to a moderate level, particularly on skills, role, and preparedness [39] and response to disasters [15,28,31–36]. Additionally, 57.7 percent of Filipino nurses were unaware of the existing protocols for disaster management in their work setting [28]. On the other hand, the findings showed that the majority of Filipino nurses were well-prepared to deal with disasters [29].

Egyptian nurses were not satisfied with their preparedness level concerning safety measures in dealing with disaster victims [39]. Additionally, Jordanian and Indonesian nurses showed a low level of preparedness for biological and chemical attacks [36] and a lack of familiarity with the recognition of signs and symptoms, and the management strategies of post-traumatic stress disorder [30]. However, Egyptian and Iranian nurses were satisfied with their disaster preparedness regarding some specific disaster emergency nursing skills such as cardio-pulmonary resuscitation, care for the unconscious, O_2 supplementation, first aid, intubation, medication administration, universal precautions, physical assessment, immobilization and transportation [39], and triage [38].

4.2.3. Theme 3: Training/education on disaster management and required strategies

Training and education related to disaster management was addressed by some studies and revealed mixed findings. Only one study [30] found that 98.4% of the Indonesian nurses had received training related to emergencies and disasters. However, six studies showed similar findings that more than half of the nurses (range from 66.8 to 88 percent) had not received any training on disasters or emergencies, or had not attended disaster drills [15,26–28,32,40]. Additionally, 92.8 percent of Ethiopian nurses and other health care workers expressed the need for the inclusion of disaster and emergency content in their training and education (i.e., communication, disaster management, resource mobilization, health economics, risk analysis, epidemiology, ecosystem health, and leadership skills) [40].

The strategies recommended most often by the authors of 17 studies to facilitate nurse disaster preparedness involved training and education [15,25–35,37,39,40]. The disaster preparedness and management concepts should be integrated into the nursing school curricula in order to prepare nurses to deal with disasters in an effective way [15,26–28,32,34–36,38,39]. Beside educating nurse about these concepts, the employment of simulated disaster drills and exercises were recommended [15,27,28,35,36,38]. Another recommendation was the formulation of a curriculum development committee to design appropriate approaches in the nursing curriculum [36].

In addition, some other strategies to improve the nurses' disaster preparedness were emphasized in the reviewed articles. They were: the development of guidelines and protocols on disaster management [15,27,28,39], the development of a triage scale [37], action research [33,40], and self-motivation to learn directly from books and articles [15,31]. Other strategies were also recommended such as attending seminars and conferences on disasters, joining international and national research collaborative networks on disaster nursing [36], and engaging in discussions related to the roles, responsibilities, and competence of nurses in disaster management [30], holding and participating in regular meetings and communication on disaster preparedness [33], collaboration between the nursing faculty and local emergency planners, and the allocation of funds across all hospitals to make disaster preparedness possible [27].

4.2.4. Theme 4: Factors associated with nurse disaster preparedness

Many factors were associated with the nurses' disaster preparedness (i.e., associated with their level of knowledge or perception regarding disaster preparedness); they were categorized as personal, education- and training-related, and organizational.

4.2.4.1. Theme 4.1: Personal factors. In terms of knowledge, two different studies among Iranian nurses revealed that their academic background was positively related with their level of knowledge and practice related to triage [37]. Furthermore, the observed differences in knowledge level on disaster preparedness among nurses from Pakistan and Indonesia were linked to their academic background [27,30]. In addition, a significant association between knowledge and practice related to disaster management and preparedness based on academic qualification was demonstrated among Pakistani nurses [33]. Similarly, the academic qualifications of Indian nurses were associated with disaster management and prevention knowledge [26]. Furthermore, this study detected a significant association between marital status and awareness on earthquakes as well as an association between occupation and awareness on tsunamis [26]. Similarly, the experience level, designation (i.e., charge nurses and head nurses), and marital status of Pakistani nurses were associated with their knowledge on disaster preparedness [33]. However, no direction of relationship as it regards the factors related to disaster awareness and knowledge was determined by John and Jothy [26], Khan et al. [27], and Shabbir et al. [33].

Related to perception, sex and exposure to disaster situations were associated with perception regarding preparedness for disasters among Jordanian nurses and other health care providers [35]. In addition, this study mentioned that the participants who were male and had exposure to real disaster situations were more likely to perceive possessing adequate knowledge and skills related to disaster management than female counterparts as well as those who lacked exposure to a real disaster situation [35]. Likewise, the age and years of experiences of Egyptian nurses were positively related to competence concerning emergency nursing skills, preparedness level, role, and management in a disaster situation [39]. Similarly, a significant positive relationship of (a) age (i.e., older nurses) with self-perceived level of skills and preparation related to disaster management; and (b) experience with knowledge, skills, and preparation for disaster management was observed among nurses from the Asia-Pacific Region [34].

4.2.4.2. Theme 4.2: Education- and training-related factors. One study reported that the structured teaching on disaster preparedness and management increased the awareness of Indian nurses as it regards disaster preparedness and management. However, this study failed to determine a direction of relationship [26]. Usher et al. [34] highlighted the positive relationship of disaster education and training with the nurses' knowledge on disaster management. Additionally, disaster training and/or education were positively related with skills for disaster management among nurses from Indonesia and the Asia-Pacific Region [30,34]. However, Usher et al. [34] further reported that nurses were

deprived of training, disaster management-related activities, and mock drills and exercises. Likewise, associations of exposure to disaster drills and nursing specialty with perceived preparedness and knowledge level; exposure to disaster drills with perceived skill level; and experience in real disaster situations with perceived preparedness for disaster management among Jordanian nurses and other health care providers were discovered [35]. This study outlined the differences in perception, knowledge, and skill levels between nurses and midwives, and nurses and physicians. Nurses were more likely to have better knowledge related to disaster management than midwives and weaker knowledge than physicians [35]. Additionally, this study stressed that health care professionals who were exposed to disaster drills perceived themselves as well-prepared, having more knowledge, and being better-skilled on disaster management than those who had never been exposed to such drills.

4.2.4.3. Theme 4.3: Organizational factor. Only one study revealed that nurses working in the government sector and private sector in Nepal had a moderate and low level of knowledge regarding disasters, respectively. The difference in disaster knowledge between nurses employed in governmental and non-governmental organizations was significant [15].

5. Discussion

This integrative review analyzed 17 articles focusing on disaster preparedness among nurses in developing countries. Only six studies used previously-developed instruments that have been deemed reliable but with modifications. The quality appraisal scores of the selected articles ranged from 63.6 to 95.5 percent. The identified themes on nurse disaster preparedness in the current review mainly concerned the nurses' knowledge and perception regarding their role, preparation for disaster management, triage skills, early warning indicators, management skills, response to a disaster, and recovery after a disaster. In addition, training and education on disaster management, factors associated with disaster preparedness, and strategies for promoting disaster preparedness were the other themes revealed by this review. Furthermore, disaster preparedness among nurses was viewed as having adequate knowledge and skills, and a high level of perception on the nurse's role in a disaster situation as well as their level of preparedness and management skills required to deal with a disaster effectively. Disaster preparedness in the current review mainly focused on providing care for those affected by natural disasters rather than disasters caused by a pandemic. A prior qualitative systematic review also highlighted that nursing professionals, healthcare settings, and the government play an important role in the response to an epidemic [41]. However, Seyedin et al. [38] reported a low level of knowledge on epidemiology and decision-making among nurses in developing countries. This finding is congruent with previous systematic [41] and integrative [42] reviews, and other literature [43]. The published literature [41,42,43] indicates that nurses and health care workers experience many challenges in a pandemic situation due to a lack of education and training to manage disease outbreaks. This highlights the necessity for the assessment of nurses' preparedness, provision of education and training for nurses related to epidemic or pandemic disaster management as well as the prevention of the spread of infection and reduction of mortality rates due to them.

Disaster nursing care is different from routine nursing care [44]. The nurses' roles are invisible during a highly-visible event (i.e., disaster) [45]. Therefore, education on disaster nursing is most important for nurses to respond immediately in disaster situations, deliver first aid care, meet pharmacological needs, assess the condition of victims, and monitor psychological health care needs without fear and anxiety [46]. However, the studies included in the current review conducted in different developing countries revealed similar findings. Weak or poor-to-average or low-to-moderate levels of disaster preparedness among nurses based on their level of knowledge or perception concerning disaster preparedness were identified [15,25,27,28,30,31,34–40]. In some cases, nurses were not aware of the existing protocols for disaster management in their work setting [28]. These findings highlighted the minimal progress achieved towards attaining satisfactory disaster nursing competencies among nurses during the 10 years after the development of the framework on disaster nursing competencies by ICN and WHO [12]. In addition, the emergency and disaster-related knowledge and training for nurses to overcome the various challenges associated with disasters were found to be lacking. These findings are consistent with the findings of previous systematic reviews on disaster preparedness among nurses [28,47]. The recent revision of disaster nursing competencies by ICN [13] highlighted the eight domains of disaster competencies for nurses, namely (1) preparation and planning; (2) communication; (3) disaster management; (4) safety and security; (5) assessment; (6) intervention; (7) recovery; and (8) legal and ethical decision-making for nurses.

Consequently, these domains reveal the need for disaster drills/exercises, refresher courses and disaster nursing education, familiarity with disaster protocols in the organization, and the provision of emergency planning guidance to nursing staff [13]. Furthermore, the nurses' participation in the development of disaster protocols, pre-disaster planning, post-disaster evaluation, disclosure of safety in decision-making during an emergency/disaster, and infection control practices are also highlighted [13]. In addition, assessing the need for physical or mental support to nurses and their capability to provide physical or mental support to others, the indication of using personal protective equipment by nurses and others, and awareness of ways to eliminate risks to self or others, and promoting safety are also outlined [13]. Furthermore, up-to-date information on emergencies and ways of reporting emergency events, triage for the quick physical and mental health assessment of victims, application of basic first aid, identification of the need to isolate the patient, and placement of the patient in isolation are also essential disaster competencies for nurses [13]. Utilization of other human resources such as volunteers and family members during an emergency/disaster, roles and responsibilities of nurses during recovery, patient referral needs, de-briefing others regarding disaster/emergency events, and identification of the nurses' ethical knowledge are also required disaster nursing competencies [13].

In addition, the American Association of Occupational Health Nurses [48] recommends that occupational and environmental health nurses should be knowledgeable on hazards, risks, signs and symptoms of hazards, assessment and caring approaches of patients exposed to hazards, and have the ability to coordinate with other professionals in order to ensure disaster preparedness. On the other hand, violence, epidemics, and pandemics are considered as the foremost health challenges globally that carry negative consequences on health [13]. It is considered that fully-prepared nurses have these disaster nursing competencies. However, there is a scarcity of standard instruments that can assess the disaster nursing competencies or the disaster preparedness of nurses covering all these domains of ICN [13] and the context of developing country. In addition, the articles in the current review did not employ

instruments covering all of the dimensions of disaster nursing competencies [13]. Thus, future research should operationally define nurse preparedness and target the development of new or standard instruments focusing on the disaster nursing competencies highlighted by ICN [13].

Additionally, the Nevada State College [46] outlined that nurses are required to be prepared for disasters by ensuring their ability to deal with insufficient resources and supplies, ethical dilemmatic situations and changing physical environments, and facing safety and security threats. Therefore, nurses in developing countries should be well-prepared by possessing an adequate level of both knowledge and skills related to disaster management as a way to develop their disaster nursing competencies. It is also necessary to share hospital protocols as well as knowledge and experience regarding the roles and responsibilities of nurses in a disaster situation.

When it comes to being ready and able to manage situations after a disaster effectively and efficiently, some personal factors have been found to associate with disaster knowledge and perception of preparedness among nurses. Exposure to real disaster situations [40]; work experience [33,39]; previous disaster experience [28,34] and undergoing disaster-related training[28] were found to relate to disaster knowledge and preparedness perception among nurses. These findings are congruent with the findings of a previous systematic review [28], which reported that experience from previous disasters and disaster training fostered the nurses' preparedness related to catastrophe response. Moreover, the current review indicated that nurses were deprived of training, disaster-related activities, mock drills, and relevant exercises [34]. Most of the identified factors related to knowledge and preparedness are modifiable rather than non-modifiable. Strengthening the modifiable factors (i.e., disaster education and training, and simulated disaster drills and exercises) would help enhance the nurses' knowledge on disaster preparedness and management.

This integrative review discovered a knowledge gap, a lack of preparation, and many associated factors. Its findings further demonstrated that disaster preparedness among nurses from developing countries remains inadequate in light of the recommendations of ICN and WHO [12]. Conceptually, it is projected that the lack of preparedness regarding disasters might be due to the lack in education and refresher training courses on disaster preparedness and management. However, it has been reported that knowledge on disaster management among nurses did not much improve even after receiving training on disaster preparedness [30]. This could be related to different contexts, willingness, and types of disasters. Narrative synthesis concluded that 23.1 percent to 95.8 percent of health care professionals had a willingness to work during an influenza pandemic [49] that might be related to the nurses' preparedness for disaster. The most important factors associated with willingness to take part in disaster response among nurses were the preparedness of the workplace [50,51]; having formal training on disaster and disaster plan in a family [51]; perception of efficacy [52]; self-efficacy [53]; professional commitment to care [52]; and disaster competence and willingness to take part in a hospital disaster rescue [54]. Likewise, work environment (i.e., disaster management plan in written form, availability of adequate personal protective materials, managing sufficient human resource, communication facilities for nurses and their loved ones) with trust in the workplace played a significant role to foster a willingness to be involved in disaster response [55]. The current infectious disaster from COVID-19 could be an example to reflect an issue of disaster preparedness and hence affect the willingness or intention to responses as shown in the time of this review [56,57,58]. Therefore, it is most important to enhance the disaster preparedness of nurses giving due consideration to the factors associated with willingness to participate in disaster response.

6. Strengths

The researchers adopted the five stages of the integrative review strictly along with a quality appraisal of the articles in order to minimize selection bias. Receiving disaster training was not associated with the knowledge level of nurses as it regards their competence to respond to and manage the situation after a disaster, which was the most important and surprising finding compared to those of previous systematic reviews. This finding provides a new direction for nurses to identify gaps in existing training and its delivery, and the availability of resources for the effective implementation of programs, which could be applied to future disasters or pandemics. This would be beneficial to the efforts to help enhance the knowledge level, skills, and attitude of nurses as it regards disaster preparedness. Even after the framework developed by the ICN and WHO [12] to promote disaster nursing competencies, nurses from developing countries still lack in disaster preparedness. Therefore, this review has identified the current situation in the field of disaster nursing and highlighted the areas that need to be improved in order to help nurses prepare for and deal with disasters by focusing on disaster nursing competencies delineated by the ICN [13].

7. Limitations

The selected articles in this review comprised diverse sample populations, different data collection instruments, and different criteria for level classification such as poor or weak, average, and high, or inadequate, moderate, and adequate, which limited its ability to perform the meta-analysis. The inclusion of only articles in English and the exclusion of unpublished and gray literature were other limitations of this review. Additionally, these selected articles have some limitations in terms of instrument descriptions, sample size calculations, and analysis techniques. The lack of preparedness among community nurses, who act as first responders in the disaster team, could be a barrier to the proper disaster response and its management. However, most of the studies concentrated on hospital settings and natural disasters. Evidence is scarce concerning the nurses' preparedness related to epidemic or pandemic disasters, recognition of psychological problems and the needs for psychological support, and disasters caused by biological and chemical attacks. Additionally, none of these studies described the magnitude and direction of the association of the known factors with the nurses' knowledge and perception of disaster preparedness. The nurses' knowledge and perception of disaster preparedness might be different based on work settings such as hospitals and other public health settings (communities, schools, or industry), and the service needs of special groups or geographic locations. However, the selected articles in the present review were limited in their ability to extract or differentiate the level of disaster preparedness among nurses in such settings.

8. Conclusions

It is difficult to derive definite conclusions on disaster preparedness among nurses because of differences in the interpretation of findings from the published research articles. However, most of the studies found that nurses had a diverse level of knowledge and perception (i.e., poor, or weak-to-average, or low-to-moderate) related to disaster preparedness. These findings indicate that nurses from developing countries remain inadequately prepared to deal with disasters. The factors associated with their preparedness to deal with disasters were related to disaster education and training as well as organizational rather than personal in nature (i.e., disaster experience and exposure to real disaster situations).

Furthermore, nurses possessed an inadequate level of knowledge on leadership and communication skills, disaster management, resource mobilization, health economics, risk analysis, and epidemiology related to disasters, particularly as it pertains to the response and recovery phases. Training and education; integration of disaster nursing concepts into nursing curricula, availability of and participation in simulated disaster drills and exercises, development of relevant guidelines and protocols are strongly recommended strategies to promote disaster

preparedness among nurses. Future research should focus on the relationship between training and disaster preparedness and/or management and recommend the analysis of the components and contents of training programs related to disasters. Additionally, it is recommended to develop disaster preparedness scales based on the disaster nursing competencies highlighted by ICN[13] and use standard validated tools to measure nurse preparedness. Finally, a study on the community nurses' preparedness related to disaster management using a robust methodological approach seems important.

9. Relevance to nursing research, policy and practice, and nursing education

The findings of this review offer valuable insight, which could prove useful to the design of interventional studies and may help increase public engagement that could enhance disaster preparedness among nurses in the future. Moreover, its findings might also be serve as a guide to healthcare policymakers and nurse practitioners in the development of policies, educational packages, and in-service training programs for nurses focusing on field triage, first aid, basic life support, epidemiology, decision-making, and the recognition of the early warning signs of disasters, etc., along with organizing disaster drill training and creating mental health support programs. Additionally, its findings might be useful to nurse educators in the development of guidelines for the inclusion of disaster concepts in the undergraduate and postgraduate nursing curricula and enhancement of disaster nursing competencies among future nurses.

Authorship

Both researchers meet the authorship criteria and both were involved with (1) conception and study design, (2) data collection, (3) data analysis and synthesis, (4) drafting, revising and finalizing the manuscript, and (5) are responsible for all aspects of work, and with the final manuscript

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CRediT authorship contribution statement

Praneed Songwathana: Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing. **Rekha Timalsina:** Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing - original draft, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

Table 2
Checklist for Assessing the Quality of Quantitative Studies[23.]

S. N.	Criteria	Authors and Year								
		Basal & Ahmed 39 (2018) [39]	Labrague et al. (2016) [28]	Magnaye et al. (2011) [29]	Asgari et al. (2018) [37]	Seyedin et al. (2015) [38]	Berhanu et al. (2016) [40]	Al Khalaileh et al. (2012) [36]	Al-Ali & Abu Ibaid, (2015) [35]	Usher et al. (2015) [34]
1	Question/objective sufficiently described?	2	2	2	2	2	2	2	2	2
2	Is the study design evident and appropriate?	2	2	2	2	2	2	2	0	2
3	Method of subject/comparison group selection *or* source of information/input variables described and appropriate?	2	2	1	1	1	2	2	2	2
4	Subject (and comparison group, if applicable) characteristics sufficiently described?	1	2	1	1	1	2	2	2	2
5	If the interventional and random allocation was possible, was it described?	NA	NA	NA	NA	NA	NA	NA	NA	NA
6	If interventional and blinding of investigators was possible, was it reported?	NA	NA	NA	NA	NA	NA	NA	NA	NA
7	If interventional and blinding of subjects as possible, was it reported?	NA	NA	NA	NA	NA	NA	NA	NA	NA
8	Outcome and (if applicable) exposure measure(s) well-defined and robust to measurement/misclassification	2	2	1	2	2	1	2	2	2

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Table 2 (*continued*)

S. N.	Criteria	Authors and Year								
		Basal & Ahmed 39 (2018) [39]	Labrague et al. (2016) [28]	Magnaye et al. (2011) [29]	Asgari et al. (2018) [37]	Seyedin et al. (2015) [38]	Berhanu et al. (2016) [40]	Al Khalaileh et al. (2012) [36]	Al-Ali & Abu Ibaid, (2015) [35]	Usher et al. (2015) [34]
	bias? Means of assessment reported?									
9	Is the sample size appropriate?	1	1	1	2	2	2	1	1	1
10	Analytic methods described/ justified and appropriate?	2	1	1	1	1	2	2	2	1
11	Some estimate of variance is reported for the main results?	1	0	1	0	0	2	0	0	2
12	Controlled for confounding?	0	0	0	0	0	2	0	0	2
13	Results reported in sufficient detail?	2	1	2	1	1	2	2	2	2
14	Conclusions supported by the results?	1	2	2	2	2	2	2	2	2
Total		16	15	14	14	14	21	17	15	20
Obtained Percent Score		72.7	68.2	63.6	63.6	63.6	95.5	77.3	68.2	90.9

S. N.	Criteria	Authors and Year							
		Martono et al. (2019) [30]	Sangkala et al. (2018) [32]	Putra et al. (2011) [31]	Ali et al. (2017) [25]	Khan et al. (2017) [27]	Shabbir et al. (2017) [33]	John & Jothy (2018) [26]	Basnet et al. (2016) [15]
1	Question/objective sufficiently described?	2	2	2	2	2	2	2	2
2	Is the study design evident and appropriate?	2	2	0	2	2	2	2	2
3	Method of subject/comparison group selection *or* source of information/input variables described and appropriate?	1	2	2	1	1	1	2	2
4	Subject (and comparison group, if applicable) characteristics sufficiently described?	1	2	2	2	2	2	1	2
5	If the interventional and random allocation was possible, was it described?	NA	NA	NA	NA	NA	NA	NA	NA
6	If interventional and blinding of investigators was possible, was it reported?	NA	NA	NA	NA	NA	NA	NA	NA
7	If interventional and blinding of subjects as possible, was it reported?	NA	NA	NA	NA	NA	NA	NA	NA
8	Outcome and (if applicable) exposure measure(s) well-defined and robust to measurement/misclassification bias? Means of assessment reported?	2	2	2	1	2	1	1	2
9	Is the sample size appropriate?	1	2	2	1	1	2	1	2
10	Analytic methods described/justified and appropriate?	1	2	1	1	1	2	2	2
11	Some estimate of variance is reported for the main results?	2	2	1	0	2	0	0	2
12	Controlled for confounding?	0	0	0	0	0	0	0	0
13	Results reported in sufficient detail?	2	2	2	1	2	2	2	2
14	Conclusions supported by the results?	1	2	2	2	2	2	2	2
Total		15	20	16	13	17	16	15	20
Obtained Percent Score		68.2	90.9	72.7	59.1	77.3	72.7	68.2	81.8

Note. 0 = No, 1 = Partial, 2 = Yes, NA = Not Applicable. Percent Conversion = Obtained Score/Total Score × 100. Here, Total Score = 22.

Table 3
Data Extraction Sheet Regarding Nurse Disaster Preparedness.

Title, Author and Year	Design/ population/ sampling technique	Sample size & characteristics	Tools used, data collection methods, and data analysis techniques	Results	Recommendations	Quality appraisal [23] & level of evidence [21,22]
1. Perception of nurses regarding their role, preparedness and management skills during hospital disasters (Basal & Ahmed, 2018) [39] • **Country and settings:** Egypt, departments of Tanta University Emergency Hospital	• Descriptive research design, • 563 nurses from Tanta University Emergency Hospital • Convenience sampling	• 424 nurses	• 30-item hospital disaster preparedness questionnaire sheet for nurses developed by the researcher • Questionnaire method • Descriptive and correlation analysis	• **Role** (High = 49.30%, Moderate = 33.96%, Low = 16.74%); • **Preparedness** (High = 47.6%, Moderate = 33.49%, Low = 16.74%), • **Management skills** (High = 48.83%, Moderate = 35.84%, Low = 15.56) • **Disaster nursing skills** (High = 60.14%, Moderate = 29.4%, and Low = 10.06%) • **Associating factors** **Age with: role** (r = 0.086, p = 0.038), **preparedness** (r = 0.095, p = 0.026), **management** (r = 0.084, p = 0.042), and **emergency nursing skills** (r = 0.092, p = 0.023) • **Years of experience with: role** (r = 0.118, p = 0.007), **preparedness** (r = 0.128, p = 0.004), **management** (r = 0.115, p = 0.009), and **emergency nursing skills** (r = 0.117, p = 0.008)	• Training and educational programs • Availability and accessibility of guidelines related to disaster management • Inclusion of content on disasters in undergraduate curriculum	**C** **72.7%**
3. Disaster preparedness in Philippine nurses (Labrague et al., 2016) [28] • **Country and settings:** The Philippines, Central Philippines	• Descriptive cross-sectional study, hospital and community nurses, convenience sampling	• 170 nurses, i.e., 105: hospital nurses, and 65 community nurses • Regular full-time nurse working in health care institutions and willing to participate	• Disaster preparedness questionnaire developed by Fung et al. (2008) • Descriptive analysis	• **Perceived level of preparedness:** 80% unprepared, 20% prepared • 57.7%: **unaware of an existing protocol** for disaster management in the workforce • **Learning needs regarding disaster preparedness:** practice drills and scenarios, disaster protocol development and implementation, first aid, field triage, basic life support, advanced cardiac life support, prehospital life support	• Disaster protocols • Disaster training • Simulated disaster drills • Inclusion of content regarding disaster management in the nursing curriculum	**C** **68.2%**
4. The role, preparedness level, and management ability of nurses during disasters (Magnaye et al., 2011) [29] a. **Country and settings:** Batangas, Philippines	• Descriptive research design • Community, hospital, school, clinic, and industrial nurses • Systematic random sampling	• 250 nurses • Working nurses in the selected settings with any area of specialization	• A researcher-made questionnaire • Questionnaire methods • Descriptive and Pearson product moment correlation coefficient analysis	• **Role of nurses in a disaster situation:** Agreed to being prepared (M = 4.33, SD = 0.70) • **Preparedness of nurses in disaster situations:** Perceived being prepared (M = 5.28, SD = 0.81) • **Management of nurses in disaster situations:** Agreed to having adequate ability (M = 5.16, SD = 0.82) • **Factors associated** • **Role:** sex (F = 4.166, p = 0.017), civil status (F = 4.682, p = 0.011), years of service (F = 2.698, p = 0.023)	• Training and educational session	**C** **63.6%**

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Table 3 (*continued*)

Title, Author and Year	Design/ population/ sampling technique	Sample size & characteristics	Tools used, data collection methods, and data analysis techniques	Results	Recommendations	Quality appraisal [23] & level of evidence [21,22]
				• **Preparedness:** years of service ($F = 2.827$, $p = 0.018$) • **Management:** sex ($F = 3.079$, $p = 0.049$), years of service ($F = 2.795$, $p = 0.019$)		
5. Evaluating the disaster triage knowledge of nursing personnel in the public hospitals of Ilam (Asgari et al., 2018) [37] • **Country and settings:** Iran	• Descriptive analytical design, nurses working in IUMS-affiliated hospitals, • Random sampling	• 160 nurses with 6 months of work experience in an emergency department and willing to participate	• A researcher-made questionnaire • Questionnaire method • Descriptive and inferential statistics, e.g., correlation	• **Level of triage knowledge and practice:** Moderate • **Association of educational level with:** ⁶ **Triage knowledge:** $r = 0.61$, $p = 0.009$ ⁶ **Triage practice:** $r = 0.509$, $p = 0.006$	• Development of scale related to triage for nurses • Training • Development of the National Triage Scale	**C** **63.6%** Lacked the clear mentioning of the type of random sampling technique
6. Emergency nurses' requirements for disaster preparedness (Seyedin et al., 2015) [38] a. **Country and settings:** Iran, Iran University of Medical Sciences	• Cross-sectional Study, • Nurses in the emergency departments of 8 hospitals • Convenient sampling	• 460 nurses with 6 months of experience and a Bachelor's or higher degree in nursing	• 42-item questionnaire using a 5-point Likert scale with 8 domains • Descriptive analysis, Pearson correlation coefficient, and independent *t*-test	• **Perceived knowledge** = Average • **Triage** = Highest familiarity • Basic first aid, administering oxygen, and artificial respiration = Highest knowledge • Epidemiology and decision-making: Lowest scores	• Establishment of a formal curriculum on mass casualty and disaster management • Scenario-based drills	**C** **63.6%** Did not present correlation findings
7. Knowledge, experience and training needs of health professionals about disaster preparedness and response in Southwest Ethiopia: A cross-sectional study (Berhanu et al., 2018) [40] • **Country and settings:** Ethiopia, Southwest of Addis Ababa	• A cross-sectional survey, 741 health professionals of selected districts, • Random sampling with lottery method	• 377 health professionals calculated using the single-population proportion formula • Nurses and midwives = 65.7%; the rest were other health professionals	• A structured questionnaire developed by the researcher based on literature review • Descriptive and bivariate analysis and multiple logistic regression model • Thematic analysis of open-ended question responses	**66% nurses: perceived having a good knowledge level** A. **Early warning indicators** • **Flood:** moderate = 32.6%, and poor = 48% • **Drought:** moderate = 36.1%, and poor = 47.5% • **Disease outbreak:** moderate = 45.4%, and poor = 28.6% B. **Preparedness for a disaster** • **Flood:** moderate = 36.1%, and poor = 49.6% • **Traffic accident:** moderate = 56.5%, and poor = 32.4% • **Fire:** moderate = 51.2%, and poor = 29.7% • **Drought:** moderate = 37.4%, and poor = 50.4% • **Disease outbreak:** moderate = 46.7%, and poor = 23.9% C. **Response to a disaster** • **Flood:** moderate = 42.4%, and poor = 49.6% • **Traffic accident:** moderate = 54.4%, and poor = 23.9% • **Fire:** moderate = 50.9%, and poor = 27.9% • **Drought:** moderate = 34%, and poor = 50.7%	• Training on disaster preparedness • Similar studies involving other sectors other than health	**C** **95.5%**

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Table 3 (*continued*)

Title, Author and Year	Design/ population/ sampling technique	Sample size & characteristics	Tools used, data collection methods, and data analysis techniques	Results	Recommendations	Quality appraisal [23] & level of evidence [21,22]
				• **Disease outbreak:** moderate = 47.5%, and poor = 21.0% D. **Overall knowledge**: moderate = 32.4%, and poor = 38.2% E. **49.9 to 76.9% of nurses expressed different areas of training need:** communication skills, disaster management, resource mobilization & health economics, risk analysis, field epidemiology & ecosystem health, and leadership skills		
7. Jordanian nurses' perception of their preparedness for disaster management (Al Khalaileh et al., 2012) [36] • **Country:** Jordan	• Descriptive cross-sectional survey, nurses of 5 Jordanian hospitals, • Convenience sampling	• 474 nurses • At least 1 year of experience, currently working as RNs in the hospital setting	• Disaster preparedness evaluation tool (Tichy et al.., 2009) • Descriptive as well as inferential statistics—t-tests and one-way ANOVA	• Knowledge on preparation: weak (M = 2.98) • Skills for participating in the creation of new guidelines, plans for an emergency, or lobbying for improvement: weak (M = 2.99) • Preparedness: half obtained knowledge and learned via drills or continued education • 11% participated in a real disaster situation • Perception of disaster preparation (i.e., health assessments related to biological and chemical agents): weak • Logistic arrangement of organization and their roles, and other areas: moderate • 58% were unfamiliar with the hospital's disaster protocol • Among aware staff, 80% lacked confidence in plan implementation	• Integration of disaster management courses into undergraduate nursing curricula • Development of graduate disaster management courses and programs • Disaster drills and exercises • Drills incorporated into in-service education • Development of a national committee on disaster nursing for curriculum development related to disaster settings and competencies • National and international collaborative research networks for disaster nursing	**C** **77.3%**
8. Health care providers' perception of knowledge, skills, and preparedness levels for disaster management in primary health care centers in Jordan (Al-Ali & Abu Ibaid, 2015) [35] • **Country and settings:** Jordan, all health care centers of Northern Jordan	• Not specified but based on analysis: quantitative • All health care providers (i.e., physicians, nurses, and midwives) • Multi-stage random sampling	• 207 health care providers (i.e., 73% nurses and midwives and 27% other) • Having at least 1 year of experience	• The modern standard Arabic version of a 6-point Likert scale disaster preparedness evaluation tool (Al Khalaileh, Bond, Beckstrand, & Al-Talafha, 2010) • Descriptive and inferential statistics—Mann-Whitney U test and Kruskal-Wallis test	• **Perception on disaster preparedness:** moderately prepared • **Knowledge on disaster management:** moderate knowledge level • **Skills related to disaster management:** moderate to weak • Significant differences between **sexes**: regarding the perception of **preparedness** (p = 0.014), skills (p = 0.043) and **knowledge** (p = 0.016) related to disaster management • Significant differences between **previous exposure to a real disaster** and **perception of preparedness** (p = 0.002) • **Participation in training drills** with **perception of level of preparedness**,	• Disaster education • Training • Facilitation of drills • Integration of disaster management into educational programs and nursing curricula	**C** **68.2%**

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Table 3 (*continued*)

Title, Author and Year	Design/ population/ sampling technique	Sample size & characteristics	Tools used, data collection methods, and data analysis techniques	Results	Recommendations	Quality appraisal [23] & level of evidence [21,22]
				skills, and **knowledge** related to disaster management: ($p = <$ 0.001) • Significant differences in nursing **specialty (i.e., level of knowledge among nurses was higher than that of midwives)** of participants with **perception** of their own disaster preparedness ($p = 0.013$), and **knowledge related to preparedness** ($p = 0.024$)		
9. A cross-sectional survey of the disaster preparedness of nurses across the Asia–Pacific Region (Usher et al., 2015) [34] • **Country and settings:** Asia-Pacific Region (i.e., Bangladesh, Bhutan, Cambodia, China, Laos, Nepal, and the Solomon Islands)	• Cross-sectional study • Hospital and community nurses • Convenience sampling	• 757 nurses, a three-year diploma in nursing; currently working at a hospital or community setting; at least one year of work experience; and consented to participate	• 68-item disaster preparedness evaluation tool with a 6-point Likert scale (Tichy et al., 2009) • Descriptive and inferential statistics—multiple linear regression analysis with multilevel modeling	A. **Knowledge** • Moderate-to-high interest in educational classes on disaster preparedness • Respondents from all countries, except China: **weakly prepared** for participating in emergency planning related to disaster situations • All other areas of knowledge: **moderately prepared** B. **Perception of skills** • Respondents from all countries, except Cambodia: **weakly prepared** • **Perception of preparation for disaster management** C. In all other areas of post-disaster management: **moderately prepared** D. **Significant relationships: (a) knowledge** with **experience** ($p = <$ 0.001) and **disaster education** ($p = < 0.003$); (b) **perception of skills** with **age** ($p = < 0.001$), **experience** ($p = <$ 0.001), and **disaster education** ($p = < 0.021$); and (c) perception of **preparation** with **age** ($p = < 0.002$) and, **experience** ($p = <$ 0.001)	• Education and training related to knowledge, skills, and disaster-management preparedness • Inclusion of disaster nursing knowledge, skills, and preparedness activities in the nursing curriculum	**C** **90.9%**
10. Indonesian nurses' perception of disaster management preparedness (Martono et al., 2019) [30] o **Country and settings:** Indonesia, hospitals	• A descriptive cross-sectional design • Nurses working in health care services all over Indonesia, • Online recruitment, voluntary participation	• 1341 nurses • Nurses working in health care service and educational institutions	• A 46-item disaster preparedness evaluation tool with a 6-point Likert scale • Descriptive and inferential statistics—*t*-test and one-way ANOVA	• Inadequately prepared for disasters • Do not understand their roles • Significant differences: **education** and perception of preparedness as it regards having the necessary skills to cope with disasters (f [46, 1294] = 1.451, $p =$ 0.027); **experience in undergoing training** and perception of preparedness as it regards possessing the necessary	• Development of specific training materials • Discussion of roles, responsibilities, and competency of nurses related to disaster management among the stakeholders	**C** **68.2%**

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Table 3 (*continued*)

Title, Author and Year	Design/ population/ sampling technique	Sample size & characteristics	Tools used, data collection methods, and data analysis techniques	Results	Recommendations	Quality appraisal [23] & level of evidence [21,22]
				skills to cope with disasters (F [46, 1294] = 1.818, $p = 0.001$)		
11. Disaster preparedness and learning needs among community health nurse coordinators in South Sulawesi Indonesia (Sangkala & Gerdtz, 2018) [32] o **Country:** Indonesia, South Sulawesi	• Cross-sectional survey design • 425 community health nurse coordinators from community health centers • Consecutive sampling	• 254 CHN coordinators, • Having at least a three-year diploma in nursing and 2 years of experience as an RN, and working as a CHN coordinator	• Disaster preparedness evaluation tool (Tichy et al, 2009) • Descriptive analysis	• Participation in disaster courses/training: 33.2% • **Knowledge:** weakly prepared • **Skills:** strongly prepared • **Preparation for disaster management [PDM]:** moderately prepared • **Overall preparation regarding knowledge, skills, and PDM:** moderately prepared	• Development of effective disaster preparedness and management programs • Inclusion of contents related to disasters in the nursing curriculum	**C** **90.9%** Possible inadequate representation of population because of consecutive sampling
12. Perceived ability to practice disaster management among public health nurses in Aceh, Indonesia (Putra et al., 2011) [31] o **Country and settings:** Indonesia, public health centers in Aceh Province, Indonesia	• Not mentioned, but based on analysis: quantitative • Public health nurses • Stratified proportionate purposive sampling	• 252 public health nurses • Government or contract nursing employees having at least a diploma in nursing, and a 1-year work experience in the community	• The researcher developed a 30-item questionnaire to assess the public health nurses' perceived ability to practice as it regards disaster management (PHNPP-DMQ) • Descriptive and inferential analysis i.e., Spearman rank correlation and Mann-Whitney U test	• Overall perceived ability: **moderate level** • **Preparedness:** low • **Response:** moderate • **Recovery:** moderate • Contributing factors to the PHNs' level of perceived ability to practice: work area, work experience, disaster experience, nursing education, and training and education	• Disaster training and educational programs • Active reading of learning materials related to disaster management	**C** **72.7%** Failed to indicate the research design clearly
13. Knowledge of nurses regarding disaster management in the tertiary health care hospitals of Lahore (Ali et al., 2017) [25] o **Country and settings:** Pakistan, city of Lahore	• Cross-sectional descriptive study design • Nurses from tertiary-care hospitals of Lahore, random sampling	• 150 nurses • Having at least a 3-year diploma in nursing and working at the emergency department, medical ICU, surgical ICU • Having at least 1 year of working experience	• A questionnaire comprising 13 knowledge-based items with a 5-point Likert scale: The DPET (Schultz, Koenig, Whiteside, & Murray, 2012) • Self-administered questionnaire • Descriptive analysis	• 60% had not participated in any disaster management program • Unaware of disaster management	• Updating knowledge and training	**C** **59.1%** Unclear about the analysis of knowledge on disaster preparedness
14. Knowledge related to disaster preparedness among nurses at two tertiary-care hospitals in Lahore (Khan et al., 2017) [27] o **Country and Settings:** Pakistan, city of Lahore	• Descriptive cross-sectional research design • Bedside nurses, head nurses, and nursing supervisors of Sheikh Zayed Hospital and Shalimar Hospital in Lahore • Convenient sampling	• 200 nurses • Nurses working in different hospital units	• Researchers developed objective knowledge-based questions • Questionnaire method • Descriptiv, and inferential statistics	• Level of knowledge on disaster preparedness ⁶ 48%: **inadequate** ⁶ 42%: **moderately adequate**, and ⁶ 10%: **adequate** • 90%: **aware of their lack of preparation** • Stated need for training: 73% • **Factor related to knowledge:** level of education ($p = < 0.001$)	• Inclusion of disaster preparedness and management in nursing curriculum • Disaster protocols • In-service education • Disaster drills in nursing curriculum • Collaboration between nursing faculty and local emergency planners	**C** **77.3%**
15. Nurses' knowledge and practices regarding disaster management and emergency preparedness (Shabbir et al., 2017) [33]	• Descriptive cross-sectional study design • 250 professional nurses from the Children's Hospital & Institute of Child Health and the General Hospital, Lahore	• 156 head nurses and charge nurses • Working in the emergency department and engaging in triage	• Semi-structured questionnaire consisting of 16 items of open- and closed-ended items developed by modifying the questionnaire used by Moabi (2009) • Descriptive and inferential analysis	• **Knowledge:** poor (34.6%) and good level (65.4%) • **Practice:** poor (83.3%) and good level (16.7%) • **Factors related to knowledge and practice:** ⁶ **Experience** ($p = 0.014$), **marital status** ($p = 0.014$), and **designation (Charge nurses and head**	• Training • Nursing research on disasters • Regular meetings and communication on disaster preparedness and management	**C** **72.7%**

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Table 3 (*continued*)

Title, Author and Year	Design/ population/ sampling technique	Sample size & characteristics	Tools used, data collection methods, and data analysis techniques	Results	Recommendations	Quality appraisal [23] & level of evidence [21,22]
o **Country and settings:** Pakistan	• Convenient sampling			**nurses)** ($p = 0.019$) with **knowledge** ⁶ **Qualification** with **practice** ($p = 0.013$)		
16. Effect of structured teaching on disaster preparedness and management among nurses in Kerala (John & Jothy, 2018) [26] • **Country:** India, Kerala State	• Quasi-experimental one group pre-test and post-test design • Nurses from selected settings, i.e., hospital, colleges and schools • Purposive sampling	• 400 nurses	• Structured questionnaire enquiring about different types of disaster and disaster preparedness • Questionnaire method • Descriptive and inferential analysis	• Significant differences in pre-test and post-test scores for disaster preparedness and management level ($p = 0.001$) • Association between education and role of the nurse in disaster management and prevention ($p = 0.007$) • Association between marital status and earthquake awareness ($p = < 0.05$) • Association between the occupation of nurses with knowledge related to tsunamis and preventive strategies ($p = 0.016$)	• Training • Increase awareness among all nurses, nursing students, and nursing educators • Integration of disaster content into the nursing curriculum that involves both more theory and practice	**B** **68.2%**
17. Disaster nursing knowledge in earthquake response and relief among Nepalese nurses working in the government and non-government sector (Basnet et al., 2016) [15] • **Country:** Nepal	• Descriptive comparative design • Nurses from 14 governmental and 4 non-governmental hospitals • Proportionate stratified random sampling	• Sample size: 300 nurses • Having at least 3 years of diploma-level education in general nursing	• Questionnaire comprising 30 items enquiring about the nurses' knowledge regarding disasters caused by earthquakes • 24 'true' or 'false' items related to the response phase, and • 6 'true' or 'false' items concerning the recovery phase • Self-administered questionnaire method • Descriptive and inferential analysis	• Overall knowledge: moderate level (low level reading the response phase and high level regarding the recovery phase) • Level of knowledge of nurses working in a. non-government hospitals ▪ Response phase: low ▪ Recovery phase: high b. governmental hospitals: ⁶ Response phase: moderate ⁶ Recovery phase: high • A statistically significant difference in knowledge between nurses working at governmental and non-governmental hospitals with: o Overall knowledge ($p \leq 0.05$), knowledge on response ($p \leq 0.05$), and knowledge on recovery ($p \leq 0.05$)	• In-service education and training • Integration of disaster-related content in the curriculum • Disaster response plan • Mock drill exercises, particularly in triage • Wound care management • Develop a knowledge package or program	**C** **81.8%**

Note. IUMS: Ilam University of Medical Sciences.

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