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Saudi Emergency Nurses Preparedness For Biological Disaster Management At The Governmental Hospitals

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Abstract

Background: The main purpose of the study was to assess the Saudi emergency nurse's perception, competencies, and skills regarding preparedness for biological disaster management at the governmental hospital. This study has developed a better understanding of the emergency nurse's readiness to manage a potential biological disaster.

Method: The study was conducted by employing a cross-sectional descriptive survey using specific outcome measures. Additionally, the study distributed a questionnaire in paper format to enhance response rate and reduce missing data. The study participants were invited to survey about their disaster preparedness knowledge, skills, and competencies towards biological disaster management. This study was conducted in East Jeddah Hospital with a simple random sample of emergency nurses who have at least three years' experience.

Result: Indicates that the perception of emergency nurses for biological disaster management is productively associated with the competency, skills, and knowledge at governmental hospitals in Jeddah Province. The emergency nurses' level of preparedness is simultaneously associated with the training and initiative-taking strength development for biological disaster management. Emergency nurses' knowledge and skills about biological disaster management depends upon the organizational and authority management. All these factors elevate the emergency nurses' competencies for biological disaster management

Conclusion: Emergency preparedness of the biological disaster management at government hospital usually depends upon the hospital management, authority decisions making capacities and mandatory practice skills that increases the chance of effective management of disaster.

Keywords: Emergency nurses. Disaster preparedness knowledge. Skills, competencies. Biological disaster management. Government hospital.

Introduction

Background

According to the World Health Organization, disaster refers to an event or situation that is of greater magnitude than an emergency; disrupts essential services such as housing, transportation (Dewanti et al., 2019), communications (Fokaefs & Sapountzaki, 2021), sanitation (Hosseinpourtehrani et al., 2022), water (Tsai et al., 2019), and health care (Almukhlifi et al., 2021); and requires the response of people outside the community affected (Sakurai & Murayama, 2019). The term disaster particularly signifies an event that carries unforeseen, serious, and immediate threats to public health. Disaster is also any occurrence that causes damage, economic disruption, loss of human life, and deterioration in health services on a scale sufficient to warrant an extraordinary response from outside the affected community area (Travers et al., 2022). Therefore, the issue is the difficulty of predicting disasters before they occur which is a motive for decision-makers to work towards access to sound methods of disaster management, thus avoiding large human and material losses by working to avoid disasters or by controlling their results if they occur (Yu et al., 2018). This will prevent unnecessary loss of human lives, and it is in this connection that the roles, preparedness, and management of a medical team including the nurses are deemed essential, considering that nurses are the largest working group in the health field (Paton et al., 2017).

Assessing nurses' perception of their role during disasters, their knowledge of disasters, and the extent to which they receive training and other skills will help decision makers and managers to understand the current situation and help them to identify needs and how to put plans for any potential disasters that may occur to decrease mortality rate (Martono et al., 2019). The goal of disaster preparedness is to ensure that appropriate actions are taken, resources are provided, and appropriate systems are pursued with a view to providing effective and urgent assistance to disaster victims and facilitating the relief and rehabilitation of victims (Wolf et al., 2019), it covers all the activities that disaster responders need before it occurs to ensure an effective and smooth response within the disaster response plan (Travers et al., 2022).

By looking into the literature review, no country is immune or protected from disaster or catastrophic events which may take place anywhere around the globe. There several factors can be used to categorize disaster (Safapour & Kermanshachi, 2020). This encompasses the onset of disaster (slow vs rapid onset) or precipitating factors (natural or human made disaster) (Sigala & Wakolbinger, 2019). The former type is characterized by sudden onset with least human intervention. These incudes natural disasters such as earthquakes and hurricanes. Other forms of natural disasters include floods, droughts, tidal waves, avalanches, volcanic eruptions, tornadoes, landslides, and earth tremors (Perić & Cvetković, 2019). On other hand, the latter type of disaster is developed

because of human activity such as terrorist acts, chemical, biological, environmental pollution, transportation accidents and political unrest (Khorram-Manesh et al., 2021, p 123).

Recently, disasters occurred more frequently around the world and the profound consequences of disaster increase. Considering the impact of disaster, it is becoming extremely disastrous on individuals and communities (Misztal-Okońska e al., 2020). For instance, it causes loss of life, forces people to leave homes (displacement of refugees), damage to health facilities (health centres, hospitals), damage to property, destruction of buildings and devastating damage to the environment and communication networks. Furthermore, it posits social, economic, psychological and health problems. Improper management of disaster plays a role in magnification of the negative consequences (Rouhanizadeh et al., 2020). Though they have a harsh impact on peoples' belongings and their surroundings, the ensuing morbidity and mortality require health care professionals to respond as effectively and as efficiently as possible (Chua et al., 2020).

Preparing emergency nurses for disaster management may result in positive outcomes for populations involved in a disaster, such as minimizing casualty and deaths, enhanced health status, and reduce economical loses (Sindhu et al., 2022: Amberson et al., 2020). Also, Murphy et al. (2020), found that there is a consensus that America's hospitals' staff, including nurses, are not prepared for large-scale terrorists' attacks. Sultan et al. (2020), stated that to be prepared to respond appropriately to biological, chemical, radiation, nuclear, expulsion (BCRNE) disasters and other public disasters, nurses must acquire related skills. These skills include quick physical assessment and disaster triage; the utilization of personal protective devices; and techniques, such as risk assessment and hazard recognition. The preparedness process consists of gaining nursing-specific bioterrorism management knowledge, planning response strategies, practicing response behaviours, and evaluating knowledge level and response plan content (Younis et sl., 2020).

Nurses play a significant role in the prevention and mitigation phase (Putra et al., 2021). This role begins by identifying risks at both the individual and community levels. Nurses work with other health workers to identify major diseases and injuries, cooperate with each other to develop risk reduction plans, and develop surveillance systems for disease outbreaks (Hung et al., 2021). Nurses also assist in conducting community needs assessments and identifying vulnerable populations, such as those with chronic diseases, disabilities or mental health problems, all this information is important data for the disaster plan, and nurses are involved in developing care plans in alternative settings such as shelters after the disaster by identifying safe and alternative health care delivery and risk reduction activities in health care facilities as well as assistance in planning the evacuation of health facilities and the transfer of patients and injured as needed (Wright et al., 2020).

The chances of disaster victims surviving will improve if nurses know what to do (Brewer et al., 2020). However, Veenema et al. (2019) strongly suggested nurses need to be prepared for common disasters, such as natural or accidental industrial accidents rather than preparing for threats of rare and exotic events and agents. A successful disaster response depends on how well the acute care facility and the emergency department staff are prepared (Chiang et al., 2020). Moreover, the attainment of preparedness takes place through a process of planning, training, and exercising (Hasan et al., 2021).

Not all emergency nurses are expected to perform as first responders. But when disaster happens, all emergency nurses, even those without disaster education or training, may be called on to participate (Brewer et al., 2020). This

indicates the importance of obtaining knowledge through disaster education and training. Nursing education plays a significant role in preparing nurses for disaster. It helps in increasing awareness and knowledge about disaster through research efforts. It also helps in improving nursing care and increasing the effectiveness of nurses' response during disaster (Yousefi et al., 2019). Specialized training and education in disaster management is the cornerstone in effective emergency nurses' response in disaster situations (Ghezeljeh et al., 2019). Goniewicz et al. (2021), stated that advance training in disaster preparedness provides emergency nurses with valuable competencies to fill a need for prepared first responders. Moreover, education is consequently an integral part of the disaster planning process; successful training yields higher effectiveness in emergency response (Taskiran & Baykal, 2019). Education will acquaint emergency nurses and other health care providers with a wide range of skills to respond in a high capacity to disasters. These skills include quick physical assessment and disaster triage; the utilization of personal protective equipment; and techniques, such as risk assessment and hazard recognition (Kim & Lee, 2020). Kavanagh and Sharpnack (2021), found education are one of the determinants that influence emergency nurse's willingness and decisions to respond to disaster situations. The other two determinants were found to be knowledge, and level of emergency preparedness.

Whether disasters are naturally caused by environmental forces, or human-made, they have placed extraordinary stresses on society. This necessitates involvement of all the community partners in health and emergency preparedness programmes to improve successful and adequate response in the community (Brewer et al., 2020). Healthcare professionals, such as nurses, who are knowledgeable and prepared for disaster, are needed to provide competent care to disaster victims. Disaster nursing involves a systematic application of knowledge and skills specific to disaster situations as well as implementation of activities that minimize health hazards and life-threatening damage caused by disasters (Said & Chiang, 2020) A study conducted by Hasan et al. (2021), examined the knowledge, attitude, and practice of the emergency nurses and community health nurses towards disaster management in Malaysia. The results showed that 57% of emergency nurses had sufficient knowledge and skills compared to 30% of community health nurses. The variation in level of preparation can be attributed to the fact that emergency nurses received comprehensive training, education, and response management which improved their perceived knowledge and skills. Said and Chiang (2020) explored the relationship between hospital preparedness and nursing skills in various emergency situations. The study results revealed that there was a significant relationship between the level of preparedness and nursing skills.

Problem Statement and Significance

The disaster cycle represents the course of a disaster from start to finish, including the prevention of disaster, preparation for disaster, the experience of the actual disaster event, the response to the disaster, and the recovery from the disaster (Al Harthi et al., 2021). It provides a tool for the examination of the various features of disaster planning and response, and thus is useful to registered nurses who play a significant role in the planning and management of responses to disasters. Preparing for a biological terrorist attack is one important subset of the overall set of skills of disaster planning in emergency nursing. By having a good understanding of the factors that influence the knowledge possessed by emergency nurses regarding managing victims of bioterrorism, we can better prepare them to deal with potential attacks (Younis et al., 2021). Our ability to assess who amongst health care providers is knowledgeable in the management of

victims of biological terrorist acts is key to effective planning for the management of the consequences of an attack, educating nursing and other health care providers, and conducting further research (Karnjuš et al., 2021). Hurricane Katrina has shown that the collapse of urban infrastructures can overwhelm neighboring rural communities and hospitals due to a large influx of patients (Glauberman et al., 2020).

The literature supports the need for nurses to be competent and professionally trained to manage emergency situations. Public Health Preparedness Committee developed a position paper on the role of public health nurses in emergency response and disasters (Ablah et al., 2019). Twelve competencies were developed. Among the twelve competencies developed, PHNs should be able to describe the public health role in responding to a range of likely emergencies, describe their agency's chain of command in emergency response (Hu et al., 2020), describe communication roles in disaster response, identify their own limits of knowledge and skill and be able to identify key system resources for referral of matters that exceed PHN's limits. One competency addresses the proper use of equipment (Zhao et al., 2022), "demonstrate the correct use of equipment and the skills required in emergency response during regular drills"

Determining the actual level of Emergency Nurses' knowledge and skills can help in planning for continuing education programme courses to meet their needs. Also, the results from this study can be used to evaluate the need of incorporating disaster management in nursing curricula in Saudi nursing programs. In summary, although Saudi Emergency Nurses must fulfil major roles at home and internationally, no information is available about Saudi nurses' disaster knowledge, skills, and preparedness. Like soldiers, health workers, nurses, face considerable mental stress.

The significance of this topic and research to emergency nurses is immense. Nurses provide nursing care for individuals, families, and groups in various environments with the goal being to promote or preserve health. The emergency nurse has an onus to provide the best possible care for clients and to act in a situation where the client's well-being is threatened. This includes the unfortunate client who arrives in the emergency department (ED) after exposure to the effects of biological terrorism. Without proper situational awareness and training, victims of a bioterrorism event will needlessly die, and nurses themselves may become casualties.

Methodology

Design

A descriptive cross-sectional survey was used to explore the perceptions of Saudi emergency nurses about their preparedness for biological disaster management. Descriptive cross-sectional studies can assess phenomenon not previously explored (Ateshim et al., 2019: Xiong et al., 2020).

Settings

A randomized sample of governmental hospitals was used in the study from Jeddah province. The random selection process revealed the following hospital as a setting for this study is East Jeddah Hospitals.

Sampling

The study employed a non-probability sampling technique, namely convenience sampling.

Inclusion and Exclusion Criteria

The inclusion criteria included emergency nurses who had a bachelor's degree in nursing sciences and at least three years of experience in emergency nursing, were currently working as emergency nurses and agreed to participate in the research. Only emergency nurses were chosen to participate in the study. The aim of the study was

to explore the perceptions of this group regarding biological disaster preparedness and management.

Procedure

Data collection commenced in September 2020 to February 2021. The investigator visited the recruitment sites (the EDs at East Jeddah Hospital) and explained the study to potential participants, entered all questions in google forms and the questionnaire link was distributed to nurses in East Jeddah Hospital and king Fahad hospital in Jeddah though an online survey.

Ethical Consideration

The study obtained ethical approval from the scientific research and studies department in health affairs in Jeddah. Ethical approval was obtained from the East Jeddah Hospital and King Fahd Hospital in Jeddah.

Results

The results also indicated that (66.7%) of the study participants had higher education. Interestingly, (83.3%) of the emergency nurse respondents indicated that they had less than five years of experience and 16.7% of them had also more than five years of experience in biological disaster preparedness, while only (16.7%) had more than five years of experience in biological disaster preparedness as shown in table 1 presents the sociodemographic characteristics of the study participants.

Questions	Determination of score	Frequency (%)
K1. The word disaster come from which of the following?		
a. Greek word b. Latin word c. French word d. German word	(Correct 1) (Incorrect 0) (Incorrect 0) (Incorrect 0)	65 (43.3%) 58 (38.7%) 19 (12.7%) 8(5.3%)
K2. A disease that becomes unusually widespread and even global in its reach is referred to which of the following?		
a) Epidemic b) Pandemic c) Spanish flu d) Hyperendemic	(Incorrect 0) (Correct 1) (Incorrect 0) (Incorrect 0)	40 (26.7%) 102 (68.0%) 1(0.7%) 7 (4.7%)
K3. Which of the following is referring to calamity caused by the exposure of living organisms to germs and toxic substances, spread of a disease, a virus, an epidemic, and a locust plague?		
a) Biological disaster b) Natural disaster	(Correct 1)	109 (72.7)

Questions	Determination of score	Frequency (%)
c) Fire disaster	(Incorrect 0)	30 (20.0%)
d) Flood disaster	(Incorrect 0)	8 (5.3%)
	(Incorrect 0)	3 (2%)
K4. Effective hazard management rely on which of the following?		
a) Govt. agencies	(Incorrect 0)	26 (17.3%)
b) Emergency responses	(Incorrect 0)	50 (33.3%)
c) Pre-disaster planning	(Correct 1)	69 (46.0%)
d) Volcanoes	(Incorrect 0)	5 (3.3%)
K5. In which part of the biological Disaster Management Cycle, vulnerability analysis comes in?		
a) Mitigation	(Correct 1)	45 (30%)
b) Preparedness	(Incorrect 0)	45 (30%)
c) Response	(Incorrect 0)	37 (24.7%)
d) Recovery	(Incorrect 0)	23 (15.3%)
K6. Which of the following diseases appeared as a public health concern in the last quarter of 20th century?		
a) MERS	(Incorrect 0)	17 (11.3%)
b) Ebola virus	(Incorrect 0)	5 (3.3%)
c) COVID-19	(Incorrect 0)	54 (36.0%)
d) All the above	(Correct 1)	74 (49.3%)
K7. MERS virus is spread by which of the following?		
a) Dog	(Incorrect 0)	17 (11.3%)
b) Camel	(Correct 1)	101 (67.3%)
c) Bat	(Incorrect 0)	26 (17.3%)
d) Butterfly	(Incorrect 0)	6 (4.0%)
K8. Which of the following groups of people is more vulnerable in the event of disaster?		

Questions	Determination of score	Frequency (%)
a) Men, boys, old people	(Incorrect 0)	30 (20%)
b) Men, women, boys	(Incorrect 0)	15 (10%)
c) Women, children, old people	(Correct 1)	83 (55.3%)
d) None of the above	(Incorrect 0)	22 (14.7%)
K9. High vulnerability and high hazard are associated with which of the following?		
a) Low disaster risk	(Incorrect 0)	21 (14 %)
b) Medium disaster risk	Incorrect 0)	24 (16%)
c) High disaster risk	(Correct 1)	93 (62%)
d) None of the above	(Incorrect 0)	12 (8%)
K10.Which of the following is not a component of biological disaster management cycle?		
a) Preparedness	(Incorrect 0)	29 (19.3%)
b) Response	Incorrect 0)	34 (22.7%)
c) Construction	(Correct 1)	66 (44.0%)
d) Recovery	(Incorrect 0)	21 (14.0%)

Regards the study participants knowledge about disaster revealed that more than half of the study respondents had a correct information about epideictic (68.0%), types of calamities (72.7), reservoir for most epidemic diseases (67.3%), vulnerable population (55.3%), and association between vulnerability and risk (62%), respectively. while less than half had a correct information about definition for the word disaster (43.3%), Effective hazard management (46.0%), vulnerability analysis (30%), diseases appeared as a public health concern (49.3%) and component of biological disaster management cycle (44.0%) respectively as illustrated in Table 2. Nurse's knowledge toward disaster preparedness were assessed by 10 related questions**.** Each question-and-answer option were described with graded scores in Table 2. Among the total 4360 collected answers, 3590 (53.8%) were correct, indicating that the study participants had moderate knowledge about the disaster preparedness.

Table 3: Emergency Nurse Participants Attitudes toward Preparedness for Biological Disaster Management (n= 150)

A1. Planning and Preparedness	Negative (0)	Neutral (1)	Positive (2)

1. In case of a biological disaster situation, there is sufficient support from local officials on the city or area level.	13 (8.7%)	39 (26%)	98 (65.4%)
2. I participate in biological disaster drills or exercises at my workplace (clinic, hospital, etc.) on a regular basis.	21 (14.0%)	48 (32.0%)	81 (54.0%)
3. I have participated in emergency plan drafting and emergency planning for biological disaster situations in my community.	30 (20%)	55 (36.7%)	65 (43.3%)
4. I participate in one of the following educational activities on regular basis: continuing education classes, seminars, or conferences dealing with biological disaster preparedness.	21 (14.0%)	56 (37.3%)	73 (48.7%)
5. I know who to contact (chain of command) in biological disaster situations in my community.	23 (15.3%)	38 (25.3%)	89 (59.3%)
A2. Training and Exercise	**Negative (0)**	**Neutral (1)**	**Positive (2)**
1. I am familiar with the local emergency response system for biological disasters	21 (14.0%)	44 (29.3%)	85 (56.7%)
2. I am familiar with accepted triage principles used in biological disaster situations.	22 (14.6%)	62 (41.3%)	66 (44%)
3. I am familiar with psychological interventions, behavioural therapy, cognitive strategies, support groups and incident debriefing for patients who experience emotional or physical trauma.	26 (17.3%)	46 (30.7%)	78 (52%)
4. I can describe my role in the response phase of a biological disaster in the context of my workplace, the public, media, and personal contacts.	20 (13.4%)	48 (32%)	82 (55.7%)
5. I am familiar with the main Groups (A, B, C) of biological weapons (Anthrax, Plague, Botulism, Smallpox, etc.), their signs and symptoms, and effective treatments	25 (16.7%)	57 (38%)	68 (45.3%)
A3. Personal Protective Equipment (PPE) against BD	Negative (0)	Neutral (1)	Positive (2)
1. In case of a bioterrorism/ biological attack, I know how to use personal protective equipment.	15 (10.0%)	45 (30%)	90 (60%)
2. In case of a bioterrorism/biological attack I know how to execute decontamination procedures.	20 (14%)	61 (40%)	69 (46%)

3. In a case of bioterrorism/biological attack I know how to perform isolation procedures so that I minimize the risks of community exposure	23 (15.3%)	40 (26.7%)	87 (58%)
4. I would feel confident implementing emergency plans, evacuation procedures, and similar functions	17 (11.4%)	53 (35.3%)	80 (55.4%)
5. I am familiar with what the scope of my role as a nurse practitioner in a post-biological disaster situation would be.	23 (15.3%)	52 (34.7%)	75 (50%)
A4. Biological Disaster Triage	Negative (0)	Neutral (1)	Positive (2)
1. Our facility identified a patient reception area, where incoming patients will be triaged for decontamination	20 (13.4%)	43 (28.7%)	87 (58%)
2. Our facility uses the Simple Triage and Rapid Treatment (START) principle or other process for prioritizing patient decontamination	26 (17.4%)	54 (36%)	70 (46.6%)
3. Our facility trained and appointed at least two resolute, skilled team members to perform triage while wearing PPE	22 (14.7%)	52 (34.7%)	76 (50.7%)
4. I can conduct an initial patient assessment at a rate of 30 seconds or less per patient while wearing Level C PPE.	26 (17.3%)	48 (32%)	76 (50.7%)
5. I am confident enough to perform biological decontamination.	23 (15.3%)	57 (38%)	70 (46.7%)
A5. Biological Disaster Recovery	Negative (0)	Neutral (1)	Positive (2)
1. Our hospital specifies how patients will be inspected for thorough decontamination prior to leaving the hospital decontamination zone.	22(14%)	44 (29.3%)	84 (55%)
2. Our facility developed discharge plans/follow-up procedures for decontaminated patients	23 (15.3%)	54 (36%)	73 (48. %)
3. Our facility has a method of determining whether equipment used in conjunction with decontamination operations can be decontaminated and reused	23 (15.3%)	44 (29.3%)	83 (55.4%)
4. Our facility has a process for timely replacement of disposed-of decontamination equipment and resources	18 (12%)	51 (34%)	81 (54%)
5. Our facility provides post-event counselling and/or other mental health services for staff involved in the decontamination response	22 (14%)	56 (36.7%)	72 (47.3%)
6. Our facility follows an established process for timely implementation of recommendations/lessons learned from real-world decontamination events	16 (10.6%)	52 (34.7%)	82 (54.6%)

7. Our facility follows an established process for timely implementation of recommendations/lessons learned from simulated decontaminated exercises	14 (9.3%)	54 (36%)	82 (54.6%)

The study participant's attitude towards disaster preparedness, namely planning and preparedness assessed through five questions. Each one is scored 0 (negative), 1 (neutral), 2 (positive) as described in Table 2. Among all 750 submitted, 371 (45.4%) showed a negative attitude towards planning and preparedness part of disaster management. Above half of the participants had a cheerful outlook towards all items related to Preparedness for Biological Disaster Management.

Table 4: Correlation between emergency nurse participants' knowledge and attitudes and their demographic characteristics (n=150)

Variables	Total Knowledge	A1- Planning and Preparedness	A2- Training and Exercise	A3- PPE	A4- Biological Disaster Triage	A5- Biological Disaster Recovery
Gender						
Male Female	7.8 ± 1.07 8.0 ± 1.13 (P = 0.46)	8.73 ± 0.57 9.7 ± 0.26 (P = 0.037)	6.40 ± 0.19 7.78 ± 0.32 (P = 0.42)	6.42 ± 0.72 6.79 ± 0.59 (P=0.37)	8.49 ± 0.92 8.51 ± 0.72 (P=0.53)	9.78 ± 0.18 9.57 ± 0.38 (P=0.62)
Age						
< 35 years > 35 years	7.8 ± 2.24 7.7 ± 1.20 (P = 0 .36)	6.7 ± 0.98 7.2 ± 0.90 (P = 0.43)	6.07 ± 0.39 6.27 ± 0.27 (P = 0.34)	6.47 ± 0.92 6.37 ± 1.07 (P=0.51)	7.51 ± 0.56 8.27 ± 0.48 (P=0.21)	12.2 ± 0.92 11.03 ± 0.73 (P=0.37)
Marital status						
Single Others	8.2 ± 0.93 10.8 ± 0.57 (P = 0.034)	7.1 ± 0.85 7.3 ± 0.37 (P = 0.61)	6.41 ± 0.31 5.49 ± 0.27 (P = 0.31)	6.79 ± 0.37 7.07 ± 0.24 (P=0.28)	6.79 ± 0.42 6.56 ± 0.29 (P=0.17)	11.08 ± 0.17 10.89 ± 0.64 (P=0.52)
Level of education						

Diploma or less Bachelor or higher	7.1 ± 1.11 10.4 ± 0.76 (P = 0.03)	6.17 ± 1.07 7.90 ± 0.89 (P = 0.019)	6.78 ± 0.72 8.27 ± 0.37 (P = 0.42)	8.07 ± 1.21 8.12 ± 0.91 (P = 0.30)	8.07 ± 0.37 7.89 ± 0.32 (P = 0.27)	9.58 ± 0.75 10.25 ± 0.83 (P = 0.43)
Year of experience						
< 5 years >5 years	8.2 ± 1.57 7.9 ± 1.31 (P=0.28)	6.1 ± 1.07 8.6 ± 1.37 (P = 0.01)	6.79 ± 1.08 7.09 ± 0.79 (P = 0.26)	6.9 ± 0.79 7.24 ± 0.63 (P=0.46)	6.83 ± 0.37 7.04 ± 0.54 (P=0.32)	11.27 ± 0.73 10.89 ± 0.70 (P=0.42)
Experience in biological disaster preparedness						
<5 years ≥5 years	6.9 ± 1.10 8.9 ± 1.47 (P = 0.02)	6.5 ± 0.38 7.08 ± 0.32 (P = 0.037)	7.84 ± 0.37 9.07 ± 1.12 (P = 0.024)	6.28 ± 1.07 6.75 ± 0.82 (P=0.28)	6.79 ± 0.56 6.42 ± 0.56 (P=0.34)	9.7 ± 0.81 8.9 ± 0.78 (P=0.50)

A p-value less than 0.05 (typically ≤ 0.05) is statistically significant.

The results of comparison of sociodemographic data in relation to the main study outcomes. The results revealed that female participants being more positive attitudes toward planning and preparedness in comparison to males ($p<0.05$). It seems also marital status, namely married status influences the knowledge level toward preparedness. Furthermore, the level of education had a more positive impact on knowledge and attitudes towards planning and preparedness compared with who attained prominent level of education. Extended years of experience (more than five years) improved the study participants' attitudes towards planning and preparedness ($p<0.05$), as described in Table 4.

Discussion

The overall aim of this study was to assess emergency nurse's knowledge, skills, and competence towards biological disaster. This chapter discusses the findings in relation to the existing research evidence by comparing similarities and differences between the results reported in the current study with those reported elsewhere, whilst also empirically, theoretically, and pragmatically analysing the results. In addition, the strengths and limitations of the current study are discussed. The implications of this study's findings for practice, education, research, and management are also presented in the chapter. The chapter ends with recommendations for the future in each of these areas and presents the conclusions of the study.

The study results revealed that emergency nurses had moderate levels of knowledge towards biological disaster. This is evident from the number of correct responses achieved in knowledge scale. In addition, the study participant's attitude towards disaster preparedness was positive in all dimensions of the attitudes scale.

In general, the respondents reported moderate levels of disaster preparedness. RNs need to function effectively in disasters, which is not possible without the necessary knowledge and skills. These results are consistent with the results of Brewer et al. (2020), who also found

low preparedness levels for disaster management. Furthermore, they found that early preparation on the part of the health care system significantly affects its ability to respond effectively to a disaster. It is not surprising to find RNs have low levels of preparedness for disaster management; this is a new, international concern. Many authors have reported the same outcomes (Goniewicz et al., 2021; Al-Ashwal et al., 2020; Mirzaei et al., 2020; Pourmohammadi et al., 2020; Taskiran & Baykal, 2019; Afulani et al., 2021).

In the preparedness questions showed low levels of preparedness in relation to response to biological and chemical attacks. Ghahremani et al. (2021), indicated that bioterrorism knowledge is obtained through participation in multidisciplinary educational initiatives and bioterrorism exercises. These results are like previous findings by Martin et al. (2022) who found that RNs had limited knowledge of potential bioterrorism agents, as well as incomplete understanding of emergency preparedness. In other studies (Almukhlifi et al., 2022) found that health care providers (including RNs) felt unprepared for biological, chemical, and radiological attacks.

In the current study, we found emergency nurses had positive attitudes towards biological disaster. This result is consistent with those reported elsewhere. A study conducted by King et al. (2019), to determine gap of emergency nurse and community health nurse towards disaster management. Researchers found that adequacy of knowledge and practice, and portraying positive attitude was driven by being involved in disaster response and attending disaster-related education. They recommended paramount for health administrators to conduct disaster-related education/ training for front-liners such as emergency and community health nurses to improve their knowledge and practice towards disaster management. (Shahbal et al., 2022; Noshili et al., 2022)

This study is one of very few studies that evaluate emergency nurses' knowledge and attitudes towards biological disaster. Respondents were recruited, rather than randomized which limits generalizability. Descriptive cross-sectional designs provide only a snapshot: the situation may provide differing results if another timeframe had been chosen, which may limit generalizability. Additionally, the hospitals were randomly selected, which helps to eliminates systematic bias and increases generalizability. However, results of questionnaire research must always be interpreted cautiously since it is self-reported data. This study is also collected data from nurses working at one hospital which limits the generalizability of the study findings.

The results of this study will assist in identifying the knowledge and attitudes of nurses to successfully assist patients in time of biological disaster situations. Furthermore, determining the actual level of RNs' knowledge and skills can help in planning for continuing education program courses to meet their needs. Also, the results from this study can be used to evaluate the need of incorporating disaster management in nursing curricula in nursing programs. Increased emphasis on disaster management knowledge and skills practiced and evaluated by drills and mock disasters will increase student nurses and practicing nurses' confidence in their ability to manage future disasters.

This study identified gaps in nursing education in disaster preparedness, disaster plans, disaster training, and education. Uniform integration of disaster management courses into undergraduate nursing curricula is recommended to prepare the next generation of nurses. Furthermore, the development of graduate disaster management courses and programs will help in preparing nurses. Disaster drills and exercises are the best ways to prepare nurses for

a disaster. Consequently, it is particularly important that health care institutions incorporate drills into their in-service education to increase nurse's readiness and preparedness for disaster. Ongoing training, including participation in drills is recommended, to increase nurse's disaster preparedness and decrease nurses' vulnerability. RNs need to be active in disaster management plans, which will enable nurses to be familiar with their responsibilities in disaster situations. Moreover, nurses should participate in disaster preparedness planning to help examine and create policies and procedures for disaster.

Conclusion and Recommendations

Based on the present study results; it can be concluded that the level of knowledge was moderate with an acceptable level of attitude regarding disaster preparedness and neutral familiarity with emergency preparedness were found. Thus, an integration of clearly titled theory and practice teaching courses about disaster and emergency preparedness into nursing curricula are crucial. They are needed and must be provided in respect to their learning/training preferences. Further, follow up research is necessary for maximizing nursing education and nursing quality in these critical areas applied to healthcare and community setting.

This successful research was able to make positive contributions to practice and answered all research questions fully and in sufficient detail to make the recommendations in the previous paragraph. Although the generalisability of the results may be limited due to the sampling method used and the low-scale survey that was completed, it is likely to be fully applicable throughout the KSA and most of the Middle East and North Africa (MENA) region.

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