

Article

Nurses' Readiness for Emergencies and Public Health Challenges—The Case of Saudi Arabia

Mohammed Ali Salem Sultan ^{1,2,*}, Amir Khorram-Manesh ^{3,4} , Eric Carlström ^{2,5} ,
Jarle Løwe Sørensen ⁵ , Hadi Jaber Al Sulayyim ⁶ and Fabian Taube ^{4,7} 

¹ Model of Care, Directorate of Health Affairs, Najran 66255, Saudi Arabia

² Institute of Health and Care Sciences, Sahlgrenska Academy, Gothenburg University, 413 46 Göteborg, Sweden; eric.carlstrom@gu.se

³ Institute of Clinical Sciences, Sahlgrenska Academy, Gothenburg University, 413 90 Göteborg, Sweden; amir.khorram-manesh@surgery.gu.se

⁴ Department of Research and Development, Swedish Armed Forces Centre for Defence Medicine, 426 76 Göteborg, Sweden; fabian.taube@amm.gu.se

⁵ USN School of Business, Campus Vestfold, University of South-Eastern Norway, 3603 Kongsberg, Norway; jarle.sorensen@usn.no

⁶ Department of Infection and Prevention and Control, Directorate of Health Affairs, Najran 66255, Saudi Arabia; hadialsleem@hotmail.com

⁷ Institute of Medicine, Sahlgrenska Academy, Gothenburg University, 41345 Göteborg, Sweden

* Correspondence: mohammed.sultan@gu.se

Received: 12 July 2020; Accepted: 21 September 2020; Published: 23 September 2020



Abstract: This study was aimed at assessing the readiness of 200 emergency nurses in the southern part of Saudi Arabia in the management of public health emergencies, major incidents, and disasters by using quantitative research through a self-reporting validated questionnaire containing 10 different dimensions. All registered nurses working in emergency departments who were willing to participate, of all ages and gender groups, were included. Nurses who were not present during the study period because of vacation or maternity leave, nurses at the managerial level, and nursing aides were excluded. The participating nurses reported good knowledge in almost all investigated aspects of the theoretical dimensions of emergency management. However, they revealed perceived weaknesses in practical dimensions of emergency management and difficulties in assessing their own efforts. There was a significant correlation between qualification and the dimensions of emergency preparedness, epidemiology and surveillance, isolation and quarantine and critical resources, which indicates a need for strengthening their practical contribution as well as their theoretical knowledge. Educational initiatives combining theoretical and practical aspects of emergency management may provide an opportunity to examine nurses' knowledge, skills, and abilities continuously in an environment with no harm to patients.

Keywords: disaster; emergency; healthcare; nurse; readiness; preparedness; public health

1. Introduction

The increasing incidences of public health emergencies and disasters necessitate global awareness, multiagency collaboration, and emergency system readiness to respond [1]. Major incidents and disasters (MIDs) might be inevitable, but they can be mitigated by performing an appropriate risk and vulnerability assessment (RVA) as the foundation for creating a disaster response plan [2]. Risks and vulnerabilities causing a public health emergency or an MID may vary in different countries; however, the current coronavirus 2019 (COVID-19) pandemic has clearly demonstrated how a local outbreak can influence the spread of a disease and how it can result in lessons learned for global benefits. A response

plan targets all possible risks, not only to enable countries to act based on their resources but also to share knowledge and compare their outcome to improve their response. Global threats can be man-made or natural (e.g., terrorism, pandemics and disasters). Vulnerabilities are the weaknesses that can be exploited by threats, and they can be dimensions which are either missing, such as strategic leadership, or of poor quality, such as the lack of proper education [3]. Although all parts of a healthcare system should be ready to manage an MID, hospital preparedness is particularly important since hospitals should serve not only the affected people but also other emergency or elective cases in need of help simultaneously. Therefore, a well-prepared hospital needs an RVA-based response plan and should facilitate educational initiatives to build up a pool of well-educated and skilled staff [4].

Because of their numbers and distribution, nurses are the largest group in the healthcare domain who face MIDs, and their knowledge and level of preparedness play a crucial role in the pre-, peri-, and post-MID periods [5]. In previous studies, about 80% of Philippine nurses were found to be neither fully prepared nor knowledgeable about disaster preparedness and response, and they lacked an awareness of existing management protocols [6]. Furthermore, 65.4% of Pakistani nurses had theoretical knowledge related to disaster plans, drills, and preparedness but very little practical knowledge about MID management [7]. Finally, in Egypt and China, the majority of nurses had unsatisfactory levels of information and knowledge about disaster management and needed to join specific training programmes [8,9]. These studies reveal the importance of theoretical and practical dimensions in nurses' preparedness.

The Kingdom of Saudi Arabia (KSA) engages nearly 80% of the Arabian Peninsula, and its desert area accommodates the largest continuous sand desert in the world [10]. The KSA is a disaster-prone country with varying grades of emergencies. It has one of the world's highest mortality rates in motor vehicle crashes [11]. Terrorist incidents such as bombings have resulted in periodic internal instability as well as shifts in regional and international political dynamics [12]. Mass gatherings (Ramadan and Hajj) are two special events on the Islamic calendar that contribute to overcrowding during prayer performance and other rituals, resulting in numerous incidents [13]. Finally, many cities experience building collapses regularly as a result of mass gatherings, insufficient building safety, and a lack of control by the authorities, leading to injuries and deaths [14]. Natural disasters, such as flooding, earthquakes, and drought, occur frequently in the KSA. Floods are the most frequently experienced natural event because of unplanned urban development and improper drainage or the low ground of some high-populated areas, such as Jeddah and Mecca, which are surrounded by mountains and are easily affected by rainfall, resulting in flooding [15]. These threats make a good case for the KSA's preparedness in MIDs to be studied. One recent study from the KSA on emergency nurses' disaster preparedness showed that 28% of the nurses had inadequate knowledge [16]. The number of participants, however, was small ($n = 72$). Other studies such as the one from Australia have also confirmed these results, showing nurses' confusion about their role in MID management and their shortcomings in basic knowledge regarding standard disaster terminology and types of disasters [17]. Altogether, these studies highlight a knowledge gap in the overall preparedness of the nurses to deal with disasters.

2. Aim

This study aims to assess the theoretical and practical MID readiness of emergency nurses in the southern KSA, where MIDs frequently occur and well-educated, multinational nurses are employed to increase its response capacity.

3. Materials and Methods

3.1. Study Design

This study employed a descriptive quantitative design using a validated questionnaire to assess the knowledge and awareness among licensed nursing staff of preparedness to respond to emergencies and specific healthcare scenarios.

3.2. Questionnaire

This study used the Emergency Preparedness Information Questionnaire (EPIQ) to assess the disaster preparedness of nurses [18]. EPIQ contains a variety of topical areas, of which two are relevant for the present study, i.e., (1) the 10 specific competency dimensions related to preparedness in the case of large-scale emergency events and (2) self-assessed familiarity across these competency areas. EPIQ is the only reliable and validated tool in the literature that evaluates nurses' perceived familiarity of emergency preparedness and disaster response core competencies. It uses familiarity as an important measure of the acquisition of new information. Wisniewski et al. developed EPIQ by performing an extensive search in the literature, combined with nurses' perceptions of perceived familiarity with these capabilities. They also sought to determine preferred education methods and demographics for future educational endeavours. EPIQ has been validated by psychometric testing and used in several studies aiming to measure levels of disaster preparedness and provides a comprehensive analysis of the topic of study since it covers broad areas [19,20]. It works to individually assess all areas of healthcare and delves into in-depth information relevant to the research. Additionally, it is simple to read and interpret and provides a user-friendly interface.

EPIQ consists of 51 items divided into two parts: the first six questions relate to demographic and individual information. Secondly, 45 knowledge-based questions are distributed among the 10 emergency preparedness competency dimensions, which are (1) Emergency Preparedness Terms and Activities, (2) Incident Command System (ICS) and own role within it, (3) Ethical Issues in Triage, (4) Epidemiology and Surveillance, (5) Isolation/Quarantine, (6) Decontamination, (7) Communication/Connectivity, (8) Psychological Issues, (9) Special Populations, and (10) Accessing Critical Resources (Appendix A).

3.3. Setting

The research was conducted at the Ministry of Health's (MOH) hospitals ($n = 10$) in the Najran region, located in the southern part of the KSA.

3.4. Population and Sample

All nurses at the 10 hospitals included in the study were informed about the study by the nursing office director at each hospital. The participants were randomly included from the list of nurses working in each emergency department (ED), thus avoiding the bias of choosing a specific group. They were ensured that their participation was voluntary, they could withdraw from the study whenever they decided to, and the obtained data were handled confidentially. They received basic information about the study and its goals, and informed consent was obtained from each participant. A power analysis with a standardised statistical power of 0.80 and medium effect size of 0.5 premediated the appropriate sample size to 200 nurses. The self-completion questionnaire was presented to the participants through the SurveyMonkey website.

3.5. Data Collection and Processing

Collected data were stored at the hospitals' research centres. Nurses answered the questionnaires on a specific research day to prevent response influence. The respondents were asked to provide correct information. The information provided was subject only to research, and the researcher could not

disclose the respondents' identities at any time, no matter the circumstances. The included participants were registered nurses working in EDs who were willing to participate, in all age and gender groups. Nurses who were not present during the study period because of vacation or maternity leave, nurses at the managerial level, and nursing aides were excluded.

All data concerning the 10 emergency preparedness competency dimensions were analysed by the authors. The primary investigator was responsible for collecting data and categorising them for further analysis by the teammate. Each dimension consisted of a number of questions, in which participants could indicate their familiarity with a topic based on a five-point Likert scale (see results).

3.6. Ethical Approval

For this study, an ethical committee certificate of approval was obtained from the Institutional Review Board at the General Directorate of Health Affairs in the Najran region (IRB Log Number 2020-27 E—Date of approval: 1 July 2020).

3.7. Statistics

The homogeneity of the items in the subscales of the EPIQ was analysed by calculating Cronbach's alpha using Statistical Package for the Social Sciences (SPSS) software version 20. Cronbach's alpha was 0.98, which shows high internal consistency and, according to Brace, Kemp and Snelgar [21], is considered satisfactory. Other results are descriptively presented in actual numbers and percentages. A Kolmogorov–Smirnov test was used to explore normality. As a result of skewness in the data, Spearman's rho was used to test co-variation. Means were compared using the Mann–Whitney U and Kruskal–Wallis tests. Statistical significance was recognised at $p < 0.05$, and all tests were two-tailed.

4. Results

Of the 200 nurses who answered the questionnaire, 181 (90.5%) were female and 19 (9.5%) were male. A majority of the respondents (45.5%) were 22–30 years old. About 39% of the nurses were 31–40 years old, while the remaining 15.5% were 40 years old or older. About 93.5% of the nurses had a Bachelor of Science in Nursing (BSN), 6% had a Master of Science in Nursing (MSN), and 0.5% had a Doctor of Philosophy (PhD) in Nursing. Most of the practicing nurses, especially those in EDs within MOH hospitals, possessed undergraduate qualifications from MOH-certified education and training institutions. About 12% of the nurses had more than 16 years of experience within EDs, 20% had 11–15 years of experience, and 34% had 6–10 years of experience, while the remaining 34% had 1–5 years of experience.

The remaining results of the study were categorised into the following 10 dimensions, which denote the extent to which nurses are aware of disaster risks and preparedness. Each dimension consisted of several questions, in which nurses were asked to indicate their familiarity with a topic based on a five-point Likert scale as follows: very familiar (5), somewhat familiar (4), familiar to neutral (3), somewhat unfamiliar (2), and not familiar (1). The positive threshold was 'familiar to neutral' to 'very familiar'.

Table 1 shows that most of the participants had good knowledge (familiar to very familiar) in most items of these dimensions: signs and symptoms (different biological agents: 49.5%, and better for Anthrax: 75%), modes of transmission (56.5%), antidote and adverse reaction (66% and 69.5%, respectively). However, participants seemed to be uncertain about their practical capabilities, skills, and evaluations of their own actions, including necessary first aid interventions such as ventilation and oxygen administration during a public health emergency (32% and 39.5%, respectively).

Table 1. Description of 200 nurses' responses regarding familiarity with Emergency Preparedness Terms and Activities.

Items	Very Familiar	Somewhat Familiar	Familiar to Neutral	Somewhat Unfamiliar	Not Familiar	Total
1. Signs/symptoms of exposure to different biological agents	11 (5.5%)	16 (8%)	72 (36%)	82 (41%)	19 (9.5%)	100%
2. Signs/symptoms of Anthrax inhalation	26 (13%)	56 (28%)	68 (34%)	42 (21%)	8 (4%)	100%
3. Modes of transmission for different types of biological agents (anthrax, smallpox, etc.)	12 (6%)	24 (12%)	77 (38.5%)	71 (35.5%)	16 (8%)	100%
4. Match antidote and prophylactic medications to specific biological/chemical agents	9 (4.5%)	35 (17.5%)	88 (44%)	55 (27.5%)	13 (6.5%)	100%
5. Possible adverse reactions to smallpox vaccination	16 (8%)	37 (18.5%)	86 (43%)	44 (22%)	17 (8.5%)	100%
6. Basic first aid in a large-scale emergency event (including oxygen administration and ventilation)	6 (6%)	4 (2%)	48 (24%)	84 (42%)	58 (29%)	100%
7. How to evaluate the effectiveness of your own actions during a large-scale emergency	4 (2%)	11 (5.5%)	64 (32%)	92 (46%)	29 (14.5%)	100%

Table 2 shows that a majority of the nurses surveyed had good knowledge regarding what they needed to do during a large-scale emergency. They also appeared to have good knowledge about the emergency operations plan (EOP), Incident Command System (ICS), physical locations of all entities, the importance of medical decision-making, etc.

Table 2. Description of nurses' responses regarding their familiarity with the Incident Command System (ICS) and their role ($n = 200$).

Items	Very Familiar	Somewhat Familiar	Familiar to Neutral	Somewhat Unfamiliar	Not Familiar	Total
1. The content of emergency operations plan (EOP) in your agency/organisation	25 (12.5%)	84 (42%)	72 (36%)	15 (7.5%)	4 (2%)	100%
2. To which functional group in the Incident Command System (ICS) you would be assigned during a large-scale emergency event	23 (11.5%)	62 (31%)	84 (42%)	24 (12%)	7 (3.5%)	100%
3. The physical location to which you would report if a large-scale emergency event occurred	27 (13.5%)	78 (39%)	76 (38%)	14 (7%)	5 (2.5%)	100%
4. Assess and respond to site safety issues for self, co-workers and affected people during a large-scale emergency event	25 (12.5%)	77 (38.5%)	80 (40%)	13 (6.5%)	5 (2.5%)	100%
5. The strategic rationale used to develop the ICS response/action plan	13 (6.5%)	68 (34%)	89 (44.5%)	25 (12.5%)	5 (2.5%)	100%
6. Your agency's preparedness for responding to a large-scale emergency event	22 (11%)	81 (40.5%)	73 (36.5%)	18 (9%)	6 (3%)	100%
7. Differences between decision-making processes in the Incident Command System for a large-scale emergency event and non-emergency situations	24 (12%)	76 (38%)	82 (41%)	14 (7%)	4 (2%)	100%
8. Tasks which should NOT be delegated to volunteers in a large-scale emergency event	22 (11%)	65 (32.5%)	86 (43%)	21 (10.5%)	6 (3%)	100%

Table 3 shows nurses' approaches to the assessment of affected people's health following a crisis and their familiarity with ethical issues in MIDs, such as during triage. Overall, they claimed that they had good knowledge and understanding of these issues.

Table 3. Description of nurses' responses regarding their familiarity with Ethical Issues in Triage ($N = 200$).

Items	Very Familiar	Somewhat Familiar	Familiar to Neutral	Somewhat Unfamiliar	Not Familiar	Total
1. How to perform a rapid physical assessment of a victim of a large-scale emergency event	28 (14%)	78 (39%)	77 (38.5%)	13 (6.5%)	4 (2%)	100%
2. How to perform a rapid mental health assessment of a victim of a large-scale emergency event	25 (12.5%)	64 (32%)	86 (43%)	20 (10%)	5 (2.5%)	100%
3. How to assist with triage in a large-scale emergency event	32 (16%)	73 (36.5%)	72 (36%)	18 (9%)	5 (2.5%)	100%
4. General issues related to the proper handling of the dead during a large-scale emergency event (ethical, legal, cultural, and safety)	29 (14.5%)	65 (32.5%)	84 (42%)	19 (9.5%)	3 (1.5%)	100%

Table 4 shows nurses' knowledge in mitigating the further outbreak of a disease. Overall, most of the nurses claimed that they had good knowledge in handling the administrative measures needed in chemical, biological, radiological, and nuclear (CBRN) surveillance.

Table 4. Description of nurses' responses regarding their familiarity with Epidemiology and Surveillance (N = 200).

Items	Very Familiar	Somewhat Familiar	Familiar to Neutral	Somewhat Unfamiliar	Not Familiar	Total
1. History and assessment surveillance data for creating a high index of suspicion that a patient has been exposed to a biological agent	20 (10%)	62 (31%)	92 (46%)	21 (10.5%)	5 (2.5%)	100%
2. When to report an unusual set of symptoms to an epidemiologist	19 (9.5%)	80 (40%)	74 (37%)	23 (11.5%)	4 (2%)	100%
3. Diseases that are immediately reportable to state health departments	26 (13%)	86 (43%)	72 (36%)	13 (6.5%)	3 (1.5%)	100%
4. Ability to identify the exacerbation of an underlying disease as a result of exposure to a chemical or biological agent or to radiation	20 (10%)	67 (33.5%)	95 (47.5%)	14 (7%)	4 (2%)	100%

In Table 5, nurses evaluated their knowledge of isolation and quarantine issues. Most of the surveyed nurses seemed to have good knowledge in these areas.

Table 5. Description of nurses' responses regarding their familiarity with Isolation/Quarantine (N = 200).

Items	Very Familiar	Somewhat Familiar	Familiar to Neutral	Somewhat Unfamiliar	Not Familiar	Total
1. Isolation procedures for people exposed to biological or chemical agents	33 (16.5%)	80 (40%)	66 (33%)	17 (8.5%)	4 (2%)	100%
2. Your facility's/community's quarantine process	36 (18%)	90 (45%)	60 (30%)	10 (5%)	4 (2%)	100%

Table 6 shows that most of the nurses had good knowledge of the decontamination process in their hospitals, including the use of personal protective equipment (PPE).

Table 6. Description of nurses' responses regarding their familiarity with Decontamination (N = 200).

Items	Very Familiar	Somewhat Familiar	Familiar to Neutral	Somewhat Unfamiliar	Not Familiar	Total
1. Selection of the appropriate personal protective equipment when caring for patients exposed to chemical, biological, radiological, and nuclear (CBRN) agents	63 (31.5%)	95 (47.5%)	35 (17.5%)	4 (2%)	3 (1.5%)	100%
2. The decontamination procedures stated in your facility's emergency operations plan	36 (18%)	89 (44.5%)	61 (30.5%)	10 (5%)	4 (2%)	100%
3. The impact on the environment from a large-scale emergency event	24 (12%)	82 (41%)	72 (36%)	18 (9%)	4 (2%)	100%

Table 7 addresses the communication aspect of emergency response. A majority of the nurses had good knowledge of communication and information sharing during an emergency and of the need for debriefing and communication devices.

Table 7. Description of nurses' responses regarding their familiarity with Communication/Connectivity (N = 200).

Items	Very Familiar	Somewhat Familiar	Familiar to Neutral	Somewhat Unfamiliar	Not Familiar	Total
1. The procedure used to document provision of care in a large-scale emergency event	21 (10.5%)	77 (38.5%)	79 (39.5%)	19 (9.5%)	4 (2%)	100%
2. Chain of custody during a large-scale emergency event	15 (7.5%)	63 (31.5%)	92 (46%)	26 (13%)	4 (2%)	100%
3. Procedure for communicating critical patient information to those transporting patients	24 (12%)	86 (43%)	74 (37%)	11 (5.5%)	5 (2.5%)	100%
4. Effectively present information about degree of risk to various audiences	23 (11.5%)	60 (30%)	95 (47.5%)	17 (8.5%)	5 (2.5%)	100%
5. Identify the different abilities of key partners in your emergency operations plan (EOP)	18 (9%)	65 (32.5%)	88 (44%)	24 (12%)	5 (2.5%)	100%
6. Appropriate debriefing activities during a large-scale emergency event	19 (9.5%)	53 (26.5%)	102 (52%)	19 (9.5%)	7 (3.5%)	100%
7. Use of all types of communication devices (phone, fax, email, personal digital assistant (PDAs), etc.)	31 (15.5%)	64 (32%)	88 (44%)	13 (6.5%)	4 (2%)	100%

Table 8 shows that a majority of the nurses had good knowledge of appropriate and necessary psychological support during MIDs, claimed that they could provide health counselling/education in issues related to chemical, biological, radiological, nuclear, and explosive (CBRNE) agents, and could communicate with, identify, and evaluate youth and adults with post-traumatic stress disorder (PTSD).

Table 8. Description of nurses' responses regarding their familiarity with Psychological Issues (N = 200).

Items	Very Familiar	Somewhat Familiar	Familiar to Neutral	Somewhat Unfamiliar	Not Familiar	Total
1. Appropriate psychological support for all parties involved in a large-scale emergency event	23 (11.5%)	67 (33.5%)	88 (44%)	17 (8.5%)	5 (2.5%)	100%
2. Provide health counselling/education to patients regarding the long-term impact of chemical, biological, radiological, nuclear, and explosive (CBRNE) agents	31 (15.5%)	48 (24%)	89 (44.5%)	26 (13%)	6 (3%)	100%
3. Signs of post-traumatic stress in patients seen for routine health care following an event	21 (10.5%)	68 (34%)	86 (43%)	20 (10%)	5 (2.5%)	100%
4. How to evaluate a teenager to detect post-traumatic mental health problems	17 (8.5%)	59 (29.5%)	87 (43.5%)	28 (14%)	9 (4.5%)	100%

Table 9 shows nurses' knowledge in handling special populations affected by a disaster. A majority of nurses claimed to have good knowledge and understanding of the unique needs and expectations required for care of vulnerable groups.

Table 9. Description of nurses' responses regarding their familiarity with Special Populations (N = 200).

Items	Very Familiar	Somewhat Familiar	Familiar to Neutral	Somewhat Unfamiliar	Not Familiar	Total
1. Procedures for providing care to children/youth during a large-scale emergency event in cases in which prior consent from parent/legal guardian is possible	20 (10%)	61 (30.5%)	88 (44%)	27 (13.5%)	4 (2%)	100%
2. The appropriate care of sensitive/vulnerable patient groups during a large-scale emergency (i.e., aged, pregnant women, and the disabled)	18 (9%)	65 (32.5%)	87 (43.5%)	25 (12.5%)	5 (2.5%)	100%

Table 10 shows the ability of nurses to access critical resources during an MID. They seemed to have good knowledge and capabilities to perform necessary measures in all areas within this dimension.

Table 10. Description of nurses' familiarity responses rate of Accessing Critical Resources (N = 200).

Items	Very Familiar	Somewhat Familiar	Familiar to Neutral	Somewhat Unfamiliar	Not Familiar	Total
1. During an event, where to quickly access up-to-date resources for specific CBRNE incidents	17 (8.5%)	52 (26%)	90 (45%)	35 (17.5%)	6 (3%)	100%
2. Determine the appropriate agency to which reportable diseases are to be directed	18 (9%)	54 (27%)	91 (45.5%)	27 (13.5%)	10 (5%)	100%
3. The process for gaining access to the Strategic National Stockpile	11 (5.5%)	36 (18%)	86 (43%)	48 (24%)	19 (9.5%)	100%
4. Please provide an assessment of your overall familiarity with response activities/preparedness in the case of a large-scale emergency event	19 (9.5%)	63 (31.5%)	88 (44%)	25 (12.5%)	5 (2.5%)	100%

The results of normality, measured with the Kolmogorov–Smirnov test, indicated the data to be significantly skewed (sig. 0.00). As a result of the skewness and the fact that the data were ordinal and presented as ranks, a non-parametric test, Spearman's rho, was chosen to measure bivariate correlations. The variables of age, qualification, and experience were tested for the 10 studied dimensions of nurses' familiarity responses. Significant correlations were found in the correlations on qualification and dimensions of Emergency Preparedness (sig. 0.006), Epidemiology and Surveillance (sig. 0.008), Isolation and Quarantine (sig. 0.000) and Critical Resources (sig. 0.019). All significant correlations represented a small to moderate association (Critical Resources, 0.185–Isolation and Quarantine, 0.266) (Table 11).

Table 11. Ranks and statistics of nurses' responses regarding their familiarity with Emergency Preparedness Terms and Activities, Epidemiology and Surveillance, Isolation/Quarantine, and Accessing Critical Resources/Qualification (sign = < 0.05, N = 200).

		Emergency Preparedness	Qualification			Epidemiology and Surveillance	Qualification
Emergency preparedness	CC	1.0	0.195	Epidemiology & Surveillance Qualification	CC	1.0	0.188
	Sig.tt		0.006		Sig.tt		0.008
Qualification	CC	0.195	1.0		CC	0.188	1.0
	Sig.tt	0.006			Sig.tt	0.008	
		Isolation/Quarantine	Qualification			Critical Resources	Qualification
Isolation/Quarantine	CC	1.0	0.266	Critical Resources Qualification	CC	1.0	0.185
	Sig.tt		0.000		Sig.tt		0.019
Qualification	CC	0.266	1.0		CC	0.185	1.0
	Sig.tt	0.000			Sig.tt	0.019	

CC = Correlation Coefficient, Sig.tt = Significant two-tailed.

The psychological issues dimension was significant when correlated to age (sig. 0.029), qualification (sig. 0.026), and experience (sig. 0.027). The correlations represented a small association (0.154–0.158) (Table 12).

Table 12. Ranks and statistics of nurses' responses regarding their familiarity with Psychological Issues/Age, Qualification and Experience (sign = < 0.05, N = 200).

		Psychologi-Cal Issues	Age			Psychologi-Cal Issues	Qualification			Psychologi-Cal Issues	Experience
Psychological issues	CC	1.0	0.154	Psychological issues Qualification	CC	1.0	0.158	Psychological issues Experience	CC	1.0	0.157
	Sig.tt		0.029		Sig.tt		0.026		Sig.tt		0.027
Age	CC	0.154	1.0		CC	0.158	1.0		CC	0.157	1.0
	Sig.tt	0.029			Sig.tt	0.026			Sig.tt	0.027	
		Psychologi-Cal Issues	Age			Psychologi-Cal Issues	Qualification			Psychologi-Cal Issues	Experience
Psychological issues	CC	1.0	0.154	Psychological issues Qualification	CC	1.0	0.158	Psychological issues Experience	CC	1.0	0.157
	Sig.tt		0.029		Sig.tt		0.026		Sig.tt		0.027
Age	CC	0.154	1.0		CC	0.158	1.0		CC	0.157	1.0
	Sig.tt	0.029			Sig.tt	0.026			Sig.tt	0.027	

CC = Correlation Coefficient, Sig.tt = Significant two-tailed.

5. Discussions

In this paper, we assessed the readiness of emergency nurses in the southern region of the KSA in the management of public health emergencies, major incidents, and disasters. The reasons for such evaluation were the continuous exposure of the region to both man-made and natural disasters and the advanced educational backgrounds of the nursing staff.

The results of this study indicate a good preparedness in all theoretical dimensions of MID management, including emergency preparedness terms and activities, Incident Command Systems and their role in MID management, ethical issues in triage, epidemiology and surveillance, isolation and quarantine, decontamination, communication issues, psychological issues, management of special/vulnerable populations, and assessment of critical resources. However, the nurses appeared to be uncertain about their skills and practical performance and the evaluation of their own abilities. These results are opposite to what was reported earlier from the KSA [16] and thus confirm a good theoretical knowledge and a need for practical opportunities. Bearing in mind that 93.5% of nurses had a BSN, 6% had an MSN, and 0.5% had a PhD in nursing and that most of the practicing nurses (66%) had more than five years of experience, these results might be indicative of a need for further educational initiatives to improve the skills and practical performance of all nurses working in the management of MIDs [6–9].

The quantitative nature of this study and the collected data provide an understanding of the preparedness of nurses working at MOH hospitals in the southern region of the KSA and reveal both strengths and weaknesses that can be implementable and relevant in other regions and countries.

The current COVID-19 pandemic has demonstrated difficulties in MID management, such as resource scarcity and medical decision-making, which seem to be more complicated in practice than in theory [22]. The EPIQ questionnaire enabled the researchers to capture various dimensions of disaster preparedness and response in nursing environments [23]. However, the nurses' lack of confidence in their own skills and performance should be considered a critical shortcoming. Several studies have shown that healthcare workers who are confident in their own level of competence are more likely to react effectively in real crises than those who are not [24–28]. Nurses' theoretical knowledge, such as their ability to identify the signs and symptoms associated with highly infectious biological and chemical agents, is essential for enhancing disaster preparedness; however, this theoretical knowledge should be incorporated in practical performance to yield a robust preparedness. Proper education and training in an environment where nurses can act without hesitation, make mistakes with no harm to patients, and establish contact with necessary agencies without getting rejected will enable them to attain the required knowledge and skills to identify and report signs and symptoms that are unclear and to treat and intervene with necessary and evaluable measures [4,29–32]. Such performance and collaborative action will ensure their confidence in their response activities as key players in an MID.

Nurses' emergency preparedness is determined by their familiarity with their organisation's emergency operations plan (EOP), which allows them to follow the recommended procedures for crisis intervention from a healthcare perspective [33]. Nurses' knowledge of the ethical, legal, cultural, psychological, and safety dimensions of emergency response is critical for effective intervention and recovery [23,34]. Planning to address the needs of special populations is a strategic dimension of emergency response and recovery initiatives [17]. Effective communication during an emergency is essential for ensuring nurses' collaboration with other stakeholders involved in a crisis event. The epidemiology and surveillance aspects of disaster management require streamlined communication among various departments and agencies [17].

Most of the nurses in this study reported knowledge of and familiarity with all aforementioned dimensions. However, since MIDs are rare events, they have no chance to evaluate their theoretical and practical abilities in a real situation. Simulation exercises may offer a chance to examine these abilities in a safe environment with no harm to patients [4,35,36]. These exercises may also offer an opportunity to raise their awareness about pandemics, quarantine, isolation, the use of PPE, and other critical resources to foster recovery and minimise the spread of highly infectious diseases. A majority of nurses in this study understood the methods for isolation but lacked adequate knowledge concerning the community quarantine process and the impact it may have on the mental health of both affected people and workers. This finding supports earlier findings by McCarthy [23,37], which as part of building modern contemporary emergency nurses, argued the need for nurses to increase their understating of procedures performed and competency in practice. This shortcoming would be addressed in collaborative simulation exercises [4].

In this study, there was a significant correlation between qualification and the dimensions of emergency preparedness, epidemiology and surveillance, isolation and quarantine, and critical resources. These findings are in accordance with Gladston, who reported a significant correlation between nurses' perceptions and qualifications [38], and similar to studies showing statistically significant associations between the dimensions of psychological issues and age, qualification and experience [38–41].

6. Limitations

This study focussed on nursing staff working in emergency departments only and did not consider other nurses' roles and responses. The sample consisted overwhelmingly of women. The small number of male nurses was not a representative sample of the male population of nurses in the region. The non-parametric correlations provided some useful data possible to generalise to a broader population. However, when comparing means, the results were mainly non-significant. Repeated non-parametric tests on the data (Mann–Whitney U and Kruskal–Wallis Test) indicated the need for

an extended study. Data for this study were collected in the Najran region only, which is one of 13 regions in Saudi Arabia, so there was a limitation to the ability to generalise the results to all parts of Saudi Arabia. Furthermore, this study focussed on nurses working in MOH hospitals, while nurses working in other agencies, such as Saudi Arabian Oil Company (ARAMCO) Medical Services, Security Forces hospitals, National Guard hospitals, and the Armed Forces Hospitals of Saudi Arabia were not included. Finally, self-reported surveys by nature have bias: response recall, the possibility that questions will be misinterpreted, and the possibility that respondents' perceived knowledge may not be what they actually know.

7. Conclusions

The aim of this study was to evaluate the theoretical and practical readiness of nurses in MID management. The results indicate that nurses working in Najran EDs in the southern part of the KSA have good theoretical knowledge but lack confidence in their practical performance. Several studies have shown the significance of self-confidence in healthcare workers' responses to real crises [24–28]. Since theoretical knowledge should go hand in hand with practical knowledge to achieve successful outcomes in MIDs, bolstering practical emergency preparedness exercises, for example, with scenario-based simulation exercises [4] may enhance nurses' readiness for crisis response.

Author Contributions: Conceptualization: M.A.S.S., A.K.-M.; Data curation: M.A.S.S., H.J.A.S.; Formal analysis: M.A.S.S., H.J.A.S., A.K.-M., E.C., J.L.S., and F.T.; Investigation: M.A.S.S.; Methodology: M.A.S.S., E.C., A.K.-M.; Project administration: M.A.S.S.; Resources: M.A.S.S.; Supervision: A.K.-M.; Validation: E.C., J.L.S. and F.T.; Writing—original draft: M.A.S.S.; Writing—review and editing: A.K.-M., E.C., J.L.S., and F.T. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Acknowledgments: All authors would like to thank James W. Peltier for providing us the questionnaire.

Conflicts of Interest: Authors declare no conflicts of interest.

Appendix A Questionnaire

The questionnaire is divided into two parts. The first six questions related to demographic and individual information, while the remaining 45 knowledge-based questions are distributed in the 10 emergency preparedness competency dimensions.

Appendix A.1 PART I

Demographics

Kindly tick the box where necessary

1. State your age 22–30 years 31–40 years > 40 years
2. State your gender Male Female
3. What is your academic degree? BS MS PhD
4. What is your nursing experience? 1–5 years 6–10 11–15 > 16
5. What is your experience in the ED? 1–5 6–8 > 9
6. What is your marital status? Single Married Divorced Widow/widower

References

- Skliarov, S.; Kaptan, K.; Khorram-Manesh, A. Definition and General Principles of Disasters. In *Handbook of Disaster and Emergency Management*; Khorram-Manesh, A., Ed.; Kompendiet: Göteborg, Sweden, 2017; Chapter 1; pp. 17–22.
- Khorram-Manesh, A.; Nyberg, L. Risk and Vulnerability Analysis. In *Handbook of Disaster and Emergency Management*; Khorram-Manesh, A., Ed.; Kompendiet: Göteborg, Sweden, 2017; Chapter 4, pp. 35–37.
- Khorram-Manesh, A. Flexible surge capacity—Public health, public education, and disaster management. *Health Promot. Perspect.* **2020**, *10*, 175–179. [[CrossRef](#)] [[PubMed](#)]
- Khorram-Manesh, A.; Berlin, J.; Carlström, E. Two Validated Ways of Improving the Ability of Decision-Making in Emergencies; Results from a Literature Review. *Bull. Emerg. Trauma* **2016**, *4*, 186–196. [[PubMed](#)]
- Schultz, C.H.; Koenig, K.L.; Whiteside, M.; Murray, R. Development of National Standardized All-Hazard Disaster Core Competencies for Acute Care Physicians, Nurses, and EMS Professionals. *Ann. Emerg. Med.* **2012**, *59*, 196–208. [[CrossRef](#)] [[PubMed](#)]
- Labrague, L.J.; Yboa, B.C.; McEnroe-Petitte, D.M.; Loblino, L.R.; Brennan, M.G.B. Disaster Preparedness in Philippine Nurses. *J. Nurs. Sch.* **2016**, *48*, 98–105. [[CrossRef](#)] [[PubMed](#)]
- Shabbir, R.; Afzal, M.; Sarwar, H.; Gilani, S.A.; Waqas, A. Nurses knowledge and practices regarding disasters management and emergency preparedness. *Saudi J. Med. Pharm. Sci.* **2017**, *3*, 464–476.
- Khalil, N.S.; Atia, A.S.M.; Moustafa, M.F.; Soliman, H.T.T. Emergency nurses' knowledge and practice regarding preparedness of disaster management at a university hospital, Egypt. *Nurs. Healthc. Int. J.* **2019**, *3*, 1–12.
- Xu, Y.; Zeng, X.; Yehua, X.; Xia, Z. Necessity for disaster-related nursing competency training of emergency nurses in China. *Int. J. Nurs. Sci.* **2016**, *3*, 198–201. [[CrossRef](#)]
- Emil, M.; Sultan, M.; Sefry, S.; Ahmed, M.; AboAbdallah, M.; Chouinard, K.; Krawczyk, M. Reconstruction of the paleohydrological setting of the Rub Al Khali, Saudi Arabia. In Proceedings of the American Geophysical Union Fall Meeting Abstracts, San Francisco, CA, USA, 9–13 December 2013.
- Hassan, H.M.; Al-Faleh, H. Exploring the risk factors associated with the size and severity of roadway crashes in Riyadh. *J. Saf. Res.* **2013**, *47*, 67–74.
- Alamri, Y.A. Emergency Management in Saudi Arabia: Past, Present and Future. In *Comparative Emergency Management: Understanding Disaster Policies, Organizations, and Initiatives from Around the World*; McEntire, D.A., Ed.; Federal Emergency Management Agency: Washington, DC, USA, 2010; p. 21.
- Fadhlullah, S.Y.; Ismail, W. A Statistical Approach in Designing an RF-Based Human Crowd Density Estimation System. *Int. J. Distrib. Sens. Netw.* **2016**, *12*, 8351017. [[CrossRef](#)]
- Rahman, J.; Thu, M.; Arshad, N.; Van Der Putten, M. Mass Gatherings and Public Health: Case Studies from the Hajj to Mecca. *Ann. Glob. Health* **2017**, *83*, 386–393. [[CrossRef](#)]
- Global Facility for Disaster Reduction and Recovery GFDRR. 2020. Saudi Arabia. Available online: <https://www.gfdrr.org/en/saudi-arabia> (accessed on 11 April 2020).
- AlShehri, B. Emergency nurses' preparedness for disaster in the Kingdom of Saudi Arabia. *J. Nurs. Educ. Pr.* **2017**, *7*, e013563. [[CrossRef](#)]
- Hammad, K.; Arbon, P.; Gebbie, K.M. Emergency nurses and disaster response: An exploration of South Australian emergency nurses' knowledge and perceptions of their roles in disaster response. *Australas. Emerg. Nurs. J.* **2011**, *14*, 87–94. [[CrossRef](#)]
- Wisniewski, R.; Dennik-Champion, G.; Peltier, J.W. Emergency Preparedness Competencies. *JONA J. Nurs. Adm.* **2004**, *34*, 475–480. [[CrossRef](#)] [[PubMed](#)]
- Garbutt, S.J.; Peltier, J.W.; Fitzpatrick, J.J. Evaluation of an instrument to measure nurses' familiarity with emergency preparedness. *Mil. Med.* **2008**, *173*, 1073–1077. [[CrossRef](#)] [[PubMed](#)]
- McKibbin, A.E.; Sekula, K.; Colbert, A.M.; Peltier, J.W. Assessing the Learning Needs of South Carolina Nurses by Exploring Their Perceived Knowledge of Emergency Preparedness: Evaluation of a Tool. *J. Contin. Educ. Nurs.* **2011**, *42*, 547–558. [[CrossRef](#)] [[PubMed](#)]
- Brace, N.; Kemp, R.; Snelgar, R. *SPSS for Psychologists: A Guide to Data Analysis Using SPSS for Windows*, 3rd ed.; Lawrence Erlbaum Associates Publishers: New York, NY, USA, 2006.

22. Goniewicz, K.; Khorram-Manesh, A.; Hertelendy, A.J.; Goniewicz, M.; Naylor, K.; Burkle, F.M. Current Response and Management Decisions of the European Union to the COVID-19 Outbreak: A Review. *Sustainability* **2020**, *12*, 3838. [[CrossRef](#)]
23. McCarthy, G.; Cornally, N.; Mahoney, C.O.; White, G.; Weathers, E. Emergency nurses: Procedures performed and competence in practice. *Int. Emerg. Nurs.* **2013**, *21*, 50–57. [[CrossRef](#)]
24. Li, H.-Y.; Bi, R.-X.; Zhong, Q.-L. The development and psychometric testing of a Disaster Response Self-Efficacy Scale among undergraduate nursing students. *Nurse Educ. Today* **2017**, *59*, 16–20. [[CrossRef](#)]
25. Al Thobaity, A.; Williams, B.; Plummer, V. A new scale for disaster nursing core competencies: Development and psychometric testing. *Australas. Emerg. Nurs. J.* **2016**, *19*, 11–19. [[CrossRef](#)]
26. Lee, Y.; Lee, M.; Park, S. Development of the disaster nursing competency scale for nursing students. *J. Korean Soc. Disaster Inform.* **2013**, *9*, 511–520.
27. Valentine, M.A.; Nembhard, I.M.; Edmondson, A.C. Measuring teamwork in health care settings: A review of survey instruments. *Med. Care.* **2015**, *53*, e16–e30. [[CrossRef](#)] [[PubMed](#)]
28. Regan, S.; Laschinger, H.K.; Wong, C.A. The influence of empowerment, authentic leadership, and professional practice environments on nurses' perceived interprofessional collaboration. *J. Nurs Manag.* **2016**, *24*, E54–E61. [[CrossRef](#)] [[PubMed](#)]
29. Al Khalailah, M.A.; Bond, E.; Alasad, J.A. Jordanian nurses' perceptions of their preparedness for disaster management. *Int. Emerg. Nurs.* **2012**, *20*, 14–23. [[CrossRef](#)]
30. Fung, O.W.M.; Loke, A.Y.; Lai, C.K.Y. Disaster preparedness among Hong Kong nurses. *J. Adv. Nurs.* **2008**, *62*, 698–703. [[CrossRef](#)]
31. Veenema, T.G.; Griffin, A.; Gable, A.R.; MacIntyre, L.; Simons, R.N.; Couig, M.P.; Walsh, J.J.; Lavin, M.C.C.; Dobalian, A.; Larson, E. Nurses as Leaders in Disaster Preparedness and Response-A Call to Action. *J. Nurs. Sch.* **2016**, *48*, 187–200. [[CrossRef](#)] [[PubMed](#)]
32. Alim, S.; Kawabata, M.; Nakazawa, M. Evaluation of disaster preparedness training and disaster drill for nursing students. *Nurse Educ. Today* **2015**, *35*, 25–31. [[CrossRef](#)]
33. Ireland, M.; Ea, E.; Kontzamanis, E.; Michel, C. Integrating Disaster Preparedness into a Community Health Nursing Course: One School's Experience. *Disaster Manag. Response* **2006**, *4*, 72–76. [[CrossRef](#)] [[PubMed](#)]
34. Ibrahim, F.A.A. Nurses Knowledge, Attitudes, Practices and Familiarity Regarding Disaster and Emergency Preparedness—Saudi Arabia. *Am. J. Nurs. Sci.* **2014**, *3*, 18–25. [[CrossRef](#)]
35. Chapman, K.; Arbon, P. Are nurses ready? Disaster preparedness in the acute setting. *Australas. Emerg. Nurs. J.* **2008**, *11*, 135–144. [[CrossRef](#)]
36. Weiner, E.; Irwin, M.; Trangenstein, P.; Gordon, J. Emergency preparedness curriculum in nursing schools in the United States. *Nurs. Educ. Perspect.* **2006**, *26*, 334–339.
37. Volkman, J.C.; Rebmann, T.; Hilley, S.; Alexander, S.; Russell, B.; Wagner, W. Infection prevention disaster preparedness planning for long-term care facilities. *Am. J. Infect. Control* **2012**, *40*, 206–210. [[CrossRef](#)] [[PubMed](#)]
38. Gladston, S.; Nayak, R. Disaster preparedness among nurses working in a paediatric acute care setting of a tertiary hospital, south India. *IOSR J. Nurs. Health Sci.* **2017**, *18*, 25–35.
39. Al-Hunaishi, W.; Hoe, V.C.; Chinna, K. Factors associated with healthcare workers willingness to participate in disasters: A cross-sectional study in Sana'a, Yemen. *BMJ Open* **2019**, *9*, e030547. [[CrossRef](#)]
40. Bella Magnaye, R.N.; Muñoz, M.S.; Muñoz, M.A.; Muñoz, R.G.; Muro, J.H. The role, preparedness and management of nurses during disasters. *Int. Sci. Res. J.* **2011**, *3*, 269–294.
41. Tzeng, W.-C.; Feng, H.-P.; Cheng, W.-T.; Lin, C.-H.; Chiang, L.-C.; Pai, L.; Lee, C.-L. Readiness of hospital nurses for disaster responses in Taiwan: A cross-sectional study. *Nurse Educ. Today* **2016**, *47*, 37–42. [[CrossRef](#)]

