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Exploring Paramedic Students' Level of Preparedness for Disaster Response in Hajj 2019

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EXPLORING PARAMEDIC STUDENTS' LEVEL OF PREPAREDNESS
FOR DISASTER RESPONSE IN HAJJ 2019

By

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A Thesis

Presented to the Faculty of
the University of Nebraska Graduate College
in Partial Fulfillment of the Requirements
for the Degree of Master of Science

M.S. Emergency Preparedness

Under the Supervision of Professor Sharon Medcalf

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EXPLORING PARAMEDIC STUDENTS' LEVEL OF PREPAREDNESS FOR DISASTER RESPONSE IN HAJJ 2019

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University of Nebraska Medical Center, 2020

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Objectives: 1) to gain further understanding of the paramedic students' level of preparedness before their clinical training at Hajj. 2) To shed more light on what paramedic students need when responding to a disaster. 3) To determine the need to recommend a change in the current practice with respect

Method: The data collection for this study was a cross-sectional survey using the REDCap electronic data capture tools. It was a convenience sample of 40 respondents. For the analyses, descriptive statistics, including frequencies and percentages, were used, and the Mann Whitney U test.

Results: The main findings in this study were the lack of training in three main areas 1) disaster response plans. 2) triage. 3) roles and responsibilities. There was no statistically significant difference between the two groups in terms of their perceived level of preparedness.

Conclusion: This study indicates that that Prince Sultan bin Abdul Aziz College for Emergency Medical Services students are not provided with essential knowledge and skills for disaster preparedness and response during their clinical training at the Hajj. Also, it shows that students who are sent to Hajj early in the program and the students who are sent to Hajj late in the program were not aware of their roles and responsibilities during clinical training at the Hajj of 2019. This study offers recommendations to Prince Sultan bin Abdul Aziz College for Emergency Medical

Services to improve the level of preparedness of the paramedic students during their clinical training at the Hajj

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Chapter 1: Introduction

Background

Mass gatherings can put a strain on the host country's healthcare system and poses risks and challenges to all healthcare workers (Memish et al., 2019). The World Health Organization (WHO) defines mass gatherings as "a planned or spontaneous event where the number of people attending could strain the planning and response resources of the community or country hosting the event" ("What is WHO's", 2016). To effectively deal with health risks associated with mass gatherings, the planning and preparation phases should address communicable and non-communicable disease outbreaks, illnesses and injuries to participants, and overcrowding as potential public health threats (Alaska, Aldawas, Algerian, Memish, & Suner, 2017). One of the challenges to effective planning for mass gathering events is the number of agencies involved in the planning phase. Those agencies sometimes have challenges identifying all the risks, roles and responsibilities associated with the mass gatherings, as well as the need the for emergency preparedness plans. Consequently, when natural disasters, stampede incidents, or disease outbreaks occur in a mass gathering overlapping duties between response agencies can emerge due to poor communication and engagement strategies (Dong, Liu, Liu, Jiang, & Zhao, 2017). Historically, crush injuries from human stampedes, and non-communicable diseases, in particular heatstroke, have been the leading causes of death at mass gathering events (Alaska et al., 2017; Memish et al., 2019; Steffen et al., 2012). In the past three decades, more than 7000 deaths and 14000 injuries resulted from stampede incidents during mass gatherings (Steffen et al., 2012). The number of people attending the mass gathering event serves as a risk factor for a stampede. However, inadequate preparedness plans for mass gatherings can hinder the ability to mitigate damages (Dong et al., 2017; Steffen et al., 2012).

Studies of previous mass gathering events have consistently shown that the spread of infectious diseases is also associated with such events. Specifically, mass gatherings that attract visitors from all over the world (Al-Tawfiq & Memish, 2014) are at high risk. Therefore, the burdens on host countries' health systems require robust emergency preparedness and response plans that involve government and non-government organizations. The most important consideration when planning for a response to mass gatherings is establishing effective coordination and communication between healthcare agencies and law enforcement, civil defense, and non-government organizations.

A central issue in mass gathering management is the risk of crowd disasters. Although considerable research has been devoted to mass gatherings, rather less attention has been paid to crowd disasters (Soomaroo & Murray, 2012). The International Federation of Red Cross (IFRC) defines a disaster as “a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its resources” (“What is a Disaster”, n.d.). Mass gathering events can stretch the healthcare system to their limits. However, the occurrence of natural disasters, stampede incidents, or disease outbreaks in mass gatherings will add more complexity and will put increasing demands on the health care system beyond its already stretched capacity. Strengthening the emergency preparedness and response capabilities of the host community will reinforce its ability to mitigate the consequences should a disaster occur, and this extends beyond the provision of medical support for mass gathering events.

Saudi Arabia hosts the annual pilgrimage to Mecca, which is one of the largest recurring religious gatherings in the world (Shafi, Booy, Haworth, Rashid, & Memish, 2008). Every year Mecca draws more than 2 million pilgrims from across the globe to perform Hajj (Al Masud, Shah

Murtaza Rashid, Bakar, & Yussof, 2016). Performing the Hajj pilgrimage to Mecca is one of the five fundamental pillars of Islam (Ahmed et al., 2006). Thus, it is a mandatory religious duty for Muslim adults who are physically and financially capable to go on Hajj at least once in their lifetime (Campo, 1991). Each pilgrim, on arrival to Mecca, performs “seven circumambulations (Tawaf) around the Ka’aba (a holy site that Muslims consider as the House of God). He/she then leaves for the Plain of Arafat, a few miles east of Mecca, where the Hajj culminates in the Day of Standing (Campo, 1991). The pilgrim makes overnight stops in Mina en route to Arafat, and in Muzdaliffah on return. On returning to Mina, the pilgrim stops at Jamarat to stone the pillars that are effigies of Satan. The new Hajjee (a pilgrim who has completed the Hajj) then makes an animal sacrifice (usually by proxy) as thanks for an accepted Hajj. After a farewell Tawaf, the pilgrim leaves Mecca” (Ahmed et al., 2006).

Hajj is highly vulnerable to disasters, particularly crowd disasters (Ahmed, Arabi, & Memish, 2006). The inevitable overcrowding within a confined area every year, tests the ability of the authorities to effectively run smooth and safe Hajj (Alaska et al., 2017). Indeed, the occurrence of a disaster during the Hajj may cause devastating consequences in the absence of preparedness. Historically, there have been many stampede and fire related incidents in Hajj that resulted in a large number of casualties and fatalities among the pilgrims. However, recently, there has been growing interest in developing the facilities infrastructure. Specifically, the Jamarat bridge to reduce the risk of human stampedes (Shujaa & Alhamid, 2015). In 2007, the Saudi governments introduced the first phase of the new Jamarat bridge, which can accommodate 300,000 pilgrims per hour, with a significant increase in length, width, exits and entrance gates, as well as implementing strict scheduling and crowd management strategies to control the distribution of pilgrims. Despite these efforts, Hajj remains at high risk for large scale disasters (Alaska et al.,

2017). Although many studies have been conducted on the Hajj and its health challenges, limited research has been conducted to evaluate the level of preparedness of healthcare workers, especially Emergency Medical Service (EMS) personnel during the Hajj. Unfortunately, few studies in this area suggest that hospital and prehospital providers are unprepared to respond for disasters (Al Khalaileh, Bond, & Alasad, 2012; Alexander & Wynia, 2003; Al-Ghamdi & Kabbash, 2011; Alzahrani & Kyratsis, 2017; Chaput, Deluhery, Stake, Martens, & Cichon, 2007). EMS providers play a pivotal role on the front lines of responding to disasters, especially in providing initial scene evaluation, identification, communication, triage, medical care, and transport of victims (Chaput et al., 2007). However, studies in this area suggest that the lack of standardized core competencies may influence the ability of prehospital providers to respond to a disaster (Chaput et al., 2007). This lack of standardized core competencies has, in turn, created concerns regarding the EMS providers' readiness to respond to a disaster, particularly during the Hajj.

Every year Prince Sultan bin Abdul Aziz College for Emergency Medical Services (PSCEMS) sends its paramedic students to support the Saudi Red Crescent Authority (SRCA) in providing prehospital care for pilgrims during the Hajj, as part of their clinical training, for pilgrims during the Hajj (Leggio et al., 2016). The students who have completed their first year of the EMS program are required to assist SRCA, which is the primary governmental organization that provides emergency medical services in the Kingdom. Nonetheless, it should be noted that the SRCA view the students as volunteers.

Since the training in Hajj would necessitate traveling to a different city, a very small percentage of the first year students miss the Hajj training due to illness or family reasons. Accordingly, the students who miss the training in their first year have to complete it after finishing the second year because the Hajj training is one of their curriculum requirements. However, the

paramedic students are not trained in mass gathering responses until the third year of the program. There are no data available on how well-prepared paramedic students are to respond to disasters during the Hajj in terms of both their clinical skills or their roles and responsibilities in the overall response.

SRCA has approximately 36 ambulance stations distributed over various Mina locations and along Jamarat Bridge during Hajj season. Once the paramedic students arrive at Mecca, they are assigned to different ambulance stations at Mina and Jamarat bridge. Mina is where pilgrims gather and sleep in tents for few nights as part of the rituals of Hajj and, Jamarat, located in Mina, is where the ritual Stoning of the Satan takes place (Ahmed et al., 2006). These two locations have been historically associated with stampede and fire incidents (Shujaa & Alhamid, 2015). Approximately eight stampedes incidents and one fire incident occurred in the last three decades in Mina and Jamarat (Ahmed et al., 2006; Alaska et al., 2017; Aleeban & Mackey, 2016). The last time a major incident happened during Hajj season was in 2015. One of the deadliest Hajj stampede incidents occurred in Mina resulting in the largest number of fatalities in the Hajj history (Aleeban & Mackey, 2016).



Figure 1: Mina. Adapted from Hajj and Umrah Planner (n.d). Retrieved September 27, 2019, <https://hajjumrahplanner.com/mina/?hilite=%27mina%27>



Figure 2: Jamarat bridge. Adapted from Hajj and Umrah Planner (n.d). Retrieved September 27, 2019, <https://hajjumrahplanner.com/jamarat-bridge/?hilite=%27jamarat%27>

This research study seeks to evaluate the Prince Sultan bin Abdul Aziz College for emergency medical services (EMS) students' level of preparedness for disasters during Hajj at the end of their first year of study. We will also examine the students' awareness of their roles and responsibilities related to disaster preparedness and response. With our results, we will attempt to shed light on the appropriateness of sending the EMS students early in the program to assist the Saudi Red Crescent Authority (SRCA) in providing prehospital care during Hajj.

Statement of the Problem

Recently, there has been growing interest in assessing the health professionals students' level of preparedness for disaster response around the globe. Most studies have identified a lack of disaster preparedness and response contents in medical, nursing, and EMS undergraduate curriculum (Alrazeeni, 2015; Schmidt et al., 2011; Sinha, Pal, Kasar, Tiwari, & Sharma, 2008; Usher & Mayner, 2011). However, In Saudi Arabia, no data are available on how well prepared paramedic students are to disaster that might occur during their volunteer work with SRCA during Hajj.

Significance of Project

This study will identify the gaps that exist in the body of knowledge about Saudi paramedic students' level of disaster preparedness and response at the end of their first year of study and training at PSCEMS. This study will also be beneficial to the Prince Sultan bin Abdul Aziz College for Emergency Medical Services in developing appropriate educational resources to help the students prepare for a wide range of mass gathering related emergencies that might emerge during

their clinical training in Hajj. This research will be beneficial to future researchers to evaluate medical, nursing, and allied health students who are also required to provide care at Hajj as part of their clinical training.

Purpose of the Project

This research aimed to provide answers to the following questions:

- A) Are the paramedic students, after their first year in the EMS program at PSCEMS, prepared to respond effectively to crush injuries at a mass gathering event?
- B) Are the paramedic students, after their first year in the EMS program at PSCEMS, prepared to respond to an infectious disease outbreak at a mass gathering event?
- C) Are the paramedic students participating in Hajj trained on of the Saudi Red Crescent Authority response plan?
- D) Are the paramedic students in Hajj aware of their roles and responsibilities within the Saudi Red Crescent Authority if a disaster occurred?

Specific Aims

The primary purpose of this study is to assess preparedness and response level to Hajj-related disasters among paramedic students, after their first year of study at Prince Sultan bin Abdul Aziz College for Emergency Medical Services during their clinical training with the Saudi Red Crescent Authority at the Hajj, in Mecca, Saudi Arabia. Previous studies have consistently shown the transmission of communicable diseases and stampede-related injuries are the most common risks in mass gatherings, especially the Hajj annual gathering. So far, investigations have been confined to assessing the level of preparedness among healthcare professionals and students in responding to disasters in general. However, the level of preparedness of paramedic students, who, as students, provide prehospital care at Hajj, remains unexplored. It is critical to explore the

students' readiness for disasters during Hajj to examine the need for changing the current practice where students are sent to Hajj early in the program before taking the course on disaster preparedness and management, which is taught in the third year of the EMS program. Therefore, the specific aims of this study 1) to gain further understanding of the paramedic students' level of preparedness prior to their clinical training at Hajj. 2) To shed more light on what paramedic students' need when responding to a disaster. 3) To determine the need to recommend a change in the current practice with respect to the timing of EMS student's clinical experience at the Hajj.

Definitions of Terms

Mass gatherings: "A planned or spontaneous event where the number of people attending could strain the planning and response resources of the community or country hosting the event" (WHO, 2016).

Hajj: is the annual pilgrimage to Mecca and related holy sites, which is one of the largest recurring religious gatherings in the world (Shafi et al., 2008). **Stampede:** Trauma hazards that is a common cause of fatalities in mass gatherings (Ahmed et al., 2006)

Preparedness: "a continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action in an effort to ensure effective coordination during incident response." ("Plan and Prepare for Disasters", 2012)

Assumptions

The first assumption made is that all participants will answer the questions honestly and to the best of their ability. It was further assumed that the participants would fully understand the questions they will be asked in the English survey since the EMS program follows the United States National EMS Curriculum. It is assumed that each participant would only participate one

time in the survey. An assumption made that the information found in this study can be representative of other health professions educational institutions in the Kingdom of Saudi Arabia.

Limitations of Study

This study has several limitations — first, the relatively small and non-random sample. Second, the use of convenience sampling technique which is highly vulnerable to selection bias. Third, the use of a new survey instrument because no pre-existing relevant instrument is available.

Chapter 2: Literature Review

Challenges of Mass Gathering

Mass gatherings present a unique set of emergency preparedness challenges. Assessing these challenges, and the impact they have on medical preparedness and emergency response is of substantial importance (Alaska, Aldawas, Algerian, Memish, & Suner, 2017). Mass gatherings can be classified into two major types: organized or unplanned. Therefore, based on this classification, Hajj, concerts, and sports events are considered examples of organized gatherings. However, an example of unplanned mass gatherings would be when people gather to mourn the death of religious and political figures (Al-Tawfiq & Memish, 2014). Mass gatherings, including organized events, can stretch the host countries' health systems beyond its capacity if the existing preparedness plans do not consider the complexity of each event separately. Therefore, mass gatherings necessitate adequate pre-event assessment that guides the preparedness plans (Dong, Liu, Liu, Jiang, & Zhao, 2017). Stampede is documented in the literature repeatedly as being a major risk during mass gatherings events (Alaska et al., 2017; Dong et al., 2017). However, Dong et al. (2017) thoroughly examined the Shanghai stampede that happened in 2014, where around 310,000 people including tourists had gathered to watch new year's eve fireworks. At the staircase of Chenyi Square, the large crowd at the top stairs started pushing the people in the middle of the stairs, which led to the unfortunate stampede incident that killed 36 and injured 49 (Dong et al., 2017). The authors identified the factors that contributed to the preventable tragedy, which include high crowd density, flow direction, environmental factors, lack of self-protection awareness, lack of adequate surveillance, and communications. However, different studies on mass gathering events highlighted lack of awareness, high density of people, restricted points of access, limited crowd control, and lack of sufficient on-site medical care and emergency response control as

factors that can considerably increase the risk of disasters, in particular, at stampede incidents during mass gathering events (Alaska et al., 2017; Arif et al. ; Soomaroo & Murray, 2012). The preparedness for mass gatherings requires substantial resources. The many stakeholders involved in the risk assessment, planning, and response, adds more challenges to the planning phase. According to Dong et al. (2017), the involvement of different players increases the complexity of managing mass gatherings. Establishment of communications with planners, local government, district administration, police department, emergency medical services, fire and rescue services, private security services, media, and volunteers is essential to have effective preparedness and response plans (Illiyas, Mani, Pradeepkumar, & Mohan, 2013). In addition, the emergency response plan should be developed in consultation with these stakeholders (Illiyas et al., 2013).

Disaster Preparedness and Response

Many researchers have extensively studied the levels of disaster preparedness of health care professionals in recent years. In a study by Al Khalaileh and his team, the Disaster Preparedness Evaluation Tool (DEPT) survey was distributed to assess the Jordanian nurses' perceived knowledge, skills, and preparedness for disaster management. A sample of 474 registered nurses (RNs) participated in the study. Sixty-five percent of the nurses exhibited poor awareness of disaster preparedness and management strategies. Whereas 18% described their disaster preparedness and management as a medium, and 12% felt good about their preparedness level. Only 5% felt that their current disaster preparedness was very good. The study found statistical differences in knowledge, skills, and perceptions among RNs according to their experiences. In addition, 430 RNs showed interest in learning more about their role in disaster preparedness and management. The researchers concluded that identifying the current level of RNs' knowledge and skills is a key factor to improve their disaster preparedness and management

education and training (Al Khalaileh, Bond, & Alasad, 2012). Other literature reported relatively low levels of knowledge about disaster preparedness and management among nurses (Al-Ali & Abu Ibaid, 2015; Öztekin, Larson, Akahoshi, & Öztekin, 2016). Knowledge and skills gained through drills and exercises were found to be essential to prepare RNs for disaster response (Al Khalaileh et al., 2012; Al-Ali & Abu Ibaid, 2015; Öztekin et al., 2016). Another quantitative study by Magnaye et al. (2011), investigated the role, the preparedness, and the management of nurses during disasters according to their age, gender, civil status, religious affiliation, years of service and area of specialization. Overall, the study found that the demographic profile of the participants has an impact on their role, preparedness, and management during disaster events. Furthermore, the investigators reported a high level of preparedness in delivering care among nurses during disasters and a high level of awareness related to their clinical roles during disasters.

Chaput, Deluhery, Stake, Martens, and Cichon (2007) assessed the perception of EMS providers about their training for chemical, biological, radiological, and nuclear (CBRN), and other mass casualty events (MCEs). In order to identify their preferred training methods, as well as their perceived knowledge about the risk of CBRN/MCE occurrence. A total of 1,010 prehospital providers from 31 different departments were surveyed via email. Results showed that 22% of the respondents reported having no training sessions related to CBRN/MCE in the past year, 19% reported having 1–5 hours training session, 15% reported receiving 6–10 hours, 24% reported receiving 11–39 hours, and 7% reported having more than 40 hours of training. The investigators reported that the remaining 13% of the response is missing or does not meet the inclusion criteria. Looking at the education provided to EMS providers, the researchers stated that hospitals did not provide all education material and training sessions related to CBRN/MCE.

Furthermore, the vast majority of those who were exposed to training sessions over the past year reported receiving lecture or drill training formats for CBRN and other MCE training. Regarding their preferred training format, drill came first with 46%, lecture and drill combination 20%, and only 13% preferred lecture format. However, when asked about their perceived likelihood of CBRN/MCE in the next three years, sixty-one percent of the respondents felt that the possibility of MCE was very likely or somewhat likely, 42% felt the same with regard to chemical event, 38% about a biological event, and 33% about a radiation/nuclear event. The study revealed that lack of universal training provided to paramedics related to CBRN and other MCE limits the ability to evaluate the EMS providers' preparedness for such events. The authors concluded that the amount of training differs significantly among prehospital providers, and further research needed to evaluate the competency and performance improvement of training time and format (Chaput et al., 2007). Other literature reported that paramedics who recently received training sessions for chemical, biological, radiological, nuclear, and explosives (CBRNE) related to terrorism exhibited higher readiness to respond to CBRNE incidents (Stevens et al., 2010). Surprisingly, however, Stevens et al. (2010) findings suggest that incident experience alone may not provide paramedics with response readiness and confidence to respond to CBRNE events compared to training sessions.

Looking at physicians' preparedness for bioterrorism incidents, Alexander and Wynia (2003) stated that the physicians' level of preparedness for bioterrorism attacks is worrying. However, he suggested that their perceived low likelihood of bioterrorism attacks may influence their preparedness for such attacks. Similarly, Hsu et al. (2005) reported that a large percentage of non-urban physicians in North Texas are suffering from a lack of preparedness and response training for CBRNE events. Based on studies mentioned earlier, there is lack of preparedness and

response training among health care providers in general which is consistent with other reports in the literature (Alexander & Wynia, 2003; Chaput et al., 2007; Hsu et al., 2005; Stevens et al., 2010).

Another study by Lim, Lim, and Vasu (2013) sought to assess the factors affecting health care workers' perception of their institutional and individual preparedness for disasters. The study found that three-quarters of the respondents had confidence in the preparedness of their institution for disasters. However, only 36.4% felt that they were as individuals prepared to respond to a disaster. This finding is consistent with an existing literature review (Alexander & Wynia, 2003). Furthermore, Lim et al. (2013) reported that health care workers were more likely to perceive that they are prepared to respond if they had responded to a disaster before. This contrasts significantly with findings reported by Stevens et al., 2010.

To many, undergraduate medical, nursing, and other allied health education programs do not address the shortcomings in their curriculum related to disaster preparedness training and education. It is often overlooked, and it may be considered insignificant by health profession programs or organizations. However, a substantial body of the literature identified a lack of knowledge in the undergraduate curriculum of healthcare students. According to Sinha, Pal, Kasar, Tiwari, and Sharma (2008), the current level of preparedness of medical students requires interventions. The authors stated that the medical students in their study perceived themselves as having moderate to weak knowledge and awareness for disaster preparedness. However, the exposure to lectures and drills relevant to disaster preparedness and response can significantly improve the medical students' knowledge, attitude, and practice (Sinha et al., 2008). Another study sought to examine undergraduate nursing curricula in order to identify the relevant disaster nursing competencies in education. The study revealed that the significance of disaster preparedness and response is often overlooked in the Australian nursing curricula (Usher & Mayner, 2011). Other

studies have also contributed to the understanding of nursing students' knowledge and preparedness for disasters, as well as identifying the challenges to implementing effective interventions. Schmidt et al. (2011) argue that the existing content of nursing curriculum seems overwhelming. Consequently, adding more content is challenging and may not be the best approach. He suggested providing educational materials outside the classroom and the clinical experience time for nursing students. Still, another study explored Saudi EMS Students' level of preparedness for disaster response. Alrazeeni (2015) suggested that little attention has been paid to disaster content in undergraduate EMS curriculum. What emerged from his findings was that, while the overwhelming majority of the EMS students acknowledge the importance of disaster preparedness in undergraduate curriculum, the students exhibited poor knowledge about disaster preparedness. The study highlighted the need to add content relevant to disaster preparedness and response in the undergraduate curriculum. Alrazeeni (2015) findings are congruent with the results of the existing literature relevant to medical, nursing, and other allied health undergraduate education (Schmidt et al., 2011; Sinha et al., 2008; Usher & Mayner, 2011).

There are many important aspects to consider in determining the role of EMS personnel during disaster response; typically, this is determined by the EMS protocol. However, field triage, proper communication, and knowledge of the roles are the most critical skills that EMS personnel need to acquire to help in mitigating the devastating consequences of mass casualty incidents (Dasgupta et al., 2012). Whereas Catlett, Jenkins, and Millin (2011) indicate that mass-casualty triage, on-scene treatment, communication, evacuation, coordination of patient transport, and patient tracking are the primary responsibilities of EMS personnel in mass casualty incidents. With these demands on EMS personnel, the failure to provide standardized training along with the lack of core competencies in disaster management and response hinder the ability to effectively assess

the current preparedness level of EMS personnel (Catlett et al., 2011; Chaput, Deluhery, Stake, Martens, & Cichon, 2007b). Dasgupta et al. (2012) expanded on this idea and suggested that educating and training first responders play a pivotal role in preparing EMS personnel for a successful response to a disaster.

Schultz, Koenig, Whiteside, and Murray (2012) discussed how the lack of standardized core competencies has a profound effect on the disaster preparedness and response of physicians, nurses, and EMS professionals. Schultz et al. (2012) argued that the current education and training materials relevant to a disaster do not consider the problematic situations that health care providers encounter during disaster response. To this effect, the development of national standardized all-hazard disaster core competencies for health care professionals is necessary.

Public health Challenges Related to Hajj Season

Hajj poses substantial challenges related to public health emergency preparedness and response capabilities (Shafi, Booy, Haworth, Rashid, & Memish, 2008). In an observational study by Memish et al. (2019) of public health issues arising from mass gatherings, the authors reviewed the literature on mass gathering events held between 2013 and 2018. The potential public health threats that were highlighted in this study were the transmission of infectious diseases, the emergence of antibiotic-resistant bacteria, mass casualty incidents (MCI) arising from stampedes and terrorist attack, and non-communicable disease, including heat exhaustion and heat stroke. The investigators conclude that the Hajj is inherently vulnerable to infectious disease outbreaks. Furthermore, the number of annual pilgrims is growing every year, which increases the health risk associated with the Hajj (Ahmed, Arabi, & Memish, 2006). Shafi et al. (2008) add that the prevalence of overcrowding during Hajj facilitates the spread of diseases. For years, Hajj has been associated with various health concerns. Specifically, the outbreak of influenza, which is common

viral infection among Hajj pilgrims (Hashem et al., 2019). Therefore, educating and preparing the front-line health care providers about the potential risk of outbreak or epidemic events in Hajj is a crucial step toward improving their preparedness level. A study examining the EMS personnel' perception of their preparedness on a potential human influenza pandemic concluded that lack of knowledge relevant to infection transmission, preventive measures, and decontamination were apparent among the respondents (Watt et al., 2010). Further, Al-Ghamdi & Kabbash (2011) reported that the health care providers, who are working in King Abdulaziz International Airport Hajj Terminals in Jeddah, showed poor knowledge about the common infectious diseases during Hajj due to lack of appropriate training. Also, the investigators noted that less experienced providers had difficulties in implementing some preventive measures (Al-Ghamdi & Kabbash, 2011). However, the stampede is perhaps the most prevalent type of incidents during Hajj. In the last three decades, roughly eight incidents were reported as a stampede (Aleeaban & Mackey, 2016). Table 1 shows the reported stampede events, injuries, and fatalities during Hajj. Despite the common challenges of mass gatherings, Hajj presents particular issues that influence the health response (Shujaa & Alhamid, 2015). Therefore, health care providers and emergency planners need to be aware of the risk that Hajj entails to prepare effective emergency response strategies (Ahmed et al., 2006).

Table 1: Reported stampede incidents at Hajj * 1990 - 2015			
Year	Deaths	Injuries	Location
1990	1426	Unknown	Mina, Mecca
1994	270	Unknown	Mina, Mecca
1998	118	180	Jamarat, Mecca
2001	35	Unknown	Mina, Mecca
2003	14	Unknown	Jamarat, Mecca
2004	251	244	Mina, Mecca
2006	380	289	Mina, Mecca
2015	+700	Unknown	Mina, Mecca

*(Alaska et al., 2017; Ngai, Burkle, Hsu, & Hsu, 2009; Salamaty & Rahimi-Movaghar, 2016; Shujaa & Alhamid, 2015)

The objective of a study conducted in 2017 was to examine nurses' levels of awareness, knowledge, skills, and their perceptions during the Hajj mass gathering in Mecca. A sample of 104 registered emergency nurses from four different public hospitals in Mecca participated in the study. In regard to their perceived knowledge and awareness about disasters, only 38% knew that Saudi Red Crescent Authority (SRCA) is responsible for transporting the vast majority of disaster victims to Emergency Departments (EDs). Only 32% of respondents knew that the disruption and poor health caused by a major disaster could lead to infectious disease outbreaks. Furthermore, only 29.1% were aware that poor people are more likely to die during disasters than the rich or the middle class. Only 20.6% were mindful that unburied corpses would not pose a risk of disease

epidemics after mass gathering disaster, and only 16% were aware that decontamination of CBR (chemical, biological, radiological) victims occur before transport to hospitals. In respect to their role during a disaster, 38% of the nurses believed that their primary role is providing general assessment and caring for patients, then 26% for triage, and 21% for resuscitation. Lastly, the nurses perceived their leadership role during mass gathering disaster as the least important, and only one believed that psychological care is related to their role during disasters. With respect to education and training, the results identified that only 34% received training in the past 6-12 months, 23 % received training in the past 12-24 months, and 43% received training in the past 12-24 months. Furthermore, concerning the level of awareness of the major incident plan, 43% of the respondents had carefully read their department plans, whereas 52.8% have not thoroughly read it. Also, a small percentage of emergency nurses reported that they have no knowledge of their department plans. The researchers concluded that nurses have a high level of awareness regarding their clinical role during disasters. However, their perceived knowledge and skills related to disaster preparedness are surprisingly low (Alzahrani & Kyratsis, 2017).

Conclusion

The literature review provided information on the current knowledge base about the health risks at mass gatherings. The transmission of communicable diseases and stampedes injuries are the most common risks in mass gatherings, especially in Hajj. A consensus in the research is that the level of disaster preparedness and management among health care providers is relatively low across the world (Al Khalaileh et al., 2012; Al-Ali & Abu Ibaid, 2015; Alexander & Wynia, 2003; Al-Ghamdi & Kabbash, 2011; Alzahrani & Kyratsis, 2017; Öztekin et al., 2016; Schmidt et al., 2011). With these findings, there is a growing need for developing standardized training for healthcare professionals related to disaster preparedness and management in order to prepare

health care professionals to respond effectively to disasters (Schultz et al., 2012). Identifying core competencies for disaster preparedness and response education is key to improve the poor knowledge and skills of healthcare professionals. The lack of content relevant to emergency and disaster responses in medical, nursing, EMS, and other allied health program curricula is described in the literature as a factor contributing to the poor knowledge, skills, and preparedness for disaster management among healthcare students. Additionally, the research demonstrates the necessity of adding disaster preparedness and response courses in the undergraduate curriculum for healthcare students as an important aspect of their education (Alrazeeni, 2015; Sinha et al., 2008; Usher & Mayner, 2011). Many researchers have extensively studied the health risks associated with Hajj in recent years since it poses significant consequences. However, few studies have been conducted to assess the disaster preparedness level of healthcare professionals during the Hajj. The gaps exist in the research pertaining to the level of disaster preparedness and response among paramedic students, after only one year of training, who are sent every year to the Hajj as part of their clinical training. Although the study by Alrazeeni (2015) gives insight into EMS students' level of preparedness related to disaster management, further research is needed to examine EMS students preparedness for public health emergencies and disasters that might emerge during their clinical training at Hajj.

Chapter 3: Methodology

Sample Population

The target population for this study is the Prince Sultan bin Abdul Aziz College for Emergency Medical Services (EMS) students who provided prehospital patient care in the Hajj of 2019, which began on the evening of Friday, August 9 and ended on the evening of Wednesday, August 14 (Pemberton, 2019). In the 2019 Hajj, more than 50 paramedic students assisted the Saudi Red Crescent Authority in providing emergency medical services and prehospital care. To be a part of this study, the participants have to meet the following criteria: 1) be a full-time student at Prince Sultan bin Abdul Aziz College for EMS; 2) have completed the first year and/or the second year of the program.

A convenience sampling method was used to recruit participants in this study. Therefore, the participants were selected according to their convenient accessibility and proximity to the researcher, making this a convenience sample (Martínez-Mesa, González-Chica, Duquia, Bonamigo, & Bastos, 2016). As a result, the responses may not represent the entire population, which limits the generalizability of this study (Etikan et al., 2016). Although the convenience sample will impede our ability to draw inferences about a population, the findings will contribute to the body of knowledge on the readiness of paramedic students during their clinical training in Hajj. Furthermore, the study will be the first empirical study that explores mass gathering disaster preparedness among paramedic students during their clinical training in Hajj. Given the exploratory nature of this study, we expect that the study findings will pave the way for further investigations.

For this study, a cross-sectional study design was used involving a survey methodology for the collection of self-report data from the study participants. This study is descriptive. Hence, there

is no formal hypothesis (Levin, 2006). This cross-sectional study design provides us with an opportunity to capture the paramedic students' level of preparedness in the Hajj of 2019 at relatively low cost. Also, cross-sectional studies take up little time to conduct (Levin, 2006).

Dependent and Independent Variables

The Prince Sultan bin Abdul Aziz College for Emergency Medical Services (EMS) is for male-only due to the gender segregation role in Saudi Arabia. The age of the students is relatively the same. Additionally, the students are from the same race/ethnicity. Thus, we do not expect to see any differences in age, gender, and race that might affect the outcome. Therefore, this study has two independent variables:

- 1) Year of study: first year, second year, and third year
- 2) Previous exposure to disaster management and response training

This study has one dependent variable:

- 1) Level of preparedness based on their confidence to respond for disasters during Hajj

To address our research questions, the dependent variable of level of preparedness is based on self-rated confidence to respond operationally to Hajj-related disasters that have been reported in the literature (Ahmed et al., 2006; Alaska et al., 2017; Al-Tawfiq & Memish, 2014; Memish, Stephens, Steffen, & Ahmed, 2012; Shafi et al., 2008; Shujaa & Alhamid, 2015). Responses will be scored on a 4- point Likert scale (“strongly disagree,” “disagree,” “agree,” and “strongly agree”).

Data Collection

An online survey was used to assess preparedness level to Hajj-related disasters among paramedic students and measure the relationship between the independent variables. The online survey provided the researcher with a cost-effective and time-efficient tool to survey the

participants. Hence, the use of an online survey reduced data collection time (Evans & Mathur, 2005). Further, the online self-administered survey was anonymous. Accordingly, the participants were encouraged to give more truthful responses (Evans & Mathur, 2005). After receiving IRB approval and according to standard legal and ethical guidelines, the study was conducted at the Prince Sultan bin Abdul Aziz College for Emergency Medical Services (EMS), King Saud University. A permission letter to conduct the study was sent via e-mail to Dr. Hashim bin Mohammed bin Salleeh, the Dean of Prince Sultan Bin Abdulaziz College for Emergency Medical Services, and his Vice Dean for Post-Graduate and Scientific Research Affairs Dr. Tariq Alzahrani. The study participants were recruited voluntarily by an e-mail invitation. A local contact sent the e-mail out through his class lists. The e-mail invitation was sent three times to 57 paramedic students, with a week between each request. The final response rate was 70% (n=40). Participants did not receive financial rewards or compensation for involvement in this study. Study data were collected and managed using the REDCap electronic data capture tools hosted at the University of Nebraska Medical Center. Service and support is provided by the Research Information Technology Office (RITO), which is funded by the Vice Chancellor for Research.

Data

This study is an observational study with a quantitative approach to explore the paramedic students' perceived level of preparedness. The development of the questionnaire's content was informed by similar previous studies (Al Khalaileh et al., 2012; Al-Ali & Abu Ibaid, 2015; Al-Otaibi, 2018; Alrazeeni, 2015; Öztekin et al., 2016).

Survey

Demographic Questions	
What is your age?	“18-20”, “21-23”, “24-26”, “27 and above”
What was the last year of paramedic program you completed before your training in the “Hajj of 2019?”	“First year ”, “Second year", “Third year”
Over the last two years, how many training/drills about disaster management and preparedness you attended before your training in the “Hajj of 2019?”	“none” “one” “two” “three” “more than three”
Where was your ambulance stationed in the hajj of 2019?	“Jamarat bridge”, “Mina”, “Muzdalifah” “Arfa”, “Ka’aba”

Questions	Strongly Disagree	Disagree	Agree	Strongly Agree
I was aware of existing Saudi Red Crescent Authority’s disaster response plans during Hajj of 2019.				
I received training on the Saudi Red Crescent Authority’s disaster response protocol before Hajj of 2019.				
I was aware of the triage protocols used by the Saudi Red				

Crescent Authority during Hajj of 2019.				
I received training on the Saudi Red Crescent Authority's triage protocols during Hajj of 2019.				
As a paramedic student, I felt confident to conduct mass casualty triage during Hajj of 2019.				
As a paramedic student, I felt confident to respond to Hajj-related disasters (e.g. stampede, terror, fire, influenza outbreak, etc.) during Hajj of 2019.				
As a paramedic student, I felt confident to care for crash injuries during Hajj of 2019.				
As a paramedic student, I felt confident to care for burn and blast injuries during Hajj of 2019.				
As a paramedic student, I felt confident to care for chemical injuries attacks during Hajj of 2019.				
As a paramedic student, I felt confident to recognize the signs and symptoms of infection diseases during Hajj of 2019.				

As a paramedic student, I felt confident to wear the appropriate PPE during Hajj of 2019.				
I knew the limits of my knowledge, skills and authority as a paramedic student during Hajj of 2019.				
I would likely perform skills or procedures outside my scope of practice if needed during Hajj of 2019.				

Timeline

October, 2019	Final proposal submission
November, 2019	IRB exempt application
November – January – March (2019-2020)	IRB Approval and data collection
January – March, 2020	Completion of the thesis
End of March, 2020	Submission of the thesis to Dr.Medcalf
Early April, 2020	Submission of thesis to the committee
April 22th, 2020	Final presentation

IRB Approval



NEBRASKA'S HEALTH SCIENCE CENTER

Office of Regulatory Affairs (ORA)
Institutional Review Board (IRB)

January 30, 2020

Nawaf Albaqami, BSc
COPH Epidemiology
UNMC - 4395

IRB # 025-20-EX

TITLE OF PROPOSAL: Exploring Paramedic Students Level of Preparedness for Disaster Response during Hajj 2019

The Office of Regulatory Affairs (ORA) has reviewed your application for *Exempt Educational, Behavioral, and Social Science Research* on the above-titled research project. According to the information provided, this project is exempt under 45 CFR 46:104(d), category 2. You are therefore authorized to begin the research.

It is understood this project will be conducted in full accordance with all applicable HRPP Policies. It is also understood that the ORA will be immediately notified of any proposed changes for your research project that

- A. affect the risk-benefit relationship of the research
- B. pose new risks which are greater than minimal
- C. constitute a new risk to privacy or confidentiality
- D. involve sensitive topics (including but not limited to personal aspects of the subject's behavior, life experiences or attitudes)
- E. involve deception
- F. target a vulnerable population
- G. include prisoners or children
- H. otherwise suggest loss of the exempt status of the research.

You are encouraged to contact the ORA to discuss whether changes to exempt research requires review by ORA.

Please be advised you will be asked to update the status of your research yearly by responding to an email from the Office of Regulatory Affairs. If you do not respond, your project will be considered completed.

Sincerely,

Signed on: 2020-01-30 16:33:00.000

Gail Kotulak, BS, CIP
IRB Administrator III
Office of Regulatory Affairs

Data Analysis Methods

Data were imported into the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics, including frequencies and percentages, were used to describe the characteristics of the sample and the responses. Since the sample size was small and the data were not normally distributed, we used the Mann–Whitney U test to compare differences between the two groups (Smalheiser, 2017).

Chapter 4 : Results

Respondents' Demographic Characteristics

Table 2: Demographic characteristics of respondents (N=40)

Variable	Frequency	Percentage
Age group (N=40)		
• 18-20	7	17.5
• 21-23	32	80
• 24-26	1	2.5
Year of study (N=39)		
• First year	32	82.1
• Second year	4	10.3
• Third year	3	7.7
Training (N=39)		
• None	17	43.6
• One	14	35.9
• Two	7	17.9
• Three	1	2.6
Ambulance location (N=39)		
• Jamarat bridge	12	30.8
• Mina	26	66.7
• Arfa	1	2.6

Table 2 summarizes the demographic characteristics of the respondents. The vast majority were aged between 21-23 (80%). Few were aged between 18-20 (17.5%), and only one respondent was aged between 24-26 (2.5%). Over 80 percent of the respondents participated in the Hajj clinical training after their first year in the EMS program. Only seven respondents (18 %) were in their second or third year of the EMS program.

A significant number of respondents (n = 17, 43.6 %) indicated that over the last two years they had not attended any training related to disaster management and preparedness; 14 respondents (35.9 %) reported that they had participated in one training about disaster management and preparedness in the last two years, seven respondents (17.9 %) indicated that they had attended two training about disaster management and preparedness in the last two years, and only 1 respondent (2.6%) had attended three training sessions related to disaster management and preparedness in the last two years.

The overwhelming majority of respondents (n=26, 66.7%) were assigned to work in the ambulance stationed in Mina; 12 respondents (30.8%) were assigned to work in the ambulance stationed in Jamarat bridge, and only one respondent (2.6%) was assigned to work in the ambulance stationed in Arfa.

Paramedics Students' Perceived Level of Preparedness to Respond to Mass Gathering Disasters

Table 3: Paramedics students' awareness of their roles and responsibilities within the Saudi Red Crescent Authority during the Hajj of 2019 (N=40)

Questions	Strongly Disagree% (n)	Disagree % (n)	Agree % (n)	Strongly Agree% (n)	Total agree % (n)	Total disagree % (n)	Missing responses% (n)
I knew the limits of my knowledge, skills and authority as a paramedic student during Hajj of 2019.	2.5 (1)	15 (6)	30 (12)	50 (20)	80 (32)	17.5 (7)	2.5 (1)
I would likely perform skills or procedures outside my scope of practice if needed during Hajj of 2019.	22.5 (9)	22.5 (9)	27.5 (11)	25 (10)	52.5 (21)	45 (18)	2.5 (1)

Table 3 summarizes the responses to selected questions regarding students' awareness of their roles and responsibilities within the Saudi Red Crescent Authority during the Hajj of 2019. Some survey respondents (n = 7, 17.5%) indicated that they did not know the limits of their knowledge, skills, and authority, whereas 80 percent of the respondents knew the limits of their knowledge, skills, and authority during their clinical practice in Hajj of 2019. Moreover, the majority of the paramedic students (n=21, 52.5%) reported that, if needed, they may perform procedures that are outside the scope of their practice.

Table 4: Awareness and training on the Saudi Red Crescent Authority response plan during Hajj of 2019 (N=40)

Questions	Strongly Disagree % (n)	Disagree % (n)	Agree % (n)	Strongly Agree % (n)	Total agree % (n)	Total disagree % (n)	Missing responses % (n)
I was aware of existing Saudi Red Crescent Authority's disaster response plans during Hajj of 2019.	27.5 (11)	17.5 (7)	30 (12)	22.5 (9)	52.5 (21)	45 (18)	2.5 (1)
I received training on the Saudi Red Crescent Authority's disaster response protocol before Hajj of 2019.	40 (16)	30 (12)	20 (8)	10 (4)	30 (12)	60 (28)	0
I was aware of the triage protocols used by the Saudi Red Crescent Authority during Hajj of 2019.	25 (10)	20 (8)	37.5 (15)	17.5 (7)	55 (22)	45 (18)	0
I received training on the Saudi Red Crescent Authority's triage protocols during Hajj of 2019.	47.5 (19)	17.5 (7)	17.5 (7)	15 (6)	32.5 (13)	65 (26)	2.5 (1)

Table 4 summarizes the responses to selected questions regarding awareness and training on the Saudi Red Crescent Authority response plan. The vast majority of respondents (n=21, 52.5

%) were aware of existing Saudi Red Crescent Authority's disaster response plans during Hajj of 2019. However, only 12 respondents (30%) received training in the Saudi Red Crescent Authority's disaster response plans. Over half of the respondents (n=22, 55%) were aware of the triage protocols used by the Saudi Red Crescent Authority. However, the majority (n= 26, 65%) received no training in the triage protocols adopted by the Saudi Red Crescent Authority.

Table 5: Paramedics students' perceived level of preparedness for disasters during Hajj of 2019 (N=40)

Questions	Strongly Disagree % (n)	Disagree % (n)	Agree % (n)	Strongly Agree % (n)	Total agree % (n)	Total disagree % (n)	Missing responses % (n)
As a paramedic student, I felt confident to conduct mass casualty triage during Hajj of 2019.	7.5 (3)	17.5 (7)	47.5 (19)	25 (10)	72.5 (29)	25 (10)	2.5 (1)
As a paramedic student, I felt confident to respond to Hajj-related disasters (e.g. stampede, terror, fire, influenza outbreak, etc.) during Hajj of 2019.	15 (6)	17.5 (7)	32.5 (13)	32.5 (13)	65 (26)	32.5 (13)	2.5 (1)
As a paramedic student, I felt confident to care for crash	15 (6)	10 (4)	27.5 (11)	45 (18)	72.5 (29)	25 (10)	2.5 (1)

injuries during Hajj of 2019.								
As a paramedic student, I felt confident to care for burn and blast injuries during Hajj of 2019.	10 (4)	10 (4)	37.5 (15)	37.5 (15)	75 (30)	20 (8)	5 (2)	
As a paramedic student, I felt confident to care for chemical injuries attacks during Hajj of 2019.	15 (6)	12.5 (5)	35 (14)	35 (14)	70 (28)	27.5 (11)	2.5 (1)	
As a paramedic student, I felt confident to recognize the signs and symptoms of infection diseases during Hajj of 2019.	(4)	10	5 (3)	7.	0 (16)	4	0 (16)	4
						8	5 (7)	17.
							(1)	2.5
As a paramedic student, I felt confident to wear the appropriate PPE during Hajj of 2019.	5 (2)	12.5 (5)	20 (8)	60 (24)	80 (32)	17.5 (7)	2.5 (1)	

Table 5 summarizes the responses to selected questions regarding students' preparedness to respond to disasters during the Hajj of 2019. The overwhelming majority of the paramedic

students (n=29, 72.5%) felt confident to conduct mass casualty triage, only ten paramedic students (25%) did not feel confident to conduct mass casualty triage. A large number of the students (n=26, 65%) indicated that they were confident to respond effectively to Hajj-related disasters. To be more specific, we asked the students about their preparedness to respond to crush injuries. Although 25 percent did not feel confident to care for a patient with crush injuries, over half of the students felt confident to care for crash injuries during the Hajj of 2019 (n= 29, 72.5%). Also, the vast majority of the respondents felt confident to care for burn and chemical injuries (75 % and 70%, respectively).

The significant majority of the respondents (n=32, 80%) felt confident to recognize the signs and symptoms of infectious diseases, and only seven respondents (17.5%) indicated that they were not confident to recognize the signs and symptoms of infectious diseases during the Hajj of 2019. Additionally, eighty percent of the respondents felt confident to wear the appropriate PPE during the Hajj of 2019.

Implications for Practice

To determine if there is a need to recommend a change in the current practice with respect to the timing of EMS student's clinical experience at the Hajj, we tested for a possible correlation between year of study and level of preparedness based on their perceived confidence to respond for disasters during the Hajj of 2019. To achieve this, we combined second and third year students into one group (group 2) and compared them to first year students (group 1). A Mann-Whitney U test was conducted to determine whether there was a difference between the two groups in their level of preparedness during the Hajj of 2019. Results of that analysis indicated that there was no statistically significant difference between the two groups. Thus, the correlation was not significant ($z = -1.26$, $P > .05$). Group 1 had an average rank of 21.08, while group 2 had an average rank of

15.07 (Figures 3 & 4). Additionally, we tested for a possible correlation between students who did not receive any training related to disaster management and preparedness (group 1) and students who received training over the last two years (group 2). Results of that analysis indicated that there was no statistically significant difference between the two groups ($z = -.58$, $P > .05$). Group 1 had an average rank of 18.79, while group 2 had an average rank of 20.93 (Figures 5 & 6).

Figure 3

Ranks

		Groups	N	Mean Rank	Sum of Ranks
core	totals	1	32	21.08	674.50
		2	7	15.07	105.50
	al	Tot	39		

Figure 4

Test Statistics

	totalscore
Mann-Whitney U	77.500
Wilcoxon W	105.500
Z	-.1264
Asymp. Sig. (2-tailed)	.206
Exact Sig. [2*(1-tailed Sig.)]	.212 ^b

Figure 5

Ranks					
		training1	N	Mean Rank	Sum of Ranks
core	totals	1	17	18.79	319.50
		2	22	20.93	460.50
		Total	39		

Figure 6

Test Statistics^a		totalscore
Mann-Whitney U		166.500
Wilcoxon W		319.500
Z		-.581
Asymp. Sig. (2-tailed)		.561
Exact Sig. [2*(1-tailed Sig.)]		.566 ^b

Chapter 5: Discussion

Recently, there have been discussions concerning medical, nursing, and EMS undergraduate curriculum, which lacks training on disaster preparedness and response (Alrazeeni, 2015; Schmidt et al., 2011; Sinha, Pal, Kasar, Tiwari, & Sharma, 2008; Usher & Mayner, 2011). Therefore, this study explored paramedics students' level of preparedness to respond to Hajj-related disasters. Indeed, attending Hajj and caring for patients is an invaluable learning experience. Hence, examining the current level of preparedness of the paramedic students who are providing emergency medical services at Hajj is vital to provide us more insight into how to improve this educational experience.

Out of the 40 undergraduate paramedic students, about 80 percent were aged between 21-23. This is because the government universities in Saudi Arabia only accept students who applied immediately after high school. Additionally, as expected, the vast majority of the students just completed their first year of the EMS program before attending the Hajj of 2019. The results of the survey also indicate that a significant number of students were stationed at Jamarat bridge and Mina.

A large number of students reported receiving no training about disaster preparedness and response before attending the Hajj. It is important to be aware of what this means in terms of disaster preparedness and response. The two locations where students were assigned are both associated with multiple stampedes and fire accidents over the last two decades (Alaska et al., 2017; Ngai, Burkle, Hsu, & Hsu, 2009; Salamati & Rahimi-Movaghar, 2016; Shujaa & Alhamid, 2015). These students assisted the Saudi Red Crescent Authority in providing emergency medical services and prehospital care. It is important to note that the Saudi Red Crescent Authority is the only government agency that provides prehospital care. Therefore, it is very likely that the

paramedic students find themselves in the front line of disaster response. However, because of the dearth of research on Saudi EMS response to previous Hajj disasters, we cannot draw conclusions, but we can question levels of preparedness.

The vast majority of the paramedic students indicated that they knew the limits of their knowledge, skills, and authority during their experience of providing patient care at the Hajj of 2019. However, surprisingly, over half of the students reported that they would likely perform skills or procedures outside their scope of practice if needed during the Hajj of 2019. That is, the majority of the students are likely to bend the rules to save people's lives. There are several reasons why they might perform procedures outside their scope of practice. For the most part, it is because the students are unaware of their roles and responsibilities within the Saudi Red Crescent Authority if a disaster occurred. Also, it might be because the students lack adequate supervision during their paramedic clinical training at Hajj. It is essential to recognize the danger of having first responders that are willing to exceed their scope of practice and realize the urgency to train the paramedic students caring for patients at Hajj on how to recognize and prevent situations that may exceed their scope.

The results of the survey indicate that the respondents have confidence in their core clinical skills. A large number of students felt confident to care for crash injuries, burn and blast injuries, and chemical injuries. Moreover, the vast majority of the paramedic students felt confident to recognize the signs and symptoms of infectious diseases and wear the appropriate PPE. Dasgupta et al. (2012) asserted that field triage and knowledge of the roles are the most vital skills that EMS personnel need to master to manage mass casualty incidents successfully. Moreover, Catlett et al. (2011) indicate that mass-casualty triage is one of the primary responsibilities of EMS personnel in mass casualty incidents. Over half of the paramedic students indicated that they were aware of

the existing Saudi Red Crescent Authority's disaster response plans and triage protocol. However, the great majority of the students have not been provided training on the disaster response plans and triage protocol adopted by the Saudi Red Crescent Authority. Surprisingly, however, over seventy percent of the students felt confident to conduct mass casualty triage. This might be due to the quality of the EMS program at PSCEMS. Nonetheless, one future research strategy that can provide us with a better understanding of these results is to compare the students with disaster response experience and the students without disaster response experience.

Our study revealed that the paramedic students are not equipped with essential knowledge and skills for disaster preparedness and response due to lack of training. These findings are congruent with the results of Alrazeeni (2015), who found that Saudi EMS students exhibited weak to moderate levels of disaster preparedness due to the absence of disaster preparedness and response content in their undergraduate programs. Moreover, Sinha et al. (2009) reported a low level of disaster preparedness among undergraduate medical students due to lack of training.

Despite the fact that the paramedic students reported high confidence in their core clinical skills during the Hajj of 2019, providing appropriate care during a disaster can be challenging even to the experienced healthcare provider. Mainly because healthcare providers find themselves in a challenging and unpredictable environment. Lund, Gutman, and Turris (2011) suggest that healthcare providers, in general, lack experience in disaster preparedness. Therefore, training is essential to improve the knowledge gap in disaster preparedness and response among the students. Also, the students must be aware of what is expected from them if a disaster occurs during their clinical practice. This step is essential to prevent the paramedic students from exceeding their legal professional scope. We call upon the Saudi Red Crescent Authority and King Saud University to recognize the importance of specifying skills and procedures that the paramedic students are

required to perform to fulfill their roles and responsibilities during the Hajj training. In addition, the paramedic students should be educated on the legal repercussions of performing a task outside their scope of practice.

The results of the study indicate that there is no significant difference between first year students and second year and above students in terms of their perceived level of preparedness. Moreover, the results suggest that there is no significant difference between students who did receive training and those who did not receive training in terms of their perceived level of preparedness. Given the fact that the correlation was not significant, we cannot recommend a change in the current practice with respect to the timing of EMS student's clinical experience at the Hajj. Nonetheless, it critical to understand the meaning of the results. The results of this study show that paramedic students have confidence in their clinical skills. However, the students reported a lack of training on triage and response plans. This might highlight the need to train the students before attending the Hajj. In terms of training, the students who received training still exhibited weak to moderate levels of perceived preparedness. This might indicate insufficient training materials. Also, it could be due to the study sample being unequal and too small.

Although the vast majority of the students are stationed in locations that have been historically associated with stampede and fire incidents, it is apparent that the students were not aware of their roles and responsibilities in disaster preparedness and response. Due to limited experience in disaster preparedness and response, paramedic students need to be better educated in the areas of emergency preparedness. As stated earlier, mass-casualty triage, on-scene treatment, communication, and transportations are special skills that are essential to ensure effective disaster response. This has been documented in both the peer-reviewed and general literature "Emergency Medical Services Role in disaster response." Therefore, it is necessary to ensure that the paramedic

students have adequate training before attending the Hajj season. It is crucial to identify the skills that the Saudi Red Crescent Authority expects from the students to incorporate them into the EMS program curriculum.

Recommendations

Given that there is limited research on Saudi paramedic students training at the Hajj, this study made an attempt to fill the research gaps by providing insights into the paramedic students' perceived level of preparedness before their clinical training at Hajj. Our results suggest that a change in the current practice concerning the timing of EMS student's clinical experience at the Hajj might not be significant enough to make a difference. Moreover, this study demonstrated that paramedic students at King Saud University need disaster preparedness and response training. Hence, based on our findings, we recommend the following:

- Prince Sultan bin Abdul Aziz College for Emergency Medical Services should consider integrating disaster preparedness and response content into their curriculum early in the program.
- Prince Sultan bin Abdul Aziz College for Emergency Medical Services and Saudi Red Crescent should discuss and identify the skills, roles, and responsibilities that are required from the students when responding to a disaster.
- Paramedic students should be involved in the Saudi Red Crescent disaster exercises in preparation for the Hajj.
- Paramedic students should receive training on the Saudi Red Crescent triage protocols.
- This study provided little information about Prince Sultan bin Abdul Aziz College for Emergency Medical Services paramedic students. Therefore, we recommend further research that examines the level of preparedness among paramedic students who previously

participated in disaster response and compare them with our result to gain a better understanding.

Conclusion

To our knowledge, this is the first study exploring paramedic students' perceived level of preparedness for disaster response in Hajj. Regardless of the limitations, this study has shown that Prince Sultan bin Abdul Aziz College for Emergency Medical Services students are not provided with essential knowledge and skills for disaster preparedness and response during their clinical training at Hajj. Moreover, we have shown that the students who are sent to Hajj early in the program and the students who are sent to Hajj late in the program were not aware of their roles and responsibilities during clinical training at the Hajj of 2019. Our results on disaster preparedness and response are broadly consistent with current literature on the level of disaster preparedness and response among undergraduate medical, nursing, and other allied health students. Evaluating the current disaster preparedness and response content is essential to ensure paramedic students are equipped with the knowledge and skills needed before their training at the Hajj. Also, providing the paramedic students with training on disaster preparedness and response early in the program is recommended. However, future investigations are necessary to validate the kinds of conclusions that can be drawn from this study.

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