Evaluation of Hospital Disaster Preparedness in Makkah

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Abstract:

Introduction: Muslims all throughout the world consider Makkah to be a sacred city. With an estimated population of 9.03 million out of Saudi Arabia's total population of 34.2 million in 2019, Makkah is a metropolis in the western part of the country. The Saudi government has spent a significant amount of money preventing risks around the Holy Mosque from the standpoint of emergency and disaster management. As part of its overarching duties for the safety and security of the nation, the Saudi government, as represented by the MOH, is the last arbiter in controlling the health repercussions of disaster occurrences. The need for healthcare organisations to create all-hazard disaster preparedness is supported by their susceptibility to dangers. Planning for hospital disaster preparedness is an integral and vital component of any emergency management system that calls for collaboration between numerous outside entities. In order for the Makkah hospitals to be successful and well-prepared, this study set out to assess the level of hospital disaster preparedness.

Methods: Five Likert scales were used in the questionnaire's design. Three indicators were distinguished: structural, non-structural, and human resources. The study evaluated the disaster preparedness for each hospital's disaster preparedness indicators using a sample of 7 hospitals. To analyse the effectiveness of hospital reforms, a tool was created.

Results: The HDP level in the hospitals surveyed was weak. More action is needed for disaster mitigation, including prevention and planning for emergency and evacuation situations at the structural, non-structural, and human resource levels.

Conclusions: Data indicate that the hospitals included in this study lack management and training during disasters and exhibit indicators of disaster preparedness. The study thus

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focused on hospital disaster readiness. Hospitals need to understand the importance of disaster readiness and that the majority of hospital disaster preparedness is already incorporated into the hospital system.

Keywords: Hospital Disaster Preparedness Indicators (HDPI), Hospital Disaster Preparedness (HDP), Disaster, Makkah.

Introduction

Preface:

Muslims all throughout the world consider Makkah to be a sacred city. With an estimated population of 9.03 million out of Saudi Arabia's total population of 34.2 million in 2019, Makkah City is located in the western part of the country (General Authority for Statistics, 2019). The Saudi government has spent a significant amount of money preventing risks around the Holy Mosque from the standpoint of emergency and disaster management.

The movement of such a large number of people poses considerable obstacles and raises the risks associated with many hazards, particularly crowding and gathering in one location, particularly during the pilgrimage season and the holy month of Ramadan. Disasters have put a strain on the healthcare system despite crucial emergency planning measures to provide visitors and residents of Makkah with the best possible service.

It is economically desirable to make hospitals and other medical facilities disaster-resistant. It is also a crucial component of life's moral, social, and ethical aspects. As a result, protecting our hospitals from the minor disaster would be much more expensive than preventing natural disaster harm to them (WHO, 2009).

As part of its overall obligations for the security and safety of the nation, the Saudi government, as represented by the MOH, is the crucial final authority in handling health effects

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from catastrophic occurrences. The need for healthcare organizations to create all-hazard disaster preparedness is supported by their susceptibility to dangers. Planning for hospital disaster preparedness is a fundamental component of any emergency management system that calls for collaboration between numerous external entities. To address all potential crises, such planning should be designed with a thorough all-hazards program. In order to evaluate the hospital's connectedness and the ability of the region to function as a unified system through local calamities, such plans should be practiced as part of local preparedness (Hick. et al., 2012). Where COVID-19 was initially found in Saudi Arabia, in the Eastern Province, the frequency of infectious diseases in such populated areas is a different worry. The fifth case was then added by the Ministry of Health as being unique and occurring in a Makkah hospital (Saudigazette, 2020). Hospitals draught their own emergency plans, which must adhere to the Civil Defence's safety standards (Ministry of Interior, Kingdom of Saudi Arabia, 2017). The MOH's Emergency and Medical Services division, which includes Civil Defence representatives from the Makkah area, is in charge of monitoring disaster preparations and ensuring that they adhere to Civil Defence specifications. These standards are not all-inclusive guidelines that cover processes with all hazards; rather, they concentrate on safety precautions, particularly those against fire. Additionally, hospitals should have their emergency preparedness plans certified by the Joint Commission or the Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI, Saudi Arabia) or by the Joint Commission (Oakbrook Terrace, Illinois, USA). There is no regionally consolidated norm as a result of hospitals complying to civil defence safety standards that solely focus on specific aspects of disaster readiness while also being recognized locally and globally under different standards.

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According to the literature, one research that looked at hospitals' disaster preparedness plans in Makkah, the Holy City, was conducted by (Al-Shareef et al., 2016). This study showed that there is a lot of potential for improvement in the majority of hospital emergency operations plans, particularly: updating the plan and doing multi-agency and hospital training sessions more frequently. This study also uncovered a serious flaw in having comprehensive written plans to expand Makkah hospitals' capacity during disasters and brought attention to the hospitals that had an Emergency Operations Plan. The study's findings support those obtained by Beyramijam et al. (2019), and they also support the finding from Parsaei et al. (2017) that they had disaster readiness that was comparable to a low level. It is therefore possible to boost the preparation of the hospitals in Iran by developing and conducting effective educational programs that will raise the hospital's level scores. The findings from the aforementioned studies thus provide credence to the idea that it is imperative to identify the elements required for hospital disaster plans as well as those that can be used in education, readiness, planning, and future study.

The evaluation of disaster preparedness for mass casualty occurrences was covered in a number of studies. According to the findings of the Ul-Haq et al. (2019) study, hospitals are not adequately prepared for disasters and the handling of large numbers of casualties, so it is important to implement development initiatives that are in line with local vulnerabilities. Bin Shalhoub, Khan, and Alaska (2017) also reported on the evaluation of disaster preparedness for mass casualty incidents in hospitals and came to the conclusion that while each hospital included in the study had a plan for HDP, some hospitals had parts of the plan that were incomplete or missing altogether. The outcomes also demonstrated that the majority of hospital plans under study do not sufficiently address the "all-hazards"

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approach. Based on the findings of these two studies, the researcher is of the opinion that suitable response capacity methods should be included in disaster plans, depending on how the surge is calculated and how full the hospital is at the time of the emergency.

Research Aim and Objectives

The aim of this study is to evaluate the hospital disaster preparedness that allows the Makkah hospitals to be successfully well prepared. This aim is achieved through the following objectives:

- To examine structure indicators for hospital disaster preparedness.
- To disclose non-structure indicators for hospital disaster preparedness.
- To evaluate human resource indicators for hospital disaster preparedness.

Methodology and Data Collection

This study is a quantitative research method that used a cross-sectional technique to collect and analyze data with the aim of providing a clear picture of the object under study to be drawn conclusions. Hospitals everywhere have been trying to be prepared for disaster for a long time. Most hospitals have a great opportunity to minimize losses during hospital disaster preparedness indicators (HDPI). The indicators include structure, non-structure, and human resources. The population of this study is seven-hospitals in Makkah city is 14,400. The sample size in this study consisted of all seven-government hospitals in Makkah city. The hospitals' number of beds respectively is King Abdul Aziz Hospital/ 300, Maternity Hospital/ 342, King Faisal Hospital/ 300, Al-Noor Hospital/ 500, KAMC/ 550, and Security forces Hospital/ 200, Hera General Hospital/288. So, ending up with a sample size of a total of 7 hospitals according to the sample size calculator is 328 samples. The selection of hospitals

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represents a convenience sample of all government hospitals in Makkah. An online questionnaire was distributed due to the Corona covid-19 pandemic. The data was collected between the periods 09/08/2021 to 03/11/2021. A five-point Likert scale (Strongly Agree, Agree, Neutral, Disagree, and Strongly disagree) is used. It can be in contact with the HR dept. At all hospitals, explain the procedure of the study to the head of HR and then send a link to the electronic questionnaire to all staff. Each participant completed the survey anonymously. All analyses were performed with SPSS. Descriptive statistics are presented as frequency and constituent ratio, mean and standard deviation (SD). Also, the chi-square test of independence is a one-way analysis of variance (ANOVA test). The level of statistical significance was set at the classic level of P = 0.05.

Literature Review.

Preface:

A hazard is a possible source of harm. Events, circumstances, or materials can lead to hazards when their nature would allow them, even just theoretically, to cause harm to health, property, life, or any other interest of value. Hazards can be divided in different ways. They can be categorized as natural, technological, anthropogenic, or any combination, therefore, such as in the condition of the natural phenomenon of wildfire becoming more harmful because changes in building practices or more usual due to human-made climate change. It can also be categorized as a health or safety hazard by the people that may be influenced and the seriousness of the associated risk.

Disaster Concept:

A maximal geophysical event that can result in a disaster is referred to as a disaster hazard (Wikipedia, 2020.). A disaster is the outcome of a significant breakdown in the relationship between humans and their environment, usually brought on by a sudden, serious incident or slow that requires extraordinary

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efforts from the affected population, frequently involving outside help or international charity. There are two basic categories of disasters: those manufactured or caused by humans and those caused by natural forces. The three main categories of human-caused disasters are technological disasters, complex emergencies, and disasters that do not result from natural calamities but take place in environments where people live, such as transportation disasters, dam breaks, and material shortages brought on by energy restrictions (Noji, 1996). A crane fell in the Holy Mosque in September 2015, causing a disaster that left 107 people dead and more than 230 others injured (BBC News, 2015).

By responding to crises and caring for numerous survivors until more help comes, hospitals play a key role in disaster management. Disaster preparedness has also been found to have a significant problem with caring for populations with chronic illnesses (Lapevi et al., 2019). Therefore, precise planning for all potential events and risks is necessary for an efficient reaction. For an all-hazards approach to training and education, all hazards must be identified, planned for, and improved upon in a single plan (Al Thobaity, Plummer, Innes, and Copnell, 2015).

Reduced confusion and congestion that frequently arise during disasters, either within hospitals or between healthcare practitioners, will be a result of a well-prepared healthcare system (Korman et al., 2019). Different types of disaster preparedness exist. One possibility is that the hospital has a robust disaster plan based on risk mitigation and vulnerability assessments (Ahayalimudin and Osman, 2016). However, hospitals differ from other institutions in terms of their disaster preparedness, particularly those with low resources (Powers and Daily, 2010). As a result, it is crucial that hospitals are adequately equipped with a disaster plan.

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A disaster management plan is a collection of policies, practices, interaction styles, job descriptions, and contingency plans that must be followed in the event of an incident in line with pre-set standards (Top, Gider, and Tas, 2010).

In this study, metrics and indicators of hospital preparedness were constructed by fusing the Hospital Safety Index's safety methodology with features of hospital vulnerability. The hospital's readiness has been the subject of a lot of writing. However, not all hospitals may be subject to the same acceptable norm. For all types of calamities, hospitals are available at various levels.

The Hospital Safety Index was created by the Pan American Health Organization and the WHO (PAHO and WHO, 2008). (HSI). It is a technique that offers a quick assessment of the hospital's ability to function normally in an emergency despite functional, structural, and human resource problems.

By identifying a hospital's safety index, the HSI is a crucial first step in prioritising improvements in hospital preparation. The ability of the hospital to handle major emergencies and disasters will be clear to decision-makers. This enables the long-term monitoring of hospital safety levels, the creation of appropriate processes and policies, the setting of priorities, the distribution of sufficient resources, and the implementation of upgrades to raise the level of HDP during disasters.

Structural Indicators of Save Hospital

The structural elements of health facilities are fundamental elements that define the overall safety of the building, such as foundations, beams, slabs, columns, load-bearing braces, walls, and trusses. In terms of hospital structural preparedness, the vulnerability element is relevant to the building construction in terms of fire safety and hazard mapping,

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earthquake, and space availability for emergency evacuation (Mulyasari et al., 2013).

Hospital Structure: The structural weakness of the hospital buildings must be examined with hazard maps prior it is built due to the actuality that hospital buildings are not near the bottom of a mountain at risk of landslide or at the border of a slope. The buildings are not near creeks, rivers, or bodies of water that could erode their basis. (Mulyasari et al., 2013).

Non-structural Indicators of Save Hospital

The non-structural elements are all other components that do not form parts of the resistance systems that allow the facility to operate. These include architectural elements, content and equipment, services, or lifelines. In the state of hospitals, nearly 80% of the total cost of the facility is made up of non-structural components. There are fundamental documents that should be available in connection with the non-structural indicators of safe hospitals, and these include (WHO, 2009).

- **Architectural and Furnishings**

It has elements like divider walls, ceilings, windows, and lighting setups. Additionally, it is made up of furniture and equipment, which includes things like office furniture, mechanical equipment, medical and laboratory equipment, and containers for medications (Hick et al., 2004).

Safety of The Roofing and Ceilings: There are different kinds of roofing materials. They must be simple to weld, fastened securely, and rivet. For example, a ceiling made of concrete must be cracked and leaks free (WHO, 2009).

Safety of Doors and Windows: Fire-resistant and windproof doors are used. Electrical doors are manually operated in the event of a power failure so that it can be quickly exited. Windows must have sun and wind protection devices. So windows should have security devices for Patient Safety. (WHO, 2009).

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Safety of Walls, Divisions, and Partitions: It is recommended to use external fire-resistant walls and room partitions. Any element such as hanging lights must be established and fixed on walls. All electrical wires and cables must also be suitably fixed and installed. (WHO, 2009).

- **Safety of Lifeline Facilities**

In any health institution, sanitation and water, electric power, treatment of waste, and disposal are essential lifelines for continuous operations. So, specific protocols and procedures through a disaster must be prepared (Hick et al., 2004).

Electrical Tools System: The healthcare organization must have an alternative source of power in the event of a power failure, such as a large-capacity generator that can meet the additional demand. This generator must be in a secure and safe location with appropriate backup for the operating room and intensive care. (WHO, 2009).

Communication Tools System: The devices and tools used for communication must be safely secured and installed well. Any external communication tools must be fixed under the ground (WHO, 2009).

Water Supply Tools System: The hospital's three-day water needs must be available in the event of a disaster by a secure water tank. This water storage must be safe and secure. (WHO, 2009).

Fire Suppression Tools System: The fire alarm system is constantly monitored by accredited fire agencies. A good fire alarm system is essential to an immediate response to a fire. In coordination with the local fire department, proper instructions regarding the location of fire fighting equipment and fire detection devices must be made. (WHO, 2009).

Emergency Exit System: Well-lit exit signs should be used in a unique color with a reliable source. In addition, the

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lighting source was estimated by the general utility electric service. (WHO, 2009).

Heating, Ventilation, and Air conditioning (HVAC) Systems in Critical Areas: it should be safe and fixed. Such as to ensure safety, suitable bracing can be done for ducts (WHO, 2009).

Human Resource Indicators of Save Hospital

The components of human resources include disaster readiness for medical and support staff, as demonstrated by the availability of training and education for emergency service, and the implementation of disaster drills for hospital employees, staff, and patients to get ready for hazardous situations (Fallah-Aliabadi et al., 2020).

Organizing of Hospital Disaster Committees and Emergency Operation Centre: The Crisis Management Committee's team leads to advising the Executive Committee regarding crisis/emergency/disaster management (Fallah-Aliabadi et al., 2020).

Capability Building of personnel: training health care workers in First Aid and BLS. Also, training hospital managers in the Hospital Emergency Incident Command System (HEICS) (Fallah-Aliabadi et al., 2020).

Drills and Exercises: Conduct fire drills at least twice a year and exercises or simulation drills at least once yearly (Fallah-Aliabadi et al., 2020).

Chapter Summary

Hospitals worldwide are trying to stay prepared for disasters in the long term. Most hospitals have an excellent chance to minimize losses during Hospital Disaster Preparedness Indicators. HDPI permits the implementation of various techniques and tools that assist in solving different issues by eliminating sources of mess in other hospital areas. There is much writing about hospital readiness; however, there is no accepted standard that applies to all hospitals - because there are

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various levels of hospitals in different parts of the world - and for each disaster.

Methodology.

Preface:

Hospitals around the world are trying to stay prepared for disasters in the long-term duration. Most hospitals have an excellent opportunity to minimize losses during Hospital Disaster Preparedness Indicators (HDPI), such as structural indicators of hospital preparedness, non-structure indicators for hospital disasters, and human resources. These indicators allow the implementation of various techniques and tools that help solve different problems by eliminating the source of a mess in different hospital areas.

As indicated earlier, the current study aims to investigate the hospital disaster preparedness that enables Makkah hospitals to be successful and well prepared when it comes to disaster management. Successful attainment of this goal required effective and reliable study methods and data collection and analysis techniques. This section of the research paper critically evaluates the research approach, design, and methods used in collecting and analysing data regarding disaster preparedness among the Makkah hospitals.

Data Collection

This study used a quantitative approach whereby data was collected via anonymous online questionnaires on random samples distributed with the assistance of the HR department in hospitals. The data was collected between the periods 09/08/2021 to 03/11/2021. Data on the structural indicators of hospital preparedness, non-structure indicators for hospital disasters, and human resources were collected using a quantitative approach to determine the most suitable answers to the research questions.

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In 2021, this study was carried out in Saudi Arabia's MAKKAH. In order to collect the necessary data for this investigation, a questionnaire was sent to the hospitals. Socio-demographic information and hospital disaster readiness indicators made up the bulk of the questionnaire created for this study. A Likert scale with five possible responses was employed: Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree. If the overall indicator was utilized in the hospital, the questionnaire was created to allow respondents to answer follow-up questions.

Population and Sample

The sample size in this study consisted of all seven-government hospitals in Makkah city. The hospitals beds number are King Abdul Aziz Hospital/ 300, Maternity Hospital/ 342, King Faisal Hospital/ 300, Al-Noor Hospital/ 500, KAMC/ 550, Security forces Hospital/ 200, and Hera General Hospital/288. The population of this study is seven-hospitals in Makkah city, and the total number of participants is 337. Therefore, ending up with a sample size of six hospitals according to the sample size calculator is 328 samples. An anonymous questionnaire on random samples was distributed with the assistance of the HR department in hospitals; to enable the assessment of hospital disaster preparedness.

Data Analysis

The data were codified, and analyses were performed with SPSS version 27 statistics. Frequency analyses, basic descriptive statistics, and constituent ratio analysis, mean and standard deviation (SD), the chi-square test of independence, and one-way analysis of variance (ANOVA test). The level of statistical significance was set at the normal level of $P = 0.05$.

Ethical Consideration

Given that the study used human participants, various ethical issues were inevitable. Therefore, one of the ethical

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considerations was the privacy and confidentiality of the information provided by the participants. To address such issues, the researcher sent consent forms alongside the questionnaires, requesting each participant to participate in the study while reassuring them of the confidentiality and privacy of the information. Further, before the study, the researcher contacted the HR departments in all hospitals to explain the study procedure to the head of HR and then send a link to the electronic questionnaire to all staff. The IRB number for all hospitals is H-02-K-076-0821-537, and the issue date is 09/08/2021. The other IRB number is specific for Security Forces Hospital because they have their IRB, which is 0436-150821 and the date is 23/08/2021.

Data Security

For data security, maintain the confidentiality of the information collected from an online questionnaire in a database with two-factor authentication.

Result.

Introduction:

For each indicator of hospital disaster preparedness in this study, a score is an average for all responses received; accordingly, the level of preparedness in each indicator of hospital disaster preparedness is evaluated.

Results:

Socio-Demographic Characteristics for All Participants

The online questionnaires were distributed to health care workers in seven hospitals in Makkah in Saudi Arabia. 328 healthcare providers completed and submitted the online questionnaires composed of 112 females (33%) and 224 males (66%). The ages of individuals vary between 18 and 55 years, with a mean of 0.9 ± 4.8 years. It was found that 42.0% (n = 141) of the participants were between 26-35 years of age. It was found that 47.0% (n = 158) of the participants had above 10

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years of work experience. Most of the participants were clinical health care workers (52%). Many different hospitals participated in this study. The majority were in King Abdullah Medical City (29.5%), followed by Hera General Hospital (15.5%) the last one was King Faisal Hospital (6.0%). Table 1 presents the socio-demographic data for the study participants. Table 1 presents the socio-demographic data for the study participants.

Table 1. Socio-Demographic characteristics of participants

Table 1. Socio-Demographic characteristics of participants (n=328)	**N**	**Frequency %**
Gender		
Female	112	33.3
Male	224	66.7
Age		
18-25	3	0.9
26-35	141	42.0
35-45	120	35.7
45-55	56	16.7
>55	16	4.8
Work experience		
<1year	9	2.7
2-5years	53	15.8
5-10years	116	34.5
>10years	158	47.0
Health care workers		
Clinical	175	52.1
Non-clinical	161	47.9
Your organization		
King Abdullah medical city	99	29.5
King Abdul Aziz Hospital	35	10.4
King Faisal Hospital	20	6.0
Al-Noor specialist Hospital	47	14.0

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Maternity Hospital	35	10.4
Hera General Hospital	52	15.5
Security force Hospital	48	14.3

The findings focus on hospital responses regarding various preparedness indicators

Hospital Disaster Preparedness Indicators (Structural)

Regarding structural preparedness, the vulnerability element is relevant to the lowest rank score (slight effectiveness) of ramps are present in appropriate areas for moving bed patients and for use by people with disabilities was 6 (97.63). The rank score of 3 (114.14) for A set of as-built construction drawings and Complete with necessary permits and readily available for reference purposes (moderate effectiveness), and the rank score is 1 (154.56) for Construction materials thoroughly checked for conformance to specifications (highest effectiveness). Also, the P-value $0.001 < \alpha = 0.05$. There is significance in all items through the hospitals so far. Their effect on hospital disaster preparedness is a concern. (Table2).

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Table2: Hospital disaster preparedness (Structural indicator)

Items			STRUCTURAL					% of agreement	rank	Chi-square	
			Strongly disagree	Disagree	Neutral	Agree	Strongly agree			X^2	P-value
1	No major structural cracks on structural elements. The minor cracks determined to be localized and repairable.	N	14	41	66	124	91	74.11%	4	108.792	<0.001*
		%	4.2%	12.2%	19.6%	36.9%	27.1%				
2	Structures built with adequate technical competence and fire-resistance	N	18	35	75	122	86	73.27%	5	102.304	<0.001*
		%	5.4%	10.4%	22.3%	36.3%	25.6%				
3	Cabinets, shelves, appliances, and equipment are properly anchored	N	14	42	62	143	75	73.27%	2	138.375	<0.001*
		%	4.2%	12.5%	18.5%	42.6%	22.3%				
4	Ramps are present in appropriate areas for moving bed patients and for use by people with disabilities	N	19	41	65	123	88	73.10%	6	97.631	<0.001*
		%	5.7%	12.2%	19.3%	36.6%	26.2%				
5	A set of as-built construction drawings and	N	10	31	98	108	89	73.99%	3	114.149	<0.001*
		%	3.0%	9.2%	29.2%	32.1%	26.5%				

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	Complete with necessary permits and readily available for reference purposes										
6	**Construction materials thoroughly checked for conformance to specifications**	**N**	10	25	124	113	64	71.67%	1	154.565	<0.001 *
		%	3.0%	7.4%	36.9%	33.6%	19.0%				

Table 3 shows that 20 out of 336 participants have a weak score of 6%, while 149 out of 336 participants have an average score of 44%. However, 167 out of 336 participants scored high 49%. The mean score is significant at the .05 level ($p<0.01$). This score indicates an apparent statistical difference in the structural indicator. All scores ranged from 6-30.

Table3: Score of Structural indicator

STRUCTURAL				**Score**	
		N	**%**	**Range**	**Mean± SD**
Weak		20	6.0	6-30.	21.970±50.98
Average		149	44.3		
High		167	49.7		
Total		336	100.0		
Chi-square	**X^2**	114.804			
	P-value	<0.001*			

Hospital Disaster Preparedness Indicators (non-Structural)

In terms of non-structural preparedness, the vulnerability element is always related to the lowest rank score (slight effectiveness) of equipment operational (boiler, air conditioning systems) was 5 (131.64). The rank score of 4 (176.44) for windows has features to secure the safety of the patient

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(moderate effectiveness) and rank score 1 (244.77) for the size of signs – clearly legible (highest effectiveness). Also, the P-value $0.001 < \alpha = 0.05$. There is significance in all items through the hospitals so far. Their effect on hospital disaster preparedness is a concern. (Table 4).

Table 4: Hospital disaster preparedness (Non-Structural indicators)

Items			NON-STRUCTURAL					% of agreement	rank	Chi-square	
			Strongly disagree	Disagree	Neutral	Agree	Strongly agree			X^2	P-value
1	Windows have features to secure the safety of the patient	N	9	21	72	143	91	77.02%	4	176.440	<0.001*
		%	2.7%	6.3%	21.4%	42.6%	27.1%				
2	Exit lights luminous with battery backup	N	8	21	59	136	112	79.23%	3	185.220	<0.001*
		%	2.4%	6.3%	17.6%	40.5%	33.3%				
3	A fire alarm system can be a combination of automatic and manual	N	7	11	67	141	110	80.00%	2	209.238	<0.001*
		%	2.1%	3.3%	19.9%	42.0%	32.7%				
4	Size of signs – clearly legible	N	7	17	40	143	129	82.02%	1	244.774	<0.001*
		%	2.1%	5.1%	11.9%	42.6%	38.4%				
5	Equipment operational at all times (boiler, air conditioning systems)	N	18	35	49	124	110	76.25%	5	131.649	<0.001*
		%	5.4%	10.4%	14.6%	36.9%	32.7%				

Table 5 shows that 16 out of 336 participants have a weak score of 5%, while 93 out of 336 participants have an average score of 27%. However, 227 out of 336 participants have a high score of 68%. The mean score is significant at the .05 level ($p<0.01$). This score indicates an apparent statistical difference in the non-structural indicator. All scores ranged from 5-25.

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Table 5: Score of non-Structural indicators

NON-STRUCTURAL				Score	
		N	%	Range	Mean± SD
Weak		16	4.8	5-25.	19.726±50.98
Average		93	27.7		
High		227	67.6		
Total		336	100.0		
Chi-square	X^2	203.589			
	P-value	<0.001*			

Hospital Disaster Preparedness Indicators (Human Resource)

In terms of human resource preparedness, the vulnerability element is relevant to the lowest rank score (slight effectiveness) of a crisis management committee with technical expertise was 4 (120.19), the rank score of 3 (185.99) for a hospital operations centre headed by a hospital emergency management coordinator (moderate effectiveness), rank score 1 (208.22) for BLs/ all health workers trained in basic life support (highest effectiveness). Also, the P-value $0.001 < \alpha = 0.05$. There is significance in all items through the hospitals and their effect on hospital disaster preparedness. (Table 6).

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Table 6: Hospital disaster preparedness (Human Resource indicators)

Items			HUMAN RESOURCE					% of agreement	rank	Chi-square	
			Strongly disagree	Disagree	Neutral	Agree	Strongly agree			X^2	P-value
1	A crisis management committee with technical expertise	N	16	28	76	124	92	74.76%	4	120.190	<0.001*
		%	4.8%	8.3%	22.6%	36.9%	27.4%				
2	A hospital operations center headed by a hospital emergency management coordinator	N	13	10	82	142	89	76.90%	3	185.994	<0.001*
		%	3.9%	3.0%	24.4%	42.3%	26.5%				
3	BLs/ All health workers trained in basic life support	N	11	19	45	129	132	80.95%	1	208.226	<0.001*
		%	3.3%	5.7%	13.4%	38.4%	39.3%				
4	conduct simulation drills or exercises on fire drills at least annually	N	14	19	46	140	117	79.46%	2	199.149	<0.001*
		%	4.2%	5.7%	13.7%	41.7%	34.8%				

Table 7 shows that 22 out of 336 participants have a weak score of 6%, while 85 out of 336 participants have an average score of 25%. However, 229 out of 336 participants have a high score of 68%. The mean score is significant at the .05 level ($p<0.01$). This score indicates an apparent statistical difference in the non-structural indicator. All scores ranged from 4-20.

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Table 7: Score of Human Resource indicator.

HUMAN RESOURCE				Score	
		N	%	Range	Mean± SD
Weak		22	6.5	4-20.	15.604±50.98
Average		85	25.3		
High		229	68.2		
Total		336	100.0		
Chi-square	X^2	201.054			
	P-value	<0.001*			

Hospital Preparedness for Disaster

Regarding preparedness for Disaster, the vulnerability element is related to the lowest rank score (slight effectiveness) for emergency Preparedness Education about applicable health care issues (e.g., infection control and clinical guidelines, etc.) was 5 (156.11). The rank score was 4 (156.97) for maintaining a current roster of all active and formerly active healthcare personnel available for emergency healthcare services (moderate effectiveness), and rank score 1 (200.93) for ensuring the plan specifies that priority is given to restoring power to the hospital (highest effectiveness). Also, the P-value $0.001 < \alpha = 0.05$. There is significance in all items through the hospitals so far. Their effect on hospital disaster preparedness is a concern. (Table 8).

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Table 8: Hospital preparedness for disaster.

	Items		Preparedness for Disaster					% of agreement	Rank	Chi-square	
			Strongly disagree	Disagree	Neutral	Agree	Strongly agree			X^2	P-value
1	Develop and Maintain an Emergency Continuity of Operations Plan	N	11	13	67	146	99	78.39 %	2	198.167	<0.001 *
		%	3.3%	3.9%	19.9%	43.5%	29.5%				
2	Ensure that the hospital's emergency plan is scalable to the magnitude and severity of the emergency and available resources	N	13	13	72	143	95	77.50 %	3	184.774	<0.001 *
		%	3.9%	3.9%	21.4%	42.6%	28.3%				
3	Ensure the plan specifies that priority is given to restoring power to hospital	N	9	8	88	143	88	77.44 %	1	200.935	<0.001 *
		%	2.7%	2.4%	26.2%	42.6%	26.2%				
4	Maintain a current roster of all active and formerly active healthcare personnel available for emergency healthcare services	N	10	16	100	124	86	75.48 %	4	156.976	<0.001 *
		%	3.0%	4.8%	29.8%	36.9%	25.6%				
5	Emergency Preparedness Education about applicable health care issues (e.g., infection control and clinical guidelines, etc.)	N	13	24	65	136	98	76.79 %	5	156.113	<0.001 *
		%	3.9%	7.1%	19.3%	40.5%	29.2%				

Table 9 shows that 22 out of 336 participants have a weak score of 6%, while 97 out of 336 participants have an average score of 28%. However, 217 out of 336 participants have a high score of 64%. The mean score is significant at the .05 level ($p<0.01$). This score indicates an apparent statistical difference in the non-structural indicator. All scores ranged from 5-25.

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Table 9: Score of preparedness for disaster.

Preparedness for Disaster				Score	
		N	%	Range	Mean± SD
Weak		22	6.5	5-25.	19.279±50.98
Average		97	28.9		
High		217	64.6		
Total		336	100.0		
Chi-square	X^2	172.768			
	P-value	<0.001*			

Comparison of the indicators between the hospitals

Table 10 shows the results of structural indicators between hospitals. The significance value (P=.001) is below 0.05. Therefore, hospitals in the structural indicator have a statistically significant difference. Also, it is showing the mean score for KAMC (M = 23.43, SD = 4.22) was highly significantly different than the KFH (M = 216.50, SD = 7.21).

Table 10: The score of structural indicators between the hospitals

Org.	STRUCTURAL		ANOVA	
	Range	Mean ± SD	F	P-value
King Abdullah medical city	11 - 30	23.434 ± 4.224	6.880	<0.001*
King Abdul Aziz Hospital	11 - 30	20.086 ± 4.889		
King Faisal Hospital	6 - 27	16.500 ± 7.215		
Al-Noor Specialist Hospital	6 - 30	21.787 ± 5.246		
Maternity Hospital	6 - 30	22.143 ± 5.169		
Hera General Hospital	12 - 30	21.846 ± 4.561		
Security force Hospital	14 - 30	22.792 ± 4.500		

Table 11 compares the structural indicators between the hospitals at a time. Results are shown in a table, with hospitals listed in order according to their mean value for the dependent

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variable. The King Faisal Hospital is shown first as this group has the lowest mean indicators (16.50), and the King Abdullah Medical City is shown last as they have the highest mean indicators (23.43).

Also, p-value = (1.00, 0.17, 0.74) > α = 0.05. There is not enough evidence to conclude that there is no significant difference in structural indicators through the hospitals at α = 0.05. More data and investigation must be done.

Table 11: One-way ANOVA of structural indicators for the hospitals

Organization	N	Subset for alpha = 0.05		
		1	2	3
King Faisal Hospital	20	16.5000		
King Abdul Aziz Hospital	35		20.0857	
Al-Noor Specialist Hospital	47		21.7872	21.7872
Hera General Hospital	52		21.8462	21.8462
Maternity Hospital	35		22.1429	22.1429
Security force Hospital	48		22.7917	22.7917
King Abdullah medical city	99			23.4343
P-value		1.000	0.174	0.743

The hospitals were divided based on the means into 3 subset groups. King Abdullah Medical City had the highest mean, followed by the Security Force hospital. King Abdul-Aziz Hospital and then King Faisal Hospital showed the lowest values. (Fig. 1).

Figure 1 : Bar chart comparison Mean ± SD for structural indicators

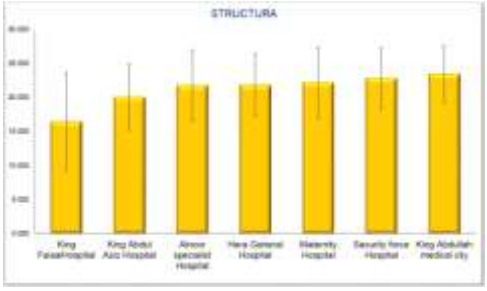

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Table 12 shows the results of non-structural indicators between hospitals. The significance value (P=.001) is below 0.05. Therefore, hospitals in the non-structural indicator have a statistically significant difference. Also, it is showing the mean score for King Abdullah Medical City (M = 20.76, SD = 3.42) was highly significantly different than the Al-Noor Specialist Hospital (M = 18.34, SD = 4.68).

Table 12: The score of non- structural indicators between the hospitals

Org.	NON-STRUCTURAL		ANOVA	
	Range	Mean ± SD	F	P-value
King Abdullah medical city	10 - 25	20.768 ± 3.425	10.138	<0.001*
King Abdul Aziz Hospital	11 - 25	18.743 ± 3.302		
King Faisal Hospital	5 - 23	14.850 ± 5.575		
Al-Noor Specialist Hospital	5 - 25	18.340 ± 4.682		
Maternity Hospital	5 - 25	20.343 ± 4.137		
Hera General Hospital	10 - 25	19.558 ± 3.369		
Security force Hospital	15 - 25	21.417 ± 2.789		

Table 13 compares the non-structural indicators between the hospitals at a time. Results are shown in a table, with hospitals listed in order according to their mean value for the dependent variable. The King Faisal Hospital is shown first as this group has the lowest mean indicators (14.85), and the Security Force Hospital is shown last as they have the highest mean indicators (21.41).

Also, p-value = (1.00, 0.06, 0.30) > α = 0.05. There is not enough evidence to conclude that there is no significant difference in non-structural indicators through the hospitals at α = 0.05. More data and investigation must be done.

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Table 13: One-way ANOVA of non- structural indicators for the hospitals

organization	N	Subset for alpha = 0.05		
		1	2	3
King Faisal Hospital	20	14.850		
Al-Noor Specialist Hospital	47		18.340	
King Abdul Aziz Hospital	35		18.743	
Hera General Hospital	52		19.558	19.558
Maternity Hospital	35		20.343	20.343
King Abdullah medical city	99		20.768	20.768
Security force Hospital	48			21.417
P-value		1.000	0.067	0.304

The hospitals were divided based on the means into 3 subset groups. Security Force Hospital had the highest mean, followed by King Abdullah Medical City. Al-Noor Specialist Hospital and then King Faisal Hospital showed the lowest values. (Fig. 2).

Figure 2: Bar chart comparison Mean ± SD for non-structural indicators

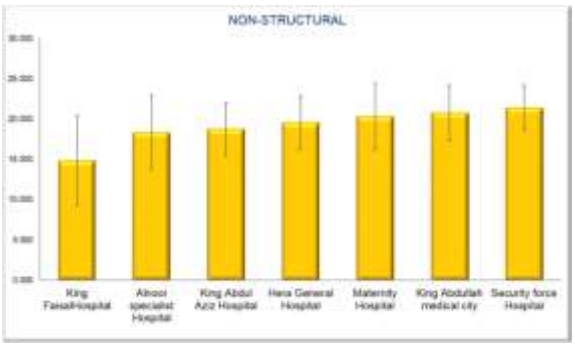

Table 14 shows the results of human resource indicators between hospitals. The significance value (P=.001) is below 0.05. Therefore, hospitals in the human resource indicator have a statistically significant difference. Also, it shows that the mean score for Security Force Hospital (M = 16.64, SD = 3.48) was

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highest significantly different than the King Faisal Hospital (M = 11.70, SD = 4.97).

Table 14: The score of human resource indicator between the hospitals

Org.	HUMAN RECOURCE			ANOVA	
	Range	Mean ± SD		F	P-value
King Abdullah medical city	7 - 20	16.182 ± 3.134[b]		6.158	<0.001*
King Abdul Aziz Hospital	10 - 20	15.514 ± 2.228[b]			
King Faisal Hospital	4 - 19	11.700 ± 4.975[a]			
Al-Noor Specialist Hospital	4 - 20	15.766 ± 3.490[b]			
Maternity Hospital	4 - 20	15.029 ± 3.682[b]			
Hera General Hospital	8 - 20	15.346 ± 2.889[b]			
Security force Hospital	4 - 20	16.646 ± 3.485[b]			

Table 15 compares the human resource indicators between the hospitals at a time. Results are shown in a table, with hospitals listed in order according to their mean value for the dependent variable. The King Faisal Hospital is shown first as this group has the lowest mean indicators (11.70), and the Security Force Hospital is shown last as they have the highest mean indicators (16.64).

Also, p-value = (1.00, 0.32) > α = 0.05. There is not enough evidence to conclude that there is no significant difference in human resource indicators through the hospitals at α = 0.05. More data and investigation must be done.

Table 15: One-way ANOVA of human resource indicators for the hospitals

organization	N	Subset for alpha = 0.05	
		1	2
King Faisal Hospital	20	11.700	
Maternity Hospital	35		15.029
Hera General Hospital	52		15.346
King Abdul Aziz Hospital	35		15.514
Al-Noor Specialist Hospital	47		15.766
King Abdullah medical city	99		16.182
Security force Hospital	48		16.646
P-value		1.000	0.321

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The hospitals were divided based on the means into 3 subset groups. Security Force Hospital had the highest mean, followed by King Abdullah Medical City. Maternity Hospital and then King Faisal Hospital showed the lowest values. (Fig. 3).

Figure 3 : Bar chart comparison Mean ± SD for human resource indicators

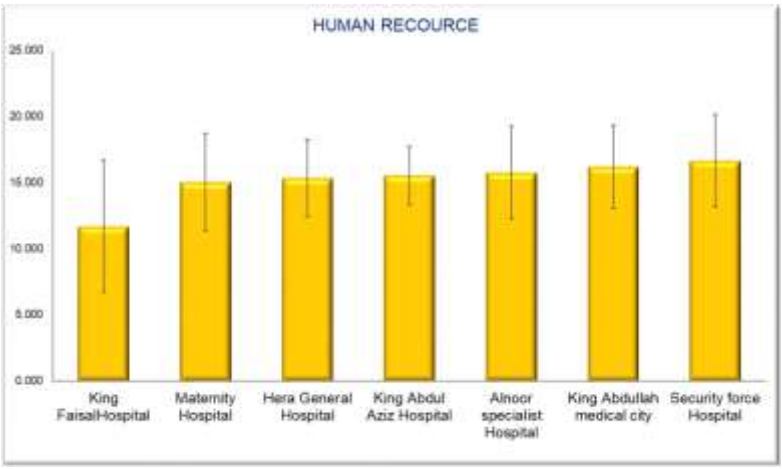

Table 16 shows the results of preparedness for disaster between hospitals. The significance value (P=.001) is below 0.05. Therefore, hospitals in the preparedness for disaster have a statistically significant difference. Also, it shows that the mean score for Security Force Hospital (M = 20.85, SD = 3.40) was highest significantly different than the King Faisal Hospital (M = 13.70, SD = 6.32).

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Table 16: The score of preparedness for disaster between the hospitals

Org.	Preparedness for Disaster		ANOVA	
	Range	Mean ± SD	F	P-value
King Abdullah medical city	11 - 25	20.242 ± 3.529 [b]	8.830	<0.001*
King Abdul Aziz Hospital	10 - 25	19.057 ± 3.464 [b]		
King Faisal Hospital	5 - 24	13.700 ± 6.325 [a]		
Al-Noor Specialist Hospital	5 - 25	18.830 ± 4.440 [b]		
Maternity Hospital	5 - 25	18.657 ± 4.752 [b]		
Hera General Hospital	10 - 25	19.115 ± 3.782 [b]		
Security force Hospital	9 - 25	20.854 ± 3.408 [b]		

Table 17 compares the preparedness for disaster between the hospitals at a time. Results are shown in a table, with hospitals listed in order according to their mean value for the dependent variable. The King Faisal Hospital is shown first as this group has the lowest mean indicators (13.70), and the Security Force Hospital is shown last as they have the highest mean indicators (20.85).

Also, p-value = (1.00, 0.19) > $\alpha = 0.05$. There is not enough evidence to conclude that there is no significant difference in preparedness for disaster through the hospitals at $\alpha = 0.05$. More data and investigation must be done.

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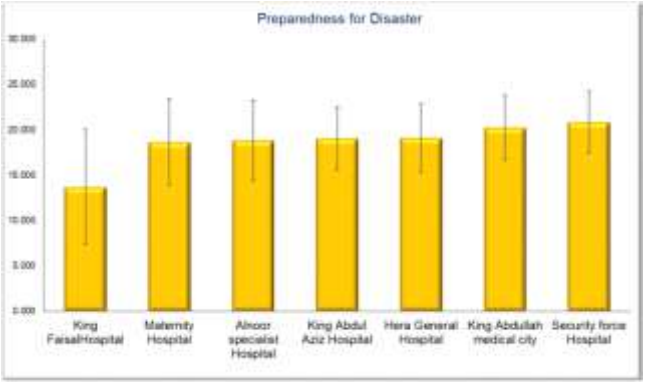
Table 17: One-way ANOVA of preparedness for disaster for the hospitals

Organization	N	Subset for alpha = 0.05	
		1	**2**
King Faisal Hospital	20	13.700	
Maternity Hospital	35		18.657
Al-Noor Specialist Hospital	47		18.830
King Abdul Aziz Hospital	35		19.057
Hera General Hospital	52		19.115
King Abdullah medical city	99		20.242
Security force Hospital	48		20.854
P-value		1.000	0.196

The hospitals were divided based on the means into 3 subset groups. Security Force hospital had the highest mean, followed by King Abdullah Medical City. Maternity Hospital and then King Faisal Hospital showed the lowest values. (Fig. 4).

Figure 4: Bar chart comparison Mean ± SD for preparedness for disaster



discussions.

Preface

Hospitals in the MAKKAH region stresses the value of adhering to their indicators-based disaster preparation plans. The goal of this study is to assess the level of hospital preparedness

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for emergencies that enables the Makkah hospitals to successfully be well prepared.

Reviewing key hospital disaster preparedness indicators is the basis for the analysis and evaluation of hospital disaster preparedness (HDPI). The results highlight the hospitals' reactions to the various readiness measures.

In terms of Structural Preparedness

Hospital architecture: 50% of the values for the structural elements are represented. The type of construction, the materials, and any prior exposure to environmental dangers are all taken into consideration while evaluating the structural safety of the hospital. This assesses if the structure complies with requirements for rendering services or whether it is susceptible to influences that could endanger its structural integrity and functional capacity. Hospitals that can withstand disastrous events can provide their patients with better medical care (WHO & PAHO, 2015).

The finding of this study is that all elements evaluated in the structural section of hospitals have average scores in case of such continuing conditions and without modification of current buildings. When the disaster occurs, they are highly likely to break down the hospitals, leading to defects in healthcare services, aggravation of the injuries, and a higher mortality rate for vulnerable groups such as children, pregnant, and the elderly. This condition is similar to the Sumatra earthquake in western Indonesia in 2011. (Fuady, Pakasi & Mansyur, 2011). Thus, the safety of Hospitals during disasters is essential to preventing further mortality and responding to health needs.

In most studies, inadequate oversight by pertinent entities during hospital construction, where structural reduction methods were not taken into account, was the cause of low structural preparation. Construction materials had the lowest percentage of compliance to requirements in the current study (71%). Only

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14% of hospitals, according to the study (Mohammadi Yeganeh et al., 2011), had an emergency escape system.

The building risk reduction for hospitals in the current study was higher than usual. It is visible when surfaces, walls, and ceilings are coated with flammable materials. According to the findings of the study by Mohammadi Yeganeh et al. (2011), structural readiness was average. The structure's defences, including its internal walls, ceilings, columns, and partitions, were all quite weak.

In terms of Non-structural Preparedness

Architectural elements: According to observations, there are still issues with architectural components, such as the need for constant equipment functioning and patient-safe windows. Inadequate patient safety in these institutions could result in other disaster, like the release of toxic materials that would cause buildings to fall and start fires. This could prevent the medical service from being delivered and result in more injuries.

Safety of Lifeline Facilities: The hospital is a challenging structure to evacuate. Having improved protection and preventative measures is a crucial aspect of fire safety (şimşek and Aknctürk, 2015). By having either an automatic or manual fire protection system, the hospital's fire protection system satisfied the requirements. The manual fire protection system makes use of hydrants that are dispersed around the building, fire extinguishers, and the Fire Alarm System.

The results of this study revealed that there is an apparent Size of signs and backup exit lights. Another study that was not compatibly conducted (Hojat, 2012) showed that most buildings had no emergency exit, and most of the emergency exits were closed. Also, there were no guide signs.

Assessment of the non-structural preparedness of vital service institutions, such as hospitals, that are anticipated to function as a safe environment in the case of a disaster, has been

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highlighted by another research (Lakbala, 2016). Hospitals may lose crucial service facilities, weak systems, and equipment in a crisis and lose their ability to serve as service facilities. Systems and equipment must therefore be placed away from dangers to safeguard crucial services. The non-structural components of hospital preparedness are crucial for the continuation of services in the immediate and long-term following a disaster, according to (PouranFard and Sadeghian, 2019). Hospital services are halted as a result of hospitals' inadequate non-structural preparedness, which might result in new disasters and hospital injuries.

Indicators are needed to examine and evaluate the risks of identifying the potential for catastrophic failure (non-structural) in the event of a disaster. Since non-structural components are a key to the continued operation of hospital buildings, it is inevitable to provide hospitals with guidelines for these components.

In terms of Human Resource Preparedness

Disaster response needs appropriate human resources. It includes staff trained in emergency and disaster preparedness and equipped with the necessary management skills. Most of the hospitals surveyed provide education and training programs for emergency services and emergency training for hospital staff at least once a year. It shows that most hospitals surveyed are prepared to improve their human resources capacity for disasters.

The results of this study revealed that all health workers are trained in basic life and conduct training on fire drills annually, but they lack a crisis management committee with expertise. A similar study by (Mulyasari et al., 2013) also showed that most hospitals provide education or training programs for emergency medical services and conduct disaster training for hospital staff at least once a year. Also, most

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Japanese hospitals were prepared for disasters to enhance their human resources capacity.

This study's results are inconsistent with the study conducted by (Ahmadi et al., 2016); this showed that the hospitals and human resources surveyed were also in bad condition. Therefore, hospitals are encouraged to design labor force and responsibilities and formulate processes for developing procedures in crisis situations.

In terms of Preparedness for Disaster

Healthcare workers claim to be experienced and trained in handling patients through a natural or artificial disaster, but there is no appropriate training for cases. Most respondent hospitals increase the frequency of the drills of disaster and the number of essential stocks as triage tags.

By assessing support plans, defining processes, recognizing hazards, offering cutting-edge services, and taking deliberate safeguards, hospitals may create effective hospital disaster recovery plans. It is advised that hospitals be encouraged to create detailed plans for pre-disaster, during-disaster, and post-disaster disaster management. Additionally, hospitals must advertise their internal disaster preparedness plans.

The proper management of disasters and the mitigation of negative effects depend on hospital readiness. (2008) Li, Huang, and Zhang have therefore largely complied with the fundamental standards of readiness, such as developing fire resistance and conducting emergency exercises. Meeting these conditions indicates being well-prepared. The findings of the hospitals that took part in this survey showed that readiness was at a high level. Similar to the findings of the study conducted by Ameriun et al. (2010), which recorded the closest percentage of preparedness in comparison to this study, hospitals were more than 70% prepared to handle disasters.

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The result corresponds with the study conducted by (Sajadi and Zaboli, 2014) in the recent Assessing hospital disaster preparedness in Tehran: which showed that the significant challenges of hospitals in crises as weakness of management and communication, and structural issues, while the other study conducted by (Khorram- Manesh, et al., 2013) showed that is Hospital Evacuation; Learning from the Past? The flooding of Bangkok in 2011 showed that they get a low score for having healthcare professionals available for emergency healthcare services and emergency preparation education, also the significant challenge of hospitals in crises is a lack that programs for hospitals' readiness against the crises should be developed and improved.

The hospital has an emergency response team or a medical disaster management team to assist patients in the event of a disaster. However, it is essential to review usual natural and unnatural disasters and how they were managed to depend on health disaster preparedness.

According to a different study that evaluated the hospitals in Jeddah, Saudi Arabia, for their preparedness for disaster (Bajow and Alkhalil, 2014), the majority of the hospitals were rated as having good levels of preparedness. However, effective management of such crises necessitates practical training. The outcome is consistent with this study. The majority of the respondent hospitals have complied with important readiness standards, such as having fireproof structures and conducting emergency drills. Meeting these conditions indicates being well-prepared.

To promote hospital preparedness for disaster response, the government, particularly the MOH, should increase investment to promote essential preparedness components, including training to produce appropriate and complete disaster preparedness.

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Conclusions and Recommendations.

Introduction

Makkah has experienced several disasters over the last decade. Hospitals must be 100% operable and safe daily at the forefront of disaster preparedness. As the number of disasters increases worldwide and hospital preparation is significant, assessing hospital preparedness for disasters is essential.

Hospitals are predicted to play an essential role in caring for people influenced by disasters. Therefore, the hospitals must have an appropriate practice and efficacious disaster plan to avoid confusion, duplication, uncertainty, authority interference during the disaster, and more. So, once the victims arrive at the hospital. (The Disaster Management Act, 2005).

Principle Finding

This study was motivated by the need to evaluate hospital disaster preparedness in MAKKAH, Saudi Arabia. The finding shows that hospitals included in this study have disaster preparedness indicators but a disaster education and management deficiency.

The weaknesses were apparent, especially the following indicators: structural indicators, especially in Construction materials, and Ramps are present in appropriate areas. Hospitals also showed weakness in non-structural indicators as Equipment is always operational, and Windows has features to secure the patient's safety. Hospitals also showed weakness in human resource indicators (A crisis management committee and A hospital operations center).

This study has provided assessments of hospital disaster preparedness that improve the progress and effectiveness of improving hospital disaster preparedness. The study also highlights that hospital disaster preparedness is critical to crisis preparedness. Therefore, hospitals must understand that disaster preparedness is primarily built into the hospital system.

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Research Contribution

According to the findings of the current review, the total level of hospital preparedness in response to disasters was average in hospitals. Therefore, the management should take adequate actions and perform requested plans using accreditation standards and guidelines to promote the preparedness of hospitals in response to disasters.

Strength and Limitation

The study does have some constraints. It was challenging to assess the effectiveness and caliber of the disaster plans because it was a cross-sectional study based on self-reported data (questionnaire), which the healthcare personnel gladly filled out. Time restrictions, pressure, and other factors could also have an impact on the filling. The recovery from disasters, psychosocial wellbeing, or rational health were not included in this study.

Implication and Recommendation

The findings of this study could serve as support for a strategic strategy to enhance the standard of healthcare services by implementing preparatory measures. Additionally, educational programs need to be planned, designed, and improved to increase the understanding of healthcare professionals in effectively managing catastrophic occurrences.

To improve hospitals disaster preparedness should follow the following is as under:

1. The hospital should be developed and test the disaster plan.
2. An empowered committee may review the plan for review, addition, modification, approval, and performance.
3. Infrastructure and equipment through capacity building.
4. Capacity building through the continuous practicing of the staff drills and exercises.
5. Constant review of the plan to make it more user-friendly, adjustable, related, and updated according to the Hospital's capability.

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Direction of Further Research

The results of this study can be used to build a hospital's resilience to future risks.

Closing Remarks

Recently, the significance of hospital readiness has once again become clearer due to the rise in natural and man-made disasters occurring throughout the world. It is crucial and required to define hospitals' level of disaster preparedness. This is because preparing for disaster preparedness requires identifying hospitals with a poor level of preparedness.

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References

1. Ahayalimudin, N. and Osman, N., 2016. Disaster management: Emergency nursing and medical personnel's knowledge, attitude and practices of the East Coast region hospitals of Malaysia. Australasian Emergency Nursing Journal, 19(4), pp.203-209.
2. Ahmadi, B., Rahimi Foroushani, A., Tanha, N., Bolban Abad, A. and Asadi, H., 2016. Study of Functional Vulnerability Status of Tehran Hospitals in Dealing with Natural Disasters. Electronic physician, 8(11), pp.3198-3204.
3. Al Thobaity, A., Plummer, V., Innes, K. and Copnell, B., 2015. Perceptions of knowledge of disaster management among military and civilian nurses in Saudi Arabia. Australasian Emergency Nursing Journal, 18(3), pp.156-164.
4. Al-Shareef, A., Alsulimani, L., Bojan, H., Masri, T., Grimes, J., Molloy, M. and Ciottone, G., 2016. Evaluation of Hospitals' Disaster Preparedness Plans in the Holy City of Makkah (Mecca): A Cross-Sectional Observation Study. Prehospital and Disaster Medicine, 32(1), pp.33-45.
5. Ameriun, A., Delavari, A. and Teymourzadeh, E., 2010. RATE OF PREPAREDNESS IN CONFRONTING CRISIS IN THREE SELECTED BORDER HOSPITALS. [online] Militarymedj.ir. Available at: <http://militarymedj.ir/article-1-698-fa.pdf> [Accessed 30 June 2022].
6. Bajow, N. and Alkhalil, S., 2014. Evaluation and Analysis of Hospital Disaster Preparedness in Jeddah. Scientific Research Publishing Inc, 06(19), pp.2668-2687.
7. BBC News. 2015. Mecca crane collapse: Saudi inquiry into Grand Mosque disaster. [online] Available at: <https://www.bbc.com/news/world-middle-east-34231620> [Accessed 11 March 2021].
8. Beyramijam, M., Ghahfarokhi, S., Fathollahzadeh, A., Rahimzadeh, A., Shahabirabori, M. and Aminizadeh, M.,

ISSN: 2537-0367 **eISSN : 2537-0375**

2019. The effect of education and implementation of "National Hospital Disaster Preparedness Plan" on an Iranian hospital preparedness: An interventional study. Journal of Education and Health Promotion,

9. Bin Shalhoub, A., Khan, A. and Alaska, Y., 2017. Evaluation of disaster preparedness for mass casualty incidents in private hospitals in Central Saudi Arabia. Saudi Medical Journal, 38(3).
10. En.wikipedia.org. 2020. Hazard. [online] Available at: <https://en.wikipedia.org/wiki/Hazard> [Accessed 11 March 2021].
11. Fallah-Aliabadi, S., Ostadtaghizadeh, A., Ardalan, A., Fatemi, F., Khazai, B. and Mirjalili, M., 2020. Towards developing a model for the evaluation of hospital disaster resilience: a systematic review. BMC Health Services Research, 20(1).
12. Fuady, A., Pakasi, T. and Mansyur, M., 2011. Primary Health Centre disaster preparedness after the earthquake in Padang Pariaman, West Sumatra, Indonesia. [online] PubMed. Available at: <https://bmcresnotes.biomedcentral.com/articles/10.1186/1756-0500-4-81> [Accessed 29 June 2022].
13. General Authority for Statistics- Kingdom of Saudi Arabia, 2019. Population in Makkah region by gender, age group, and nationality (Saudi/Non-Saudi). [online] Available at: <https://www.stats.gov.sa/en/1007-0> [Accessed 1 February 2021].
14. Hick, J., Hanfling, D., Burstein, J., DeAtley, C., Barbisch, D., Bogdan, G. and Cantrill, S., 2004. Health care facility and community strategies for patient care surge capacity. Annals of Emergency Medicine, 44(3), pp.253-261.
15. Hick, J.L., Hanfling, D. and Cantrill, S.V. (2012). Allocating Scarce Resources in Disasters: Emergency Department

ISSN: 2537-0367 **eISSN : 2537-0375**

Principles. *Annals of Emergency Medicine*, 59(3), pp.177–187.

16. Hojat, M., 2012. Disaster Disaster preparedness in hospitals of Jahrom University of Medical Sciences (2010). [online] Journal.qums.ac.ir. Available at: <https://journal.qums.ac.ir/article-1-1328-en.html> [Accessed 30 June 2022].
17. Khorram-Manesh, A., Jarayabhad, R., Angthong, C. and Ortenwall, P., 2013. Hospital Evacuation; Learning from the Past? Flooding of Bangkok 2011. [online] Journal of Medicine and Medical Research. Available at: <https://www.semanticscholar.org/paper/Hospital-evacuation%3B-learning-from-the-past-of-Khorram-Manesh-Angthong/b1d2a1d98f696ee43f744417d65c510689bb76ab> [Accessed 22 June 2022].
18. Korman, M., Goldberg, L., Klein, C., Khanjani, M., Cox, G., Fila, E., Dick, A., Ellis, J. and Moore, S., 2019. Code Orange: A Systematic Review of Psychosocial Disaster Response. Prehospital and Disaster Medicine, 34(s1), pp.s69-s70.
19. Lakbala, P., 2016. Hospital Workers Disaster Management and Hospital Nonstructural: A Study in Bandar Abbas, Iran. [online] Glob J Health Sci. Available at: <https://pubmed.ncbi.nlm.nih.gov/26573039/> [Accessed 30 June 2022].
20. Lapčević, Z., Mandić-Rajčević, S., Lepić, M. and Jovanović, M., 2019. Evaluating a primary healthcare centre's preparedness for disasters using the hospital safety index: Lessons learned from the 2014 floods in Obrenovac, Serbia. International Journal of Disaster Risk Reduction, 34, pp.436-442.
21. Legislative.gov.in. 2022. The Disaster Management Act, 2005|Legislative Department | Ministry of Law and Justice |

ISSN: 2537-0367 **eISSN : 2537-0375**

GoI. [online] Available at: <https://legislative.gov.in/actsofparliamentfromtheyear/disaster-management-act-2005> [Accessed 13 June 2022].

22. Li, X., Huang, J. and Zhang, H., 2008. An analysis of hospital preparedness capacity for public health emergency in four regions of China: Beijing, Shandong, Guangxi, and Hainan. [online] Biomedcenteral. Available at: <https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-8-319#citeas> [Accessed 30 June 2022].
23. Mohammadi Yeganeh, S., Asadi Lari, M., Seyedin, S. and Maher, A., 2011. Qualitative and Quantitative Performance of Equipment and Non-Structural Vulnerability in Selected Public Hospitals in Tehran city During an Earthquake. [online] Jorar.ir. Available at: <https://jorar.ir/article-1-90-en.html> [Accessed 30 June 2022].
24. Mulyasari, F., Inoue, S., Prashar, S., Isayama, K., Basu, M., Srivastava, N. and Shaw, R., 2013. Disaster preparedness: Looking through the lens of hospitals in Japan. International Journal of Disaster Risk Science, 4(2), pp.89-100.
25. Noji, E., 1996. DISASTER EPIDEMIOLOGY. Emergency Medicine Clinics of North America, 14(2), pp.289-300.
26. PAHO, O. and WHO, O., 2008. Hospital Safety Index: Evaluation Forms for Safe Hospitals. [online] Iris.paho.org. Available at: <https://iris.paho.org/handle/10665.2/51959?show=full> [Accessed 25 June 2022].
27. Parsaei, M., Khankeh, H., HabibiSaravi, R., masoumi, G. and Hosseini, S., 2017. Hospital Disaster Preparedness in Mazandaran Province. [online] Available at: <https://www.researchgate.net/publication/341451998_Hospital_Disaster_Preparedness_in_Mazandaran_Province> [Accessed 30 January 2021].

ISSN: 2537-0367 **eISSN : 2537-0375**

28. PouranFard, J. and Sadeghian, Z., 2019. Assessing the readiness of hospitals in Kohgiluyeh and Boyerahmad provinces against disasters based on HIS. [online] Japer.in. Available at: <https://japer.in/storage/models/article/VsaUbv5ZG6B88S90eZY3Nk43eCyNhYaP73L8DgjqknkKPllGal7FoFbnSEZ8/assessing-the-readiness-of-hospitals-in-kohgiluyeh-and-boyerahmad-provinces-against-disasters-base.pdf> [Accessed 30 June 2022].
29. Powers, R. and Daily, E., 2010. International disaster nursing. Cambridge: Cambridge University Press.
30. Preventionweb.net. 2009. Hospitals should be safe from disasters: reduce risk, protect health facilities, save lives | PreventionWeb.net. [online] Available at: <https://www.preventionweb.net/publications/view/25616> [Accessed 13 March 2021].
31. Sajadi, H. and Zaboli, R., 2014. Assessing hospital disaster preparedness in Tehran: Lessons learned on disaster and mass casualty management system. International Journal of Health System and Disaster Management, 2(4), p.220.
32. Saudigazette. (2020). *Saudi Arabia reports five new cases of coronavirus; first in Makkah*. [online] Available at: https://www.saudigazette.com.sa/article/590664 [Accessed 22 Dec. 2020].
33. şimşek, Z. and Akıncıtürk, N., 2015. An Evaluation of Hospital Evacuation Strategies with an Example. [online] Ijastnet.com. Available at: <http://www.ijastnet.com/journals/Vol_5_No_3_June_2015/12.pdf> [Accessed 28 June 2022].
34. Top, M., Gider, Ö. and Tas, Y., 2010. An Investigation of Hospital Disaster Preparedness in Turkey. Journal of Homeland Security and Emergency Management, 7(1).

ISSN: 2537-0367 **eISSN : 2537-0375**

35. Ul-Haq, Z., Shah, B., Khattak, M., Fazid, S., Gillani, S., Khan, S., Khan, F., Shahzad, H., Abdul Razzak, J., Farooq, S. and Huda, Q., 2019. Hospital preparedness for disaster and mass casualty management in Pakistan: A cross-sectional evaluation study. American Journal of Disaster Medicine.
36. WHO, the World Bank and International Strategy for Disaster Reduction (2009). World Disaster Reduction Campaign 2008-2009. Hospital save from disaster, Reduce Risk, Protect Health Facilities, Save Lives. [Online] Available at: https://www.unisdr.org/2009/campaign/pdf/wdrc-2008-2009-information-kit.pdf [Accessed 22 Dec. 2020].
37. World Health Organization & Pan American Health Organization. (2015). Hospital safety index: guide for evaluators, 2nd ed.. World Health Organization. https://apps.who.int/iris/handle/10665/258966.

ISSN: 2537-0367 **eISSN : 2537-0375**