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Investigation into the management of emergency medical services and medical evacuation in crises and disasters and classification of injuries in emergency departments in the Kingdom of Saudi Arabia

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Abstract

Crises, catastrophes, and disasters can happen everywhere in the world, including Saudi Arabia. There are both natural and man-made disasters in KSA. However, this incident's effects could lead to injuries that necessitate both medical attention and evacuation from the region. Additionally, impacted and injured people must be evacuated and assessed in accordance with their injuries so that they can receive the proper medical care. To evaluate the effectiveness of emergency medical services EMS management, medical evacuation and inspect the classification of injuries in the emergency departments during the crises and disasters in Saudi Arabia, a descriptive and review methodology is used to indicate the results. While the findings of this paper showed that EMS and medical evacuating are so effective during disasters, also there are a governmental efforts and cooperating with other organizations to enhance these services. Moreover, START system is used by the medical staff and volunteers during crises to classify the injuries and their need for medical services. Also, it is important to shed the light on the need of educating and training the medical staff and volunteers in order to use the START system effectively and improve their performance. This will reduce the number of fatalities and the probability of disability.

Keywords: *Emergency Medical Services, Disaster, Medical Evacuation, START System.*

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1. Introduction

Disasters and crises are catastrophic, unexpected events that produce a great deal of damage above and beyond what is handled locally and necessitate extra resources and organization (Alazmy et al., 2020; FitzGerald et al., 2017). According to international standards, catastrophes can be either man-made (such fires and terrorist attacks) or natural (like floods, storms, earthquakes, and tsunamis). Both of these catastrophes, whether they were natural or man-made, result in the loss of life and the damage to property (Alazmy et al., 2020).

It is critical to indicate that these catastrophes are always associated with mass casualty incidents (MCIs). This phrase is used to describe situations where the number of fatalities beyond the capacity and resources of the local area over a brief amount of time, in other words it is overloading the current healthcare systems and personnel (Khorram-Manesh, 2021; Alazmy et al., 2020).

Despite the fact that catastrophes and crises occur all across the world, Saudi Arabia's history of catastrophes extends back to 1941 when the Kabbah flash flood occurred. However, lacks of trustworthy information regarding it or its effects on society (Alazmy et al., 2020). The first reported catastrophe occurred in 1964 when strong rains hit various areas of Saudi Arabia, resulting in 20 fatalities and 1000 injuries (Alamri, 2010).

People who are affected by crises and disasters need to be evacuated from the scene as fast as possible. In addition, they require assistance from a

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well-resourced, organized approach, and qualified medical teams. Moreover, emergency medical services (EMS) are a crucial tool for managing and organizing these conditions. Additionally, EMS is important for the prevention, preparedness, response, and recovery processes (Alazmy et al., 2020; Al-Shaqsi, 2010). While the process of classification of injured or affected victims should be accurate and under the supervision of qualified medical teams (United States Government US Army, 2019) In light of previous data, it is important to Investigation into the management of emergency medical services and medical evacuation in crises and disasters and classification of injuries in emergency departments in the Kingdom of Saudi Arabia

1.1 Problem statement

Injuries, fatalities, disabilities, and illnesses can be brought on by crises and disasters. The fact that crises and disasters may have long-term impacts, such as the loss of hard-won gains in health and well-being, is also striking (Alraga, 2017). Afifi et al. (2013) & Abosuliman et al (2013) stated that Disasters can affect negatively on health, in fact the impact of it can be direct or indirect on both societies and individuals.

In Saudi Arabia overcrowding, terrorist attacks and natural disasters are the most crises that lead to general health disasters (Abosuliman et al., 2013). In addition, flooding is the most common disaster in Saudi Arabia, due to poor drainage networks. The consequences of it include family migration and water pollution that has detrimental effects on health (Abosuliman et al., 2013). Seven out of the eleven worst natural catastrophes in Saudi

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Arabia's history between 2000 and 2011 were caused by floods (Alshehri et al., 2013).

During the hajj season, there are almost three million people who reside in Makkah (Alshehri et al., 2013). It is an annual gathering of Muslims from all over the world may result in many catastrophes and tragedies, including widespread poaching, a lack of food and water, inadequate health care, and the spread of diseases and viruses. (Al-Wathinani et al., 2021; Alraga, 2017). For instance, 346 people died as a result of crowding on the jamarat bridge in Mina (Alraga, 2017), while 1426 people were crushed to death in a congested tunnel that goes to Makkah in 1990 (Alshehri et al., 2013).

In light of previous data which shed the light on some of KSA disasters and crises, it is essential to investigate the management of emergency medical services and medical evacuation in crises and disasters and classification of injuries in emergency departments in the kingdom of Saudi Arabia. Furthermore, numerous studies examined the relationships between various factors. Examples include investigation into disaster health management in Saudi Arabia (Alraga, 2017), and disaster preparedness and management in Saudi Arabia: an empirical investigation (Abosuliman et al., 2013). However, the investigation into the management of emergency medical services and medical evacuation in crises and disasters and classification of injuries in emergency departments in the kingdom of Saudi Arabia does not receive the appropriate attention from researchers leaving a gap in research.

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1.2 Questions

This paper seeks to address the following questions:

- How effective is emergency medical service management during crises and disasters in Saudi Arabia?
- How effectively does medical evacuation operate in emergencies and disasters in Saudi Arabia?
- What is the classification of injuries in emergence departments during disasters and crises in Saudi Arabia?

1.3 Aim

Collecting existing research, studies, and publications in order to carry out a comprehensive evaluation of the efficiency of the management of emergency medical services, medical evacuation during crises and disasters, and injury classification in emergency departments in the Kingdom of Saudi Arabia is the primary goal of this study**.**

1.4 Objectives

According to the main aim, following are the objectives of this study:

- Study the effectiveness of emergency medical service management during crises and disasters in Saudi Arabia.
- Review the effectiveness of medical evacuation operates in emergencies and disasters in Saudi Arabia.

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- Recognize the classification of injuries in emergency departments during disasters and crises in Saudi Arabia.

2. Methodology

The method employed in this research is descriptive with a review of the most significant and prior studies from online databases such as Google scholar or other reports papers from governmental websites. Collected data will be used to show the findings and results in aim to evaluate the EMS management, medical evacuation, and the Classification of injuries in the emergency department in KSA.

3. Disasters and crises history of Saudi Arabia

The list below includes a few of the natural and man-made disasters that the kingdom of Saudi Arabia has experienced during 1941 and 2015. It is important to note that the climate, geography, geology, economic development, and other aspects of KSA increase the risk of crises and disasters occurring there (Ministry of Municipal and Rural Affairs- KSA, 2018; Alshehri et al., 2013; Abosuliman et al., 2013).

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Type of MCIs	Year	Injured	Deaths
Earthquake in Abu Arish (Jazan region)	1941	N.A	N.A
Floods	1964	1000	20
Siege of the Grand Mosque	1979	600	250
Deadly clash between Iranian demonstrators and the Saudi law-enforcement	1987	649	402
Pilgrims stampede inside tunnel	1990	N.A	1426
Massive fire in the camps of pilgrims in Mina	1997	1500	343
Medina floods	2005	43	29
Jeddah flood	2011	5000	10
Residential building fires in Khobar at Aramco Complex	2015	200	11
Hospital fire in intensive care and maternity wards	2015	123	25

4. Management of emergency medical services during crises and disasters in KSA.

Over 80 years ago, Saudi Arabia began its deployment of disaster management, which has since developed. The fire bridge, which was established in Makkah in 1927 with the intention of serving pilgrims who

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performed the Hajj and Umrah annually, served as the first basis for emergency management (Alamri, 2010). Later, and following numerous revisions to Saudi Arabia's emergency plans, management of emergency medical services became one of the civil defense's responsibilities. To put it another way, they have a responsibility to safeguard individuals, as well as public and private property, from dangers including war, fires, accidents, and natural disasters (Alamri, 2010).

One of the Saudi Red Crescent's (SRCA) primary duties in the Kingdom of Saudi Arabia is to supervise emergency medical services since the early years of healthcare's founding; SRCA has been the governing body of the Saudi healthcare system. Before hospitals became popular, Saudi Red Crescent was in charge of providing health care for city residents. (Alshammari et al., 2017; Alazmy et al., 2020). Following the establishment of the national ambulance health organization, EMS and SRCA were merged into the nation's healthcare system in 1943 (Alazmy et al., 2020).

It was clear that a body or agency was required in 1934 during the Saudi-Yamen civil war to supply the Saudi soldiers who were injured with medical care. After several years of battle, the Charitable Relief Society, a charitable organization, began to cover some of Saudi Arabia which is the holy towns of Makkah and Medina (Alshammari et al., 2017). The financial status of charitable organizations had collapsed after World War II, thus the government converted CRS into a public body. The Saudi Red Crescent (SRC) became its new label as a result. Furthermore, it is crucial

to note that this organization changed its name once more to SRAC in 2008 (Mutair, et al., 2016; Alazmy et al., 2020).

In emergency situations, SRCA has a well-organized system that includes deploying skilled and very well trained medical professionals to respond for these cases like Umrah (Mutair, et al., 2016). Moreover, this institute builds medical schools across the kingdom in aim to boost the population of medical professionals and emergency physicians (Alazmy et al., 2020).

5. Medical evacuation during disaster and crises in KSA.

Medical evacuation is the process of rapidly transporting ill, hurt, or injured persons among medical treatment facilities so they can receive treatment from qualified medical personnel (United States Government US Army, 2019). According to (Tashrifullahi & Hassanain, 2013) evacuation is not an easy process; it requires hospitals to send qualified medical personnel and supplies to evacuate as many victims from the afflicted area as possible (Khorram-Manesh et al., 2021). Additionally, hospitals need to be functional and ready to receive and handle patients (Stander et al., 2011; Khorram-Manesh et al., 2013).

Giving crisis and disaster victims' medical attention while traveling in vehicles with the necessary medical equipment will increase their chances of surviving and lower their risk of developing long-term disabilities (United Sates Government US Army, 2019).

In Saudi Arabia, the government and SRCA work to offer skilled medical workers. In addition, there are 165 ambulance stations that are equipped

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with medical equipment. In fact, each station has two ambulances. (Mutairi, et al., 2016).

For instance, the utilization of medical evacuation and EMS were witnessed in 2012 hajj. More than 27046 emergency calls have been received, and much more than 20210 of them have been attended to by qualified and skilled manpower. While over than 18230 patients were treated, 100 mobile team doctors, and 25 motorcycle units were utilized. Moreover, 600 volunteers and 1750 EMS professionals were spread to 47 posts and 26 stations around the zone of the event. Additionally, it is important to note that SRCA used a variety of transportation methods to treat emergency patients, which made it easier for doctors and paramedics to collaborate and meet patients' needs (Alazmy et al., 2020).

6. Classification of injuries in the emergency department during crises and disasters in KSA.

To be included as a disaster in the global database, several requirements must be met. Which include demands for international assistance, an emergency declaration, reports of more than 10 people killed, and over than or equal to 100 people affected (Vos et al., 2009).

It is essential to categorize crises and disasters in order to identify the different types of injuries which they cause. According to CRED (2017) disasters can be classified to gsialeophyl, meteorological, hydrologic, climatological, biological.

However, injuries and deaths due to catastrophic and disasters in Saudi Arabia can be classified generally into human related injuries, motor

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vehicle crashes injured, Ramadan and hajj seasons injuries. Furthermore, there are technological hazards injuries which occur in the oil industry and natural disasters injuries (Alamri, 2010). However, In KSA, injuries and fatalities brought on by man-made disasters outnumber those brought on by natural ones. For instance, in 2008, there were 6000 death cased.

by vehicle accidents, which is 12 times more than the deaths were by natural disasters (Alyami et al., 2021).

START is a rapid triage system used by prehospital providers to categorize victims according to the medical care that they need during disasters and crises in Saudi Arabia (Althunayyan et al., 2021). This technique evaluates every injured person who is older than eight years old in less than 60 seconds. It depends on five factors: the ability of walking, compliance with used commands, capillary filling, and radial pulse (Bazyar et al., 2019). Jump START pediatric triage is used to evaluate victims who are eight years old or younger (Althunayyan et al., 2021).

According to the results of their examination, injured people will be marked with the colors green, red, yellow, and black and receive medical help according to them (Bazyar et al., 2019). The colors of the start system are shown in the figure below, along with descriptions of each

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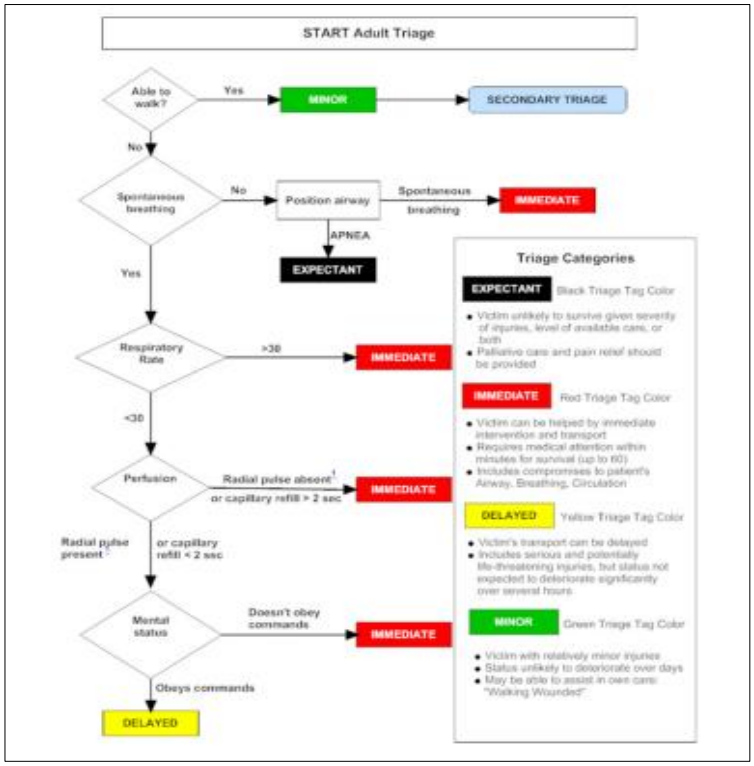

Figure 1: START Triage Algorithm (Elbaih & Alnasser, 2020)

However, it is significant to indicate that the EMS staff does not have a full knowledge of START triage tool. This means it is necessary to improve their performance by educating and training them (Bazyar et al., 2019).

From the perspective of the researcher and according to previous data, Saudi Arabia is working harder every day to enhance the technique that emergency medical services are managed during crises and disasters. While in order to deal with crises and disasters with the fewest possible losses, the government of the Kingdom has also established a number of institutions and agencies that are cooperating with one another. Additionally, it's important to highlight efforts made by government,

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institutions, and nonprofit organizations to staff these organs with skilled individuals so that they can do their duties accurately and efficiently. Additionally, there is a system in place to categorize injuries in accordance with the outcomes of examinations. While hospitals and ambulances are outfitted to transport injured people. Additionally, medical staff and volunteers must be properly trained and educated in order to use the START triage procedure. As a result, it would be simpler to offer medical care for catastrophe victims as well as decrease the fatalities and chances that they would sustain disabilities.

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7. Conclusion

The main aim of this paper is to investigate the effectiveness of emergency medical services EMS management, medical evacuation and inspect the classification of injuries in the emergency departments during the crises and disasters in Saudi Arabia. Many papers have studied the EMS and medical evacuation in Saudi Arabia, according to them these systems are so effective during a catastrophe in KSA. Additionally, there are governmental efforts to improve them day by day. While the classification of injuries in the emergency department is done using the START system. However, there is a need to educate and train medical personnel and volunteers on using the START system effectively in order to decrease the lives lost and the chances of being disabled.

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