Original Article

DOI: 10.14235/bas.galenos.2025.25993
Bezmialem Science

Sustainability of Health Services in a University Hospital during Disaster: The Kahramanmaraş Earthquakes Experience

Bir Üniversite Hastanesinde Afet Döneminde Sağlık Hizmetlerinin Sürdürülebilirliği: Kahramanmaraş Depremleri Deneyimi

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ABSTRACT

Objective: The diverse impacts and repercussions of catastrophes underscore the need for hospitals to enhance their physical and functional resilience, as well as to strengthen their preparedness for interventions. Disasters lead to an increased demand for health services. The earthquakes that occurred in Türkiye on February 6, 2023, concentrated in Kahramanmaraş and impacted 11 regions, exemplifying an unusual situation when power and resources were inadequate. This research investigates the experiences of Kahramanmaraş Sütçü İmam University Faculty of Medicine Hospital, situated near the disaster's epicenter, to ascertain objectives for maintaining continuous and efficient healthcare service delivery during catastrophes.

Methods: This study utilizes a phenomenological research design, which is a qualitative research methodology. Data were gathered via semi-structured interviews with 19 individuals. The interviews were examined using the MAXQDA analytic software, with results classified into two primary themes: crisis management and individual experience.

ÖZ

Amaç: Dünyadaki afetlerin çok yönlü etki ve sonuçları, hastanelerin afetlere fiziksel ve işlevsel olarak daha dayanıklı ve müdahalelere daha hazırlıklı olmaları gerekliliğine dikkat çekmektedir. Hem doğal hem de insan kaynaklı çok sayıda farklı afet ve acil durumun yaşandığı Türkiye'de, özellikle deprem ve pandemiler olmak üzere afet ve acil durumların neden olduğu kitlesel yaralanmalar ve hastalıkların artması, sağlık sistemine, özellikle de hastanelere yoğun bir ek iş yükü getirmektedir. Türkiye'de 06 Şubat 2023'te Kahramanmaraş'ta merkezlenen ve 11 ili etkileyen deprem, güç ve kaynakların yetersiz kaldığı nadir afetlerden biridir. Bu çalışmada, depremin merkez üssünde bulunan Kahramanmaraş Sütçü İmam Üniversitesi Tıp Fakültesi Hastanesi'nin deprem deneyimleri incelenerek, afetlerde sağlık hizmetlerinin kesintisiz ve etkin bir şekilde yürütülmesi için önceliklerin belirlenmesi amaçlanmıştır.

Yöntemler: Çalışmanın yöntemi, nitel araştırma desenlerinden biri olan fenomenolojik desendir. Çalışmanın verileri yarı yapılandırılmış görüşmeler yoluyla elde edilmiş olup, çalışma kapsamında 19 katılımcı ile görüşme yapılmıştır. Katılımcı

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Cite this article as: Gerdan S, Yazıcı A, Yılmaz S, Çağlayan Ç. Sustainability of health services in a university hospital during disaster: the Kahramanmaraş earthquakes experience. Bezmialem Science. [Epub Ahead of Print]

Received: 11.03.2025
Accepted: 20.08.2025
Epub: 07.10.2025

ABSTRACT

Results: A principal conclusion of this research is that hospital disaster planning should start at the development phase of the hospital and healthcare workers must get regular training to effectively react to crises and catastrophes across all tiers.

Conclusion: The research highlights the significance of proactive disaster planning in hospitals and the need to foresee coordination difficulties that may occur during extensive catastrophes.

Keywords: Disaster planning, earthquakes, emergency service, hospital

ÖZ

görüşmelerinin MAXQDA analiz programı ile kodlanması kriz yönetimi ve bireysel deneyim olmak üzere 2 tema altında toplanmıştır.

Bulgular: Bu çalışmanın en önemli çıktılarından biri deprem gibi can kaybına ve yaralanmaya neden olan afetler için hastane afet planlamasının hastanenin inşaat aşamasından itibaren başlaması ve sağlık çalışanlarının her ölçekteki acil durumlar ile afetlere hazırlıklı olması gerektiğidir.

Sonuç: Araştırma, hastanelerde proaktif afet planlamasının önemini ve felaketler sırasında ortaya çıkabilecek koordinasyon zorluklarını öngörme ihtiyacını vurgulamaktadır.

Anahtar Kelimeler: Afet planlaması, depremler, acil servis, hastane

Introduction

The frequency and severity of catastrophes are rising globally, underscoring the need for nations to improve their disaster planning and response capacities.

On February 6, 2023, two significant earthquakes, both originating in Kahramanmaraş, occurred within a 24-hour period, impacting almost 14 million people throughout many regions. Official records indicate that 53,537 individuals perished (1,2). The earthquakes highlighted the critical function of hospitals in delivering emergency healthcare services, both in the impacted area and in other provinces.

During significant natural catastrophes, the demand for medical services increases, exerting substantial strain on healthcare institutions. Hospitals are essential for preserving lives and providing care to wounded individuals. Consequently, all healthcare facilities must be equipped to manage large casualties and possess contingency plans to maintain operations when resources are strained. The capacity of a hospital to provide optimum patient care during catastrophes relies on efficient collaboration with other institutions and service providers (3).

Recent experiences have shown that inter-institutional coordination is as essential as guaranteeing hospitals provide safe patient care during crises. Hospital emergency management strategies must emphasize catastrophe resilience, guaranteeing that healthcare facilities remain functional and autonomous during crises (4). Notwithstanding insights gained from previous catastrophes and initiatives to enhance healthcare service standards, substantial deficiencies persist in the provision of competent healthcare services during emergencies.

Despite the abundance of literature on hospital disaster preparation and emergency response tactics, little research addresses the enhancement of communication, coordination, and reaction capabilities in hospitals impacted by disasters. Post-disaster phases can provide significant physical and psychological problems for healthcare practitioners (5).

The Kahramanmaraş earthquakes on February 6, 2023, significantly impacted people, especially healthcare professionals, who experienced personal losses and encountered substantial pressure to provide emergency treatment to victims of the calamity. Numerous healthcare workers encountered both sorrow and the need to guarantee an efficient medical reaction.

This research investigates the viewpoints of medical personnel at Kahramanmaraş Sütçü İmam University Faculty of Medicine about their experiences during the earthquakes of February 6, 2023. The aim is to ascertain essential preparations and priorities required for the continuous and efficient provision of healthcare services during emergencies.

Methods

Location of the Study

This study was conducted with volunteer healthcare workers at Kahramanmaraş Sütçü İmam University Faculty of Medicine, the epicenter of the earthquakes. This institution was chosen because it was directly affected by the disaster and played a crucial role in providing uninterrupted healthcare services during the crisis.

Sample of the Study

The study sample consisted of volunteer healthcare workers from Kahramanmaraş Sütçü İmam University Faculty of Medicine. Saturation is important in qualitative studies. Saturation is defined as continuing the research until no different data is obtained from the purposeful sampling methods (6). Data saturation occurs when no new or further insights emerge from the interviews, indicating that the sample size is sufficient (5). In this study, 19 participants (n=19) were interviewed, as the collected data reached a saturation point where further interviews did not yield additional information or new themes.

Hospitals are places where clinicians and non-clinical personnel work. As in normal times, these different disciplines need to work in harmony in times of disaster and emergency. The disruption of non-clinical activities also disrupts clinical services. It is necessary to experience these disruptions and needs, especially in

disaster situations. For this reason, all personnel of the hospital representing the sample of this study were included in the research.

Type of Research

This study employed purposive sampling, a method widely used in qualitative research. This sampling method involves identifying and selecting individuals or groups who are knowledgeable and experienced about the subject of interest (6). The goal was to explore how participants interpreted and made sense of their experiences during the earthquakes. Therefore, the study aimed to approach the topic from the participants' own viewpoints (7,8). The research utilized interviews and observations, which are standard qualitative research techniques. No exclusion criteria were determined other than data saturation for sample.

Implementation of the Research

Data collection was conducted between February 14 and 15, 2024. Each interview lasted between 10 and 30 minutes. Data were collected via voice recordings to ensure accuracy.

Before the interviews, participants were informed about the purpose and significance of the study. They were assured that the information provided would be used exclusively for research purposes and that they could withdraw from the interview at any time. Non-Interventional Clinical Research Ethics Committee of Kocaeli University approved the study (decision no: KOÜ GOKAEK-2024/04.34, number: E-80418770-020-563301, date: 08.03.2024). Verbal consent was obtained before proceeding.

The researchers created an open-ended question pool suitable for the purpose of the study and presented it to 3 experts. The following 6 non-directive questions were determined to be used in the interviews based on expert opinions.

1. Did you know the earthquake risk in the region you work / live in?

2. Did you have any individual or institutional preparations for a disaster of this scale? If so, can you provide brief information?

3. Do you have any training as a healthcare professional regarding what to do during and after a disaster? (If so, what kind of training did you receive?) If yes, to what extent were you able to apply this information on February 6?

4. Can you briefly describe what you experienced / felt as a healthcare professional who was affected by the earthquake? (What actions did you take to continue providing healthcare services, and did you experience any losses or damages during the earthquake?)

5. What were the problems you encountered while providing healthcare services?

6. Based on the incidents you experienced, do you have any suggestions to prevent these problems?

Statistical Analysis

The study used the content analysis method to examine the collected data. Content analysis involves systematically analyzing textual data, identifying patterns, and interpreting meanings within communication materials (9). This process consists of several stages, including defining objectives, identifying key concepts, determining units of analysis, extracting relevant data, developing a logical framework, establishing coding categories, analyzing frequency patterns, interpreting results, and drawing conclusions (10). To facilitate analysis, the MAXQDA 2020 qualitative data analysis software was used. This software enables researchers to efficiently process, code, and visualize qualitative data.

Before transferring the data to MAXQDA, the audio recordings were transcribed using a web-based transcription tool. The transcribed data were then reviewed separately by multiple researchers to ensure accuracy. Next, the transcribed text was imported into MAXQDA, where it was coded systematically.

Each interview was assigned specific coding keys, and as new codes emerged, previously coded transcripts were re-examined to refine the coding structure. This iterative approach minimized the risk of data loss during the analysis process (7).

Results

A total of 19 participants were interviewed for this study. Each participant's responses were anonymized and represented using the identifiers P1, P2, P3,… to maintain confidentiality.

Demographic Information

Table 1 presents the demographic characteristics of the 19 participants, including relevant variables such as age, gender, profession, and years of experience.

To maintain confidentiality, participant responses were anonymized and represented using the identifiers P1, P2, P3,….

Thematic Analysis

The qualitative data obtained from participant interviews were analyzed using the MAXQDA program. The findings were categorized under two main themes:

- Crisis Management
- Individual Experience

Each theme was further divided into categories with corresponding codes (Table 2). In total, 500 codes were generated, providing a comprehensive representation of participants' perspectives. Schematic representations of the hierarchical code-subcode model are presented in Figures 1 and 2.

Individual Experience Theme

Participants' opinions were grouped into three categories: earthquake knowledge and awareness, preparedness, and post-earthquake experiences. All participants reported awareness of the region's seismicity, yet stated that the earthquake exceeded

Table 1. Demographic data of participants

Interview	Gender	Age	Position / Department	Title	Marital Status
P1	Male	40+	Anesthesiology and Reanimation	Doctor (Assoc. Prof.)	Married
P2	Male	40+	Cardiology	Doctor (Prof. MD.)	Married
P3	Male	40+	Physical Medicine and Rehabilitation	Doctor (Assoc. Prof.)	Married
P4	Female	30-40	Operating Theater	Nurse	Married
P5	Male	30-40	Information Technology	Engineer	Single
P6	Male	30-40	Chief Physician	Chief Manager	Married
P7	Male	20-30	Intensive Care Unit	Nurse	Married
P8	Male	20-30	Intensive Care Unit	Nurse	Married
P9	Male	40+	Emergency Medicine	Doctor	Married
P10	Female	30-40	Emergency Service	Charge Nurse	Married
P11	Female	30-40	Director of Nursing Services	Nurse	Married
P12	Female	20-30	Chief Pharmacist	Pharmacist	Married
P13	Female	40+	Anesthesia	Doctor	Married
P14	Male	40+	Orthopedics and Traumatology	Doctor	Married
P15	Male	30-40	Head Nurse	Nurse	Married
P16	Male	40+	Deputy Chief Physician	Doctor	Married
P17	Female	20-30	Anesthesiology and Reanimation	Assistant Doctor	Married
P18	Female	30-40	General Surgery	Nurse	Married
P19	Female	40+	Radiology	Doctor	Married

Table 2. Theme, category and code data of MAXQDA

Theme	Category	Sub-category		Participant opinions	
		Number	Percentage (%)	Number	Percentage (%)
Crisis management	Problems and difficulties during and after the earthquake	48	22.64	133	26.33
	Positive situations during and after the earthquake	22	10.37	93	18.41
	Institutional preparation before earthquake	13	6.13	41	8.11
	Healing - regulatory suggestions	49	23.11	107	21.18
Individual experience	Earthquake information - awareness - preparation	9	4.2	50	9.90
	Positive situations after the earthquake	7	3.30	12	2.37
	Adverse situations after the earthquake	64	30.18	64	12.67
Total sub-category / code		212		500	

expectations. They indicated that they followed news sources on the anticipated earthquake and safe zones, considered seismic risk when choosing residences, and made limited preparations, often neglecting drills and comprehensive measures.

Positive aspects highlighted were strong solidarity among colleagues, adequate provision of basic needs (food, clean water, sanitation), and safe areas for family members within the hospital. Conversely, some participants noted difficulties such as unmet basic needs, hygiene problems, and feelings of loneliness and abandonment in the first 24 hours. All participants expressed grief over the loss of colleagues and relatives, and emphasized the strain of working while being victims themselves. Seasonal hardships, limited social awareness, and challenges faced by female staff in balancing family responsibilities while on duty were also underscored.

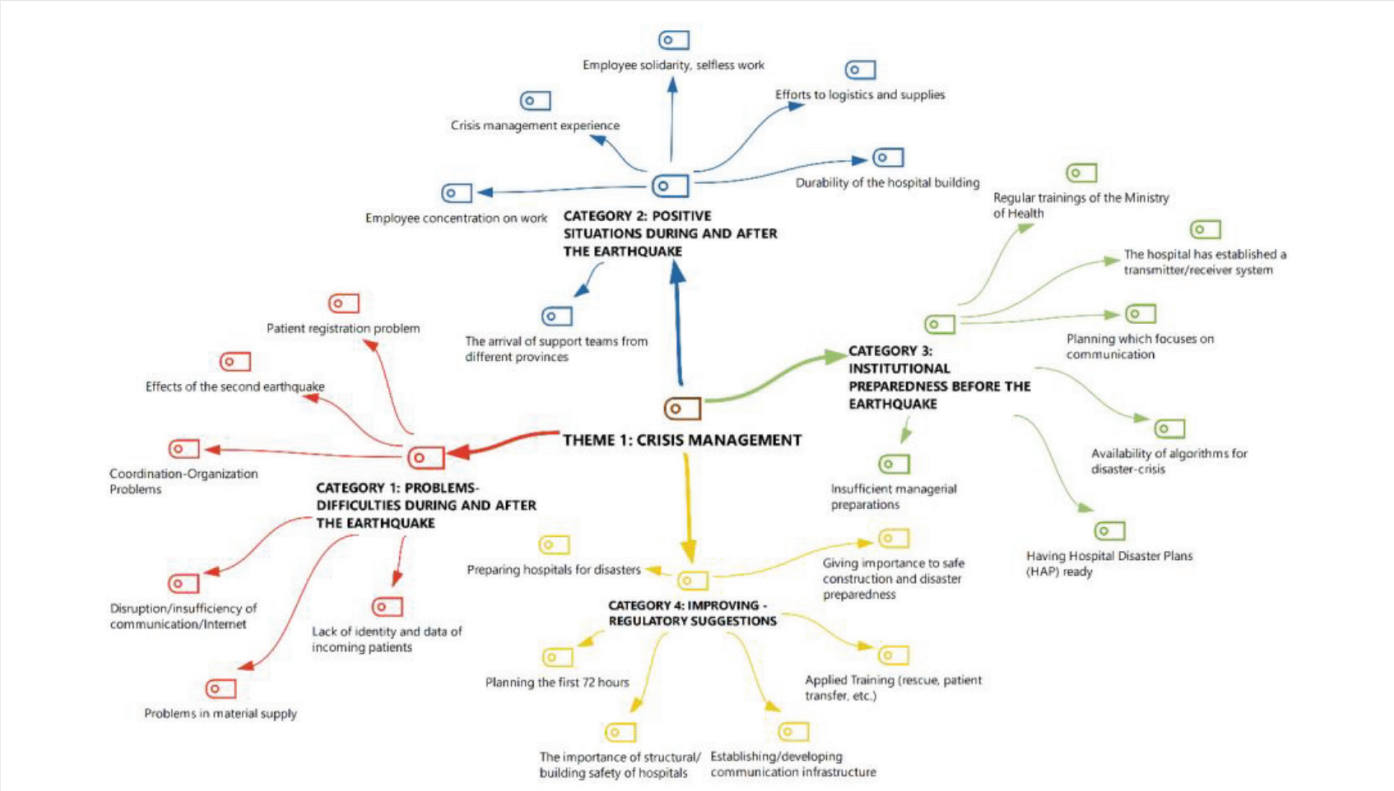

Figure 1. Crisis management theme code-subcode model

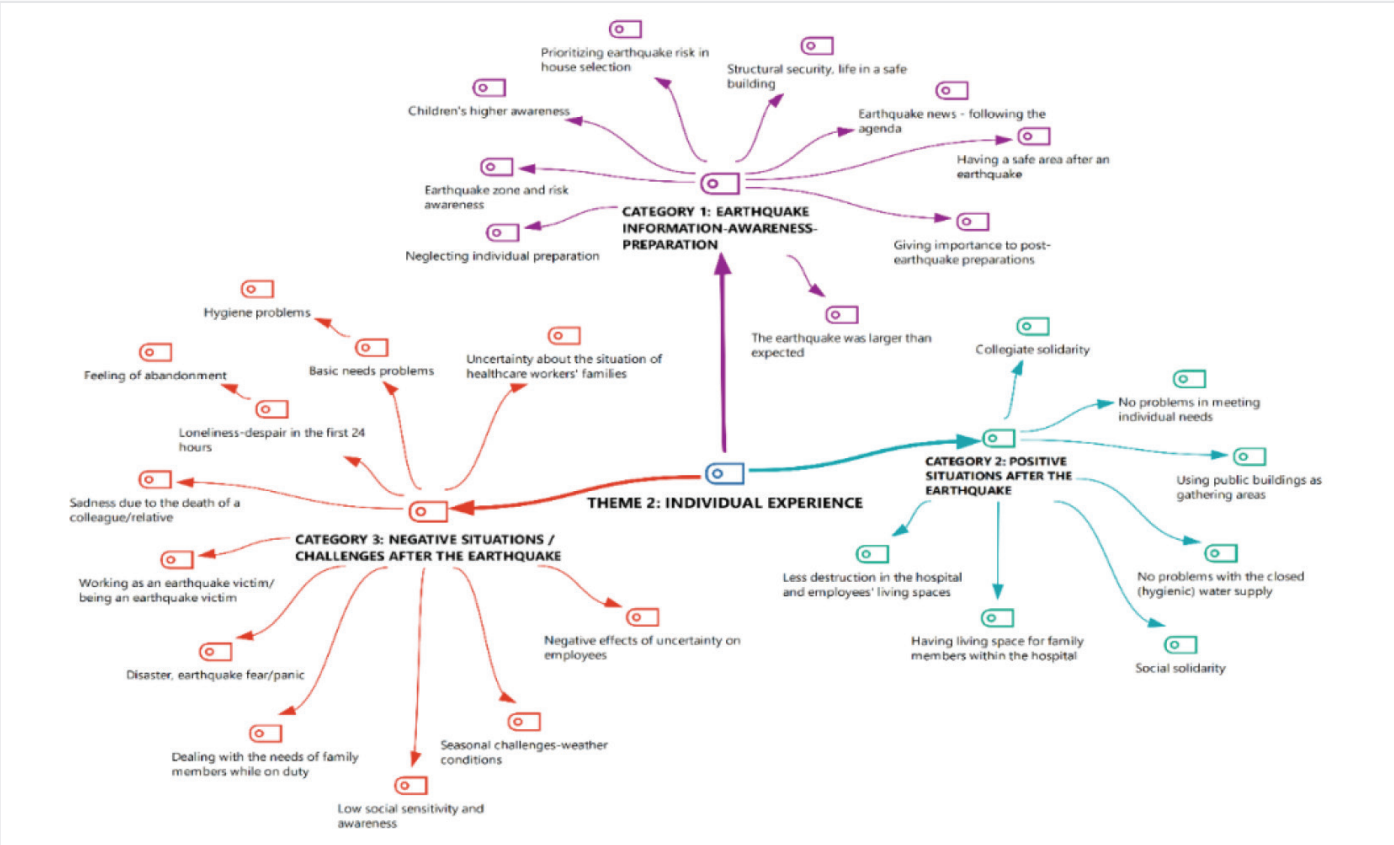

Figure 2. Individual experience theme code-subcode model

Crisis Management Theme

Nineteen participants reported issues primarily categorized as problems, challenges, and remedial suggestions during and after the earthquake (Table 2). The main difficulties included patient registration problems, lack of patient identity data, poor coordination and organization, communication breakdowns, material shortages, and the disruptive impact of the second earthquake occurring on the same day. These deficiencies revealed that disaster response proved insufficient in terms of health system planning.

Other challenges involved the overwhelming patient influx in the first 24 hours, delays in external team and material support due to winter conditions, and difficulties in team coordination. Hospital damage during the second earthquake further weakened medical capacity, especially regarding hygiene and sterilization.

Despite these constraints, participants reported high motivation, solidarity, and dedication in maintaining healthcare services. They recommended that hospital infrastructure be strengthened with earthquake-resistant design, communication systems be established with disaster-oriented planning, and the first 72 hours be organized with realistic self-sufficiency in mind. Furthermore, hospital disaster plans (HDP) and training content should be updated for practical, large-scale disaster scenarios.

Discussion

The 1999 earthquakes and the process that followed revealed many deficiencies in Türkiye's disaster management. These deficiencies observed in the disaster area and specific to the disaster revealed the need for coordination and organization in Türkiye's disaster management, especially in the response process. The heavy damage suffered in the 2023 earthquakes created discussions about whether these deficiencies were remedied. Some studies evaluating the development of Türkiye's disaster response capacity after the 2023 earthquakes described the earthquakes as seismic events that tested and shaped Türkiye's disaster management strategies (11).

The "Emergency Medicine Specialists Field Observation Report 2023" by the Turkish Association of Emergency Medicine Specialists highlighted several critical issues on the initial day of the earthquakes: inadequate preparedness for earthquake zone assessments, insufficient coordination, transportation constraints, and a deficiency in essential equipment, materials, and personnel within the affected area (12,13). A significant number of the concerns highlighted in the report coincide with the results of our investigation.

Following the first day, most volunteer health teams were unable to reach the earthquake zone due to damage to highways caused by the earthquake, poor winter road conditions, and a significant presence of private cars. Numerous routes were evaluated for road transportation; however, most of these routes lacked access to the area. The highway routes were often altered based on the data acquired from the area. Within the first 24 hours post-earthquake, military and civilian evacuation planes were used to convey persons to the impacted areas. Most airports in the earthquake zones incurred substantial damage within 20 hours of the seismic event. In the subsequent days, there was a deficiency of healthcare personnel in the disaster-affected areas due to the tragic loss of lives, families, or homes among many healthcare workers in those regions. The lack of cooperation in the disaster-affected regions, together with the approach of winter, obstructed the prompt arrival of external health personnel.

Furthermore, this research indicated that regional communication, particularly internet-mediated services, which were disrupted by structural damage and power outages resulting from the earthquake, could only be restored partly and regionally by the end of the first day. Hospital information management systems (HIMS) facilitate patient registration and identification, generate forensic reports, issue death notifications, conduct consultation processes, produce burial certificates, and schedule exams. Subsequent to the earthquake, the internet and energy infrastructures were compromised, particularly in the municipalities of Hatay, Adıyaman, and Maraş, resulting in the inability to conduct patient transactions via the HIMS. Communication inside the same institution was fraught with problems, achievable alone via individual effort. Notification systems were reported as disabled, resulting in difficulties in identifying the deceased and wounded.

Disel et al. (14) did research examining the impact of the February 6, Kahramanmaraş earthquakes on patient outcomes. Their work, "Factors Affecting the Mortality of February Earthquake Victims in Türkiye", significantly contributes to the literature on disaster medicine.

This study revealed a notably innovative and alarming finding: unidentified patients face increased risks, including higher instances of entrapment under debris, classification with a red triage code, the need for hemodialysis, emergency surgical procedures, and elevated mortality rates relative to other groups.

Disaster victim identification is an essential component of handling casualties in the domain of disaster science. This includes immediate medical care, advanced treatments like dialysis and surgery, and the creation of transfer systems.

Azarmi et al. (15) asserted that senior managers regard preventive planning and risk preparedness as critical elements of hospital disaster management, advocating for comprehensive studies that encompassed all hazards, stages, and levels of disaster risk management. The study examined the challenges faced in hospital disaster risk management, categorized into technical-physical, organizational-managerial barriers (including planning, surge capacity, communication, coordination, and regulatory compliance), financial barriers (encompassing budget, political will and commitment, cultural factors, motivation, and knowledge), and human barriers (covering training and exercises, commitment, motivation, cultural influences, and personnel shortages). These results aligned precisely with the perspectives of the participants in the current

research (15). Melnychuk et al. (16) examined the adverse conditions encountered in hospitals affected by disasters, categorizing them as power outages, loss of heating, ventilation, and air conditioning, fluctuations in temperature and air quality, loss of health information and technology, communication failures, workforce reductions, material shortages (disruptions in logistics and supply chain management), vulnerabilities, and both structural and non-structural damages. The titles corresponded with the themes articulated by participants in our research on the adverse circumstances they encountered during and after the tragedy (16). Adelaine et al. (4) asserted in their research that a hospital's capacity to provide optimal patient care during emergencies depends on its proficiency in coordinating with other institutions and service providers, highlighting the impracticality of depending on such partnerships in crisis situations. This discovery corroborated the coordination experiences of our participants (4).

Study Limitations

In this study, Kahramanmaraş Sütçü İmam University Faculty of Medicine Hospital employees were asked about their experiences and behaviors immediately after the February 06, 2023 earthquakes. These behaviors might not be representative of all employees. Therefore, the results could not be generalized.

Conclusion

Earthquakes are occurrences that impact communities, resulting in loss of life, but also enhancing the resilience of the affected community for future disasters. The Kahramanmaraş earthquake on February 6, 2023, resulted in significant devastation and fatalities in our nation. The extent of the impact zone of the event, the significant effects on adjacent provinces comparable to the epicenter, delays in response attributable to meteorological conditions, and, crucially, the coordination challenges encountered due to the unprecedented scale of the disaster, underscore the necessity for enhancements in our nation's disaster management system and HDP. A key finding of this study is that hospital disaster planning must commence during the construction phase to address disasters that result in fatalities and injuries, such as earthquakes, and healthcare professionals should be equipped to handle emergencies and disasters of all magnitudes. During a disaster, there is a sudden increase in hospital load. One of the most important steps that prevents hospitals from responding effectively to disasters is the sudden increase in capacity known as surge capacity. In disaster preparations, HDP based on scenarios specific to different events such as simulations, incident command systems, disaster triage, epidemic disease interventions, decontamination, mass incident management, surge capacity, and terror-war situations, should be prepared to cover all hazards and all stages of disaster management and supported with training and drills.

Ethics

Ethics Committee Approval: Non-Interventional Clinical Research Ethics Committee of Kocaeli University approved the study (decision no: KOÜ GOKAEK-2024/04.34, date: 08.03.2024).

Informed Consent: Verbal consent was obtained before proceeding.

Acknowledgment

The authors express gratitude to Prof. MD. Alptekin YASIM, Rector of Kahramanmaraş Sütçü İmam University; Prof. MD. Hafize ÖKSÜZ, Dean of the Faculty of Medicine; and other healthcare professionals who persist in delivering medical services in challenging circumstances during and after the earthquake.

Footnotes

Authorship Contributions

Surgical and Medical Practices: S.G., A.Y., S.Y., Ç.Ç., Concept: S.G., A.Y., Design: S.G., Data Collection or Processing: A.Y., S.Y., Ç.Ç., Analysis or Interpretation: S.Y., Ç.Ç., Literature Search: S.G., S.Y., Writing: S.G., S.Y.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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