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The Impact Of The Düzce Earthquake On Emergency Department Patient Load And Process Management

Düzce Depreminin Acil Servis Hasta Yükü Ve Süreç Yönetimi Üzerindeki Etkisi

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Abstract

Objective: Emergency health services are important in increasing the chance of survival of the sick and injured and preventing deaths during earthquakes and natural disasters.Within the scope of this research, we aimed to analyze the emergency service admissions during the Düzce Gölyaka earthquake disaster in November 2022 and improve our efficiency in the emergency service and trauma room.

Method: A total of 31 patients applied to Sakarya Training and Research Hospital following the 5.9 magnitude earthquake that occurred in the Gölyaka district of Düzce have been enrolled in this retrospective analysis. The trauma mechanism the patients were exposed to following the earthquake, the duration of admission to the hospital, the pathology detected, the treatment applied, the consultations requested, and the hospitalization or discharge status were recorded andanalyzed.

Results: Within the scope of the study, 31 patients affected by the earthquake were evaluated. The ages of the patients ranged from 12 to 75, with a mean age of 37 years. The gender distribution of the patients was as follows: 12 (38.7%) female and 19 (61.3%) male. The distribution of demographic and clinical findings according to the time of admission to the hospital is elaborated in Table 1. When the table is examined,it was determined that there was a statistical difference between the two groups regarding hospitalization, discharge, surgical procedure, and soft tissue trauma within 0 – 1 hour and 1 – 6 hours of admission ($p<0.05$).

Conclusion: In the face of this extremely diverse and severe patient profile, the presence of well-trained and experienced personnel in disaster medicine in emergency services and the presence of pre-preparedness can reduce mortality and morbidity in future disasters. The main purpose of emergency aid is to save many human lives in a short time and to meet basic urgent needs.

Keywords: Earthquake, Emergency Service, Trauma Room, Triage, Disaster Management.

Özet

Amaç: Acil sağlık hizmetleri, deprem ve doğal afetlerde hasta ve yaralıların yaşama şanslarının artırılması, ölümlerin önlenmesi açısından önemlidir. Bu araştırma kapsamında Kasım 2022'de Düzce Gölyaka deprem felaketi sırasında acil servis başvurularını analiz ederek acil servis ve travma odasında süreçlerimizi verimlilik açısından iyileştirmeyi amaçladık.

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Yöntem: Düzce'nin Gölyaka ilçesinde meydana gelen 5.9 büyüklüğündeki depremin ardından Sakarya Eğitim ve Araştırma Hastanesi'ne başvuran toplam 31 hasta retrospektif olarak yapılan bu analize dahil edildi. Hastaların deprem sonrası maruz kaldıkları travma mekanizması, hastaneye yatış süreleri, saptanan patoloji, uygulanan tedavi, istenen konsültasyonlar, hastanede yatış veya taburcu olma durumları kayıt altına alınarak analiz edildi.

Bulgular: Çalışma kapsamında depremden etkilenen 31 hasta değerlendirildi. Hastaların yaşları 12 ile 75 arasında değişmekte olup, ortalama yaş 37'dir. Hastaların cinsiyet dağılımı 12 (%38.7) kadın, 19 (%61.3) erkek olarak bulundu. Başvuru süresine göre gruplandırılan hastalarda iki grup arasında hastaneye yatış, taburculuk, cerrahi girişim ve yumuşak doku travması0 – 1 saat ve 1 – 6 saat başvuru süreleri arasındaistatistiksel anlamlı farklılık saptanmıştır ($p<0.05$).

Sonuç: Deprem sırasında birbirinden farklı ve ağır hasta profili karşısında, acil servislerde afet hekimliği konusunda iyi eğitimli ve deneyimli personelin bulunması ve önceden hazırlıklı olunması, gelecekteki afetlerde mortalite ve morbiditeyi azaltabilir. Acil yardımın temel amacı kısa sürede çok sayıda insanın hayatını kurtarmak ve temel acil ihtiyaçları karşılamaktır.

Anahtar Kelimeler: Deprem, Acil Servis, Travma Odası, Triyaj, Afet Yönetimi.

INTRODUCTION

Although earthquakes can occur in any place and time, the places where they are seen intensely constitute three main belts. These are Pacific Seismic Belt, Alpine-Himalayan Seismic Belt, and Atlantic Seismic Belt (1). Turkey is located on the Alpine-Himalayan Earthquake Belt, which is one of the most active of these. Since we are located on this belt and in the region where the tectonic plates intersect, it can be said, based on the information of the past years our country is a major zonefor earthquakes on average every five years, causing extensive loss of life and property (2).

Considering that medical emergencies, violent events, and disasters frequently occur today, Emergency health services are important in increasing the chance of survival of the sick and injured and preventing deaths (3). Regardless of their social and economic status, people need emergency health care in the best possible way when they encounter emergencies. The way to provide instant health service to everyone in need is to establish a central organization. Providing the service from a single source will achieve minimum cost and maximum gain (4). Thanks to this organization, in the event of a disaster, it will be more possible to ensure the safety of the victims' lives and then meet their basic needs such as food and shelter. One of the main objectives is that the interventions to be made are programmed, sustainable, and practices that strengthen the society's resources (5).

It should be remembered that all health institutions will be overloaded in the first hour or minutes because of the patients who reach the emergency services. However, patients requiring major or intensive care will come from the rear as the debris is removed or from other nearby villages. For this reason, it is necessary to direct the patients to the emergency room quickly (6). According to the triage rules, the slightly injured are immediately sent to the outpatient clinics. No time is wasted for patients whose condition is very bad and who have no chance of survival. Because the aim is to help more injured people with limited means, the senior doctor in charge of triage can decide this by looking at the patient's face. The patients do not request blood tests, and X-rays are not taken unless necessary. For example, if a fracture is not very complicated, it is just splinted and sent home, anddefinitive treatment is performed the next day (7).

One of the groups that should be given the most importance in disaster situations is the media, and the other is the relatives of the patients. Both groups are right in their expectations. Media members must inform the public by passing the most accurate news to their center as soon as

possible. But this requirement should allow doctors to work properly (8). For this reason, a center with a very good communication network should be established in the hospital. The hospital's social worker constantly conveys fresh and accurate news to these people. A constant flow of information should be ensured by establishing a center within the hospital for the accompanying persons. In other words, people who are not sick should be prevented from entering the patient care area (8 – 10).

Within the scope of this research, we aimed to analyze the emergency service admissions during the Düzce Gölyaka earthquake disaster in November 2022 and improve our processes in terms of efficiency in emergency service and trauma room. We believe the outcomes of this study will provide a road map for emergency service management measures following natural disasters.

METHOD

A total of 31 patients applied to Sakarya Training and Research Hospital following the 5.9 magnitude earthquake that occurred in the Gölyaka district of Düzce have been enrolled in this retrospective analysis.

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Ethics committee approval has been granted from our institution with protocol number 216243-29, andinformed consent has been obtained from all participants.

The trauma mechanism the patients were exposed to following the earthquake, the duration of admission to the hospital, the pathology detected, the treatment applied, the consultations requested, and the hospitalization or discharge status were recorded andanalyzed.Emergency service application hours (0 – 1. hour and 1 – 6. hours) were also examined in line with the records.

Statistical Analysis

Patient data collected within the scope of the study were analyzed with the IBM Statistical Package for the Social Sciences (SPSS) for Windows 23.0 (IBM Corp., Armonk, NY) package program. Frequency and percentage for categorical data and mean and standard deviation for continuous data was given as descriptive values. "Independent Sample T-Test" was used to compare groups, and "Fisher's Exact Test or Chi-Square Test" was used to compare categorical variables. The results were considered statistically significant when the p-value was less than 0.05.

RESULTS

Within the scope of the study, 31 patients affected by the earthquake were evaluated. The ages of the patients ranged from 12 to 75, with a mean age of 37years. The gender distribution of the patients was as follows: 12 (38.7%) female and 19 (61.3%) male.

The distribution of demographic and clinical findings according to the time of admission to the hospital is elaborated in Table 1. When the table is examined,it was determined that there was a statistical difference between the two groups regarding hospitalization, discharge, surgical procedure, and soft tissue trauma within 0 – 1 hour and 1 –6 hours of admission ($p<0.05$).

Table 1. Distribution of Demographic and Clinical Findings by Patients' Application Times

	Total (N=31)	Application Time (0 – 1 hour) (n=14)	Application Time(1 – 6 hours) (n=17)	p-value
	n (%) or Median±SD	n (%) or Median±SD	n (%) or Median±SD	
Age *(years)*	37±19	36±23	38±16	0.842
Gender				0.496
Female	12 (38.7)	4 (28.6)	8 (47.1)	
Male	19 (61.3)	10 (71.4)	9 (52.9)	
Reason for application				
Fall	22 (71)	9 (64.3)	13 (76.5)	0.693
High jump	6 (19.4)	3 (21.4)	3 (17.6)	1.000
Hitting object	2 (6.5)	1 (7.1)	1 (5.9)	1.000
Extremity injury	22 (71)	11 (78.6)	11 (64.7)	0.456
Thoracic trauma	2 (6.5)	0 (0)	2 (11.8)	0.488
Head trauma	4 (12.9)	3 (21.4)	1 (5.9)	0.304
Orthopedic emergencies	19 (61.3)	11 (78.6)	8 (47.1)	0.155
Upper Extremity **Fracture**	6 (19.4)	4 (28.6)	2 (11.8)	0.370
Lower Extremity **Fracture**	8 (25.8)	3 (21.4)	5 (29.4)	0.698
Shoulder dislocation	2 (6.5)	2 (14.3)	0 (0)	0.196
Calcaneus Fracture	3 (9.7)	2 (14.3)	1 (5.9)	0.576
Vertebral Fracture	1 (3.2)	1 (7.1)	0 (0)	0.452
Intracranial Hemorrhage	2 (6.5)	2 (14.3)	0 (0)	0.196
Linear Fracture	1 (3.2)	1 (7.1)	0 (0)	0.452
Cot Fracture	1 (3.2)	0 (0)	1 (5.9)	1.000
Consultation unit				
Neurosurgeon **Consultation**	2 (6.5)	2 (14.3)	0 (0)	0.196
Orthopedics Consultation	14 (45.2)	9 (64.3)	5 (29.4)	0.114
Surgeon General Consultation	3 (9.7)	3 (21.4)	0 (0)	0.081
Eye Consultation	1 (3.2)	1 (7.1)	0 (0)	0.452
Admission	6 (19.4)	**6 (42.9)**	**0 (0)**	**0.004**
Discharge	25 (80.6)	**8 (57.1)**	**17 (100)**	**0.004**
Intensive care	2 (6.5)	2 (14.3)	0 (0)	0.196
Surgical	5 (16.1)	**5 (35.7)**	**0 (0)**	**0.012**
Plaster Splint	14 (45.2)	7 (50)	7 (41.2)	0.898
Incision Suture	6 (19.4)	5 (35.7)	1 (5.9)	0.067
Soft tissue trauma	13 (41.9)	**2 (14.3)**	**11 (64.7)**	**0.014**

DISCUSSION

Earthquakes differ from other natural disasters in that they are sudden-onset and destructive. Due to its complex geological structure and geodynamic location, Turkey is one of the regions where earthquakes are most common worldwide, containing many active fault lines.Earthquakes have injured and killed millions of people (11). Adequate and well-timed management by rescuers and health professionals can contribute to reduced disability and death. In earthquakes, the services provided by health professionals are often delayed due to the destruction of roads, damage to hospitals, and inadequate equipment (12).

After the earthquake, there was an increasing number of applications to the emergency health services from the first hours, both due to being under the s with the effect of the devastation and injuries that may occur when people move away from their environment in case of panic caused by a natural disaster (13). It was concluded that crush and sprain injuries, such as soft tissue trauma, are common in injuries caused by earthquakes, and the need for surgical procedures and hospitalization rates in earthquake victims who applied to the hospital within the first hour after the event was significantly higher than those admitted after the first hour. It was concluded that it would be appropriate to plan the emergency service in this direction, considering that there will be more patient admissions, especially in the first hours after the earthquake, and these cases may be complicated cases requiring hospitalization or surgery (14).

In the management of post-earthquake emergency health services, Turkey's Disaster Response Plan at the national level and the National Level Health Service Group Plan; at the local level, Provincial Disaster Response Plans, Local Level Health Service Group Plans, and Hospital Disaster and Emergency Plans have been preparedto clarify the implementation. The main solution partner of the Health Service Group is the Ministry of Health. On the other hand, its responsibility is to coordinate to meet the needs of first response, public health and medical care at the scene in disasters and emergencies and to ensure that environmental health services return to normal as quickly as possible without interruption (15).

The Van Earthquake that took place in 2011 can be considered an example of post-earthquake emergency health services in our country. With the occurrence of the earthquake, SAKOM convened urgently and continued its work on a 24-hour basis. 112 Emergency Medical teams and UMKE personnel in the city center and its districts arrived at the scene in the first 20 minutes. A total of 2.905 health personnel participated, and 24% of them started to work at the scene within the first 24 hours. Again in the first 24 hours, 113 ambulances were on duty. It corresponds to approximately 75% of the ambulances in total. Within the scope of health services,six field hospitals were established in addition to the four hospitals that were not damaged, six field hospitals. UMKE and ambulance teams were present at all the wrecks that were rescued. UMKE teams personally participated in 252 live rescue efforts in both earthquakes and played a major role in transferring 1403 to other provinces by land ambulances and 271 patients by air ambulances (16).

The Hospital Disaster Plan (HAP) was published and put into effect on 20.03.2015 in order to improve the hospital capacity in emergencies and disasters, increase sustainability, increase the service, prevent the panic environment, to make the intervention fast and effective; in short, to ensure that the hospitals are prepared for disasters and emergencies (HAP, 2015). Medical assistance in disasters in Turkey is provided by 112 ambulance teams, UMKE, and other institutions and NGOs participating in the scene. Studies in Turkey started with the Hospital Disaster Plans issued in 2015. Once the disaster occurs, the HAP protocol is applied (17).

A hospital disaster command center should be established once the news is received. Emergency services and all hospital unitsshould be activated according to the plan. Security teams keep the vehicle and human traffic in the hospital under control. Special departments established for the media and patient relatives should initiate a suitable communication network. Continuous coordination is ensured with the city disaster command center, and a person is assigned for this task. One of the most important rules of success in patient care is serious triage practices. Hospitals should have written disaster plans,which should be read and learned very well by those with a duty (in case of a disaster, there is no time to read them, even these books cannot be found to be read). These plans should be tested at least twice yearly (10, 18).

After those hectic moments of the disaster are over, the hospital and especially the emergency service should be restored quickly. Because daily life will be restored, patients will continue to come, or a new disaster may occur at any moment. After that, the hospital's top management should meet with the relevant people to review the failing points and correct the observed deficiencies quickly, without a new disaster (19, 20).

CONCLUSION

In the face of this extremely diverse and severe patient profile, the presence of well-trained and experienced personnel in disaster medicine in emergency services and the presence of pre-preparedness can reduce mortality and morbidity in future disasters.Emergency aid, identifying those affected by the disaster, debris removal, injured rescue, medical first aid and treatment, evacuation, meeting basic vital needs such as shelter, nutrition, protection, heating, communication, psychological support, providing security to prevent chaos and disorder, administrative and activities for the provision of technical support services should be professionally organized. The main purpose of emergency aid is to save many human lives in a short time and to meet basic urgent needs.

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Competing interests: The authors declare that they have no competing interests.

Ethical Declaration: All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Ethics committee approval has been granted from our institution.As this was a retrospective research, no informed consent has been obtained from participants.

REFERENCES

1. Oluwafemi J, Ofuyatan O, Sadiq OM, Oyebisi S, Abolarin J, Babaremu K. Review of world earthquakes. International Journal of Civil Engineering and Technology. 2018;9:440-464.

2. Alper U, Oğlakcı B. Turkey's Earthquake History and Institution Based Earthquake Reduction Policies and Strategies. 2019.

3. Sarı H, Özel M, Akkoç MF, Şen A. First-Week Analysis after the Turkey Earthquakes: Demographic and Clinical Outcomes of Victims. Prehosp Disaster Med. 2023:1-7. doi:10.1017/S1049023X23000493

4. Alisjahbana I, Ceferino L, Kiremidjian A. Prioritized reconstruction of healthcare facilities after earthquakes based on recovery of emergency services. Risk Anal. 2022;5. doi:10.1111/risa.14076

5. Yorulmaz Ş, Korkut S, Tunali Türkdoğan F, Türkdoğan KA. Disaster area triage in the first 24 h of earthquakes, evaluation of pre-hospital and hospital procedures: 6.6 Elazig earthquake. Ulus Travma Acil Cerrahi Derg. 2022;28(8):1122-1127. doi:10.14744/tjtes.2022.91324

6. Danridge L, Greer B. Earthquake! Lab Anim (NY). 2023;52(4):76-77. doi:10.1038/s41684-023-01142-z

7. Ni S, Sun H, Somerville P, et al. Complexities of the Turkey-Syria doublet earthquake sequence. Innovation (Camb). 2023;4(3):100431. doi:10.1016/j.xinn.2023.100431

8. López-Castro B, Haro-Baez AG, Arcos-Aviles D, Barreno-Riera M, Landázuri-Avilés B. A Systematic Review of Structural Health Monitoring Systems to Strengthen Post-Earthquake Assessment Procedures. Sensors (Basel). 2022;22(23):9206. doi:10.3390/s22239206

9. Ehsani B, Karimi H, Bakhshi A, Aghsami A, Rabbani M. Designing humanitarian logistics network for managing epidemic outbreaks in disasters using Internet-of-Things. A case study: An earthquake in Salas-e-Babajani city. Comput Ind Eng. 2023;175:108821. doi:10.1016/j.cie.2022.108821

10. Mousavi SH, Khankeh H, Atighechian G, Yarmohammadian MH, Memarzadeh M. Analysis of the intellectual and social structure of health system response plan to earthquake studies adopting word co-occurrence and narrative approaches. J Educ Health Promot. 2022;11:362. doi:10.4103/jehp.jehp_1632_21

11. Ayhan Y. Healing to Heal - After the Maraş Earthquake. Turk Psikiyatri Derg. 2023;34(1):1. doi:10.5080/u27306

12. Onder RO, Tosun A, Ibıs E. Earthquake-related head trauma: initial consequences of an earthquake disaster. Br J Hosp Med (Lond). 2023;84(2):1. doi:10.12968/hmed.2023.0055

13. Yılmaz S, Karakayali O, Yilmaz S, et al. Emergency Medicine Association of Turkey Disaster Committee Summary of Field Observations of February 6th Kahramanmaraş Earthquakes. Prehosp Disaster Med. 2023;18:1-4. doi:10.1017/S1049023X23000523

14. Korkmaz HA. Public Health Emergencies and Disaster Risk Management: A Rural Experience Following the Earthquake. Turk Arch Pediatr. 2023;58(3):353-354. doi:10.5152/TurkArchPediatr.2023.23061

15. Aydin N, Cetinkale Z. Simultaneous response to multiple disasters: Integrated planning for pandemics and large-scale earthquakes. Int J Disaster Risk Reduct. 2023;86:103538. doi:10.1016/j.ijdrr.2023.103538

16. Zaré M, Nazmazar B. Van, Turkey earthquake of 23 october 2011, mw 7.2; an overview on disaster management. Iran J Public Health. 2013;42(2):134-44.

17. Turkish Ministry of Health, Hospital Disaster Plan Version 2 Date: 14/06/2021, https://dosyasb.saglik.gov.tr/Eklenti/40879,haphazirlamaklavuzusurum214062021pdf.pdf?0 (Accessed at 06/06/2023).

18. Kondo H, Koido Y, Kawashima Y, et al. Consideration of Medical and Public Health Coordination - Experience from the 2016 Kumamoto, Japan Earthquake. Prehosp Disaster Med. 2019;34(2):149-154. doi:10.1017/S1049023X19000177

19. Mousavi SH, Khankeh H, Atighechian G, Yarmohammadian MH, Memarzadeh M. Challenges of prehospital aerial operations in response to earthquake hazards: A qualitative study. J Educ Health Promot. 2022;11:268. doi:10.4103/jehp.jehp_1302_21

20. Yamamura H, Kaneda K, Mizobata Y. Communication problems after the Great East Japan Earthquake of 2011. Disaster Med Public Health Prep. 2014;8(4):293-6. doi:10.1017/dmp.2014.49