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EPIDEMIOLOGICAL DATA OF PATIENTS CONSULTED TO PHYSICAL THERAPY CLINIC INTHE 2023 KAHRAMANMARAŞ EARTHQUAKE

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Abstract: On February 6, 2023, 7.8-magnitude earthquake occurred in Kahramanmaraş, Türkiye. This earthquake was one of the most devastating disasters to hit Türkiye, resulting in an official death count of over 45,000. In this study, we aimed to determine the injury patterns of the patients who were consulted to the physical therapy and rehabilitation clinic after the Kahramanmaraş earthquake, and to ensure that their physicians were better prepared for possible earthquakes. Our study was completed between February and June 2023. All patients, male and female, who had earthquake-related injuries and were consulted to the physical therapy unit were included. Discharged patients were screened retrospectively. Inpatients were investigated prospectively. A total of 220 patients were included in the study. The patients were examined in terms of age, gender, date of application, pain score, time under the dent, complaint at admission, additional disease, type of injury, and treatment applied. Statistical analyzes were performed using SPSS version 22.0 software. The most frequently affected age group was 15-30 years old. The most common complaints were pain, limitation of movement and difficulty in walking. The most common surgical procedures are fasciotomy, internal fixation, and amputation. The most commonly injured limbs are the lower extremities. The most common level of amputation was transtibial amputation. After the earthquake, patients need physical therapy and rehabilitation. The knowledge and experience of the physicians of the relevant branches about the frequently observed injury patterns should be increased. This study is generally in line with most other studies reporting the epidemiology of injury after earthquakes. However, there is no standardization among the studies. Therefore, standardization in reporting earthquake injuries is necessary for evidence-based response policy planning after natural disasters.

Keywords: Earthquake, Kahramanmaraş, Injury prevention

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1. Introduction

On February 6, 2023, an earthquake with a magnitude of 7.8 occurred in the province of Kahramanmaraş in Türkiye. About 9 hours later, another 7.6 magnitude earthquake occurred. The earthquake was the most severe earthquake in more than 80 years in Türkiye. This earthquake was one of the most catastrophic disasters to hit Türkiye and unfortunately resulted in extensive damage. According to the Disaster and Emergency Management Presidency (AFAD), as of March 6, 2023, the Kahramanmaraş earthquake pair resulted in an official death count of over 45,000 in Türkiye, with the total death count exceeding 52,000, including Syria. 105,000 people were injured. Caused 170,000 buildings to be severely damaged or destroyed (Dal Zilio and Ampuero, 2023; Kanwal, 2023). More than 1,000 aftershocks happened, some of which were greater than 6 (Ergani et al., 2023).

Looking at past earthquakes, more than 281 earthquakes occurred in 58 countries between 1996 and 2005. Similar to the numerical data in the 2023 Kahramanmaraş earthquake, the number of injured in these earthquakes is 3 times more than the dead. Immediate effective medical attention can significantly affect injury patterns and death rates in earthquakes (Lechat, 1979; Lechat, 1990; Guha-Sapir and Vos, 2010).

The quality of life of people after the earthquake is significantly affected. In particular, adequate and correct management of the damage caused by trauma on the human body is very important to reduce disability. Epidemiological information about the injury pattern from past earthquakes is crucial for preparedness and effective response to potential earthquakes in regions where resources are scarce. Thanks to the epidemiological data obtained from post-earthquake injury patterns, hospitals can be prepared for possible earthquakes, and disability and mortality can be reduced. Although many earthquake victims suffer injuries that require treatment, there are large gaps in knowledge

regarding the epidemiology of earthquakes. It is essential to evaluate the data collected after the earthquake in the planning phase of the health demands of the earthquake area (Kanwal, 2023). Epidemiological studies on earthquakes guide the planning and organization of health services for hospitals located in and around the earthquake area. By knowing the injury patterns that will occur after the earthquake, the effectiveness of the early and specific treatments to be applied to the earthquake victims can be increased significantly. In this way, complications, disability and mortality rates that may occur in future natural disasters can be reduced. The aim of this study is to record the injury patterns and treatments of the patients who were consulted to the physical therapy and rehabilitation clinic after the 2023 Kahramanmaraş earthquake in our country, which is an earthquake zone, and to ensure that the physical therapy physicians meet the possible earthquakes in a more knowledgeable, experienced and prepared manner.

2. Materials and Methods

In this study, the study population consists of earthquake survivors who were consulted to the physical therapy unit, who applied to Kayseri City Education and Research Hospital after the 2023 Kahramanmaraş earthquake. All age group patients, male and female, who had earthquake-related injuries and were consulted to the physical therapy unit were included in our study. Our study included both earthquake survivors who were consulted before the study (their files were scanned retrospectively) and newly registered patients (by obtaining voluntary consent form signatures). A total of 220 patients who were hospitalized due to injury and illness due to the 2023 Kahramanmaraş earthquake and were consulted to the physical therapy unit were examined.

The patients were examined in terms of age, gender, date of application, pain score (VAS), time under the dent, complaint at admission, additional disease, type of injury, and treatment applied. Statistical analyzes were performed using SPSS version 22.0 software. For normally distributed variables, mean and standard deviation (mean ± SD) were used. Median and minimum-maximum values were used for variables that did not show normal distribution.

3. Results

In terms of age and gender distribution, 117 (53.2%) women and 103 (46.8%) men were examined in our study. The number of pediatric patients was 43 (19.5%), and the number of patients over 65 years old was 23 (10.4%). The mean age of our patients was 34.62±19.37. According to the age distribution of the patients, the most affected group was between the ages of 15-30. The most common presenting complaint in our patients was pain. The distribution of patients' pain levels is presented in Figure 1. The most common complaint after pain was limitation of movement and gait disturbance. The injury patterns and frequency of our patients are presented in Figure 2.

Our patients were questioned in terms of their comorbidities. 16 (7.3%) had diabetes mellitus, 4 (1.8%) had coronary artery disease, and 1 (0.5%) had asthma. The mean time spent under the dent was 22.19 hours (Figure 3). Skin integrity was impaired in 39.5% of our patients, sensory disturbances in 37.7%, and limitations in joint range of motion at 47.3%.

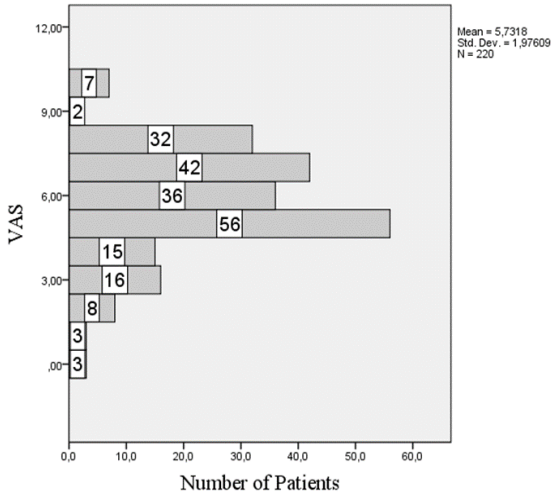

Figure 1. Distribution of pain levels of our patients.

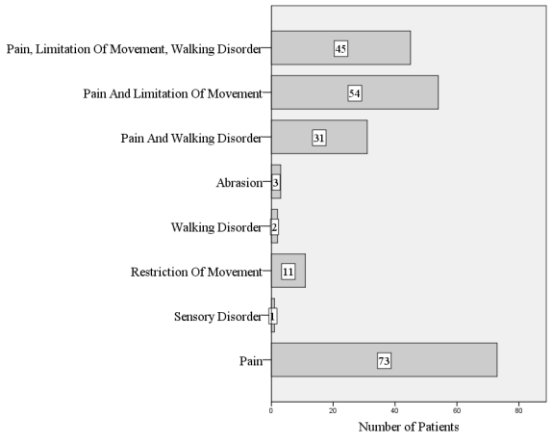

Figure 2. Injury patterns and frequency of our patients.

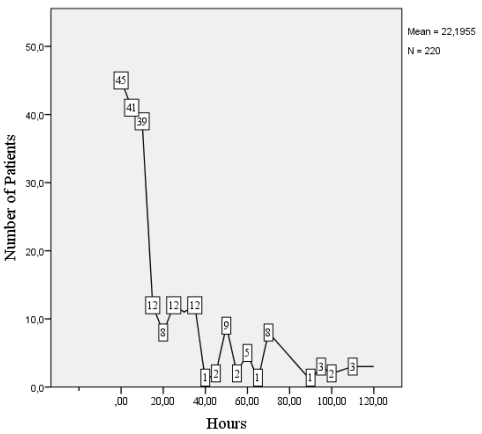

Figure 3. Distribution of patients according to the time under the dent.

When we examine our patients in terms of the type of treatment applied after the earthquake; 69 patients (31.4%) were followed up conservatively. Fasciotomy in 47 patients (21.4%), spinal posterior instrumentation in 11 patients (5%), amputation in 29 patients (13.2%), internal fixation in 57 patients (25.9%), external fixation in 4 patients (1.8%), 3 patients (1.4%) underwent closed reduction (Figure 4).

In our study, 40 (18.2%) of 220 patients examined had compartment syndrome, and the most common complaints were paresthesia, pain, and pallor. According to the body part injured after the earthquake; the most common extremity injury was observed in 83.2% (183 patients). Of the extremities, the legs were most commonly affected. Trunk injury was observed in 34 (15.5%) patients, and head injury was observed in 1 (0.5%) patient. Of the patients with trunk injuries, 13 (5.9%) injuries were to the spine, 11 (5%) to the costa, 10 (4.5%) to the abdomen. When we look at the distribution of patients who underwent amputation; the most common type of amputation was transtibial amputation. The distribution of patients undergoing amputation according to the level of amputation is presented in Figure 5.

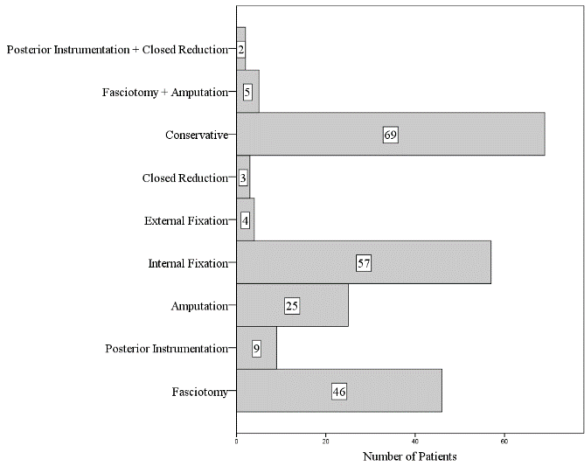

Figure 4. Distribution of patients according to the type of operation performed.

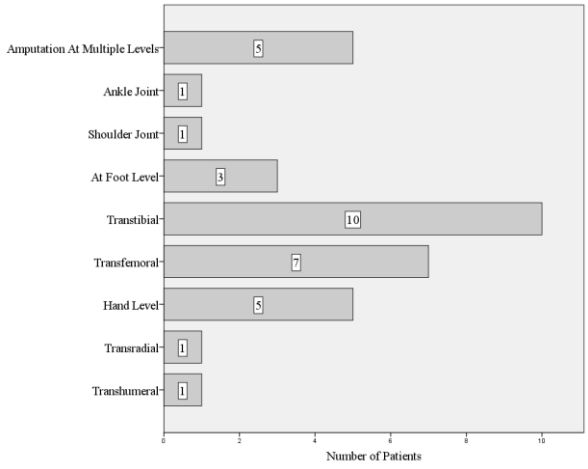

Figure 5. Distribution of patients by amputation level.

4. Discussion

In our study, the age group most frequently affected by the earthquake was between the ages of 15-30. The most common complaints were pain, limitation of movement and difficulty in walking. At least one third of our patients were accompanied by deterioration of skin integrity, sensory disturbances, and limitation of joint range of motion. Most of the patients were removed from the dent in the first 24 hours. The most common surgical procedures was fasciotomy, internal fixation, and amputation. The most frequently injured limb was the lower extremities. In relation to this, amputation, fasciotomy and internal fixation were most frequently applied to the lower extremity. The most common level of amputation was transtibial amputation.

When we look at natural disasters around the world, 552 earthquakes have occurred in the last 20 years, accounting for 8% of all disasters. Although earthquakes have a low percentage of the total number of disasters worldwide, they are among the deadliest events that can cause megadisasters that kill tens to thousands of people (Mavrouli et al., 2023).

The destructive power and consequences of earthquakes can be very catastrophic. Therefore, taking the necessary precautions can reduce the number of injured and dead. In a study, it was shown that mortality can be significantly reduced by effective intervention, especially in the first 6 hours after an earthquake. Therefore, a comprehensive plan should be made for coordinated work and effective intervention after the disaster. In every disaster, it is very important to identify patients in need of treatment and refer them to medical institutions that are not affected by the earthquake. In this systematic order, approximately 90% of patients who receive care within the first 24 hours survive (Haynes et al., 1992; Emami et al., 2005).

After a severe earthquake, the local health system may not be able to keep up with the increased demand, causing overcrowding of hospitals and consequent problems in the health system. Hospitals located further away from disaster areas after natural disasters have an important role in supporting the injured. With the preparation of these hospitals for the earthquake, better health care can be provided to the injured patients coming from the earthquake area. To provide better treatment services in hospitals adjacent to the earthquake zone, the organization that will meet the needs of the earthquake zone is of great importance. Evaluation of the data collected after the earthquake is essential for a successful earthquake preparation organization. Kayseri City Education and Research Hospital, for which we are planning this study, is a large health complex adjacent to earthquake zones. In our study, the injury characteristics of earthquake survivors were examined. Thanks to these examinations, adequate medical equipment can be made available in hospitals for the common type of injury. Increasing the knowledge and experience of doctors and health workers regarding

intervention to observe injury patterns could ensure that they are preparing for a possible disaster.

In our study, injury was most common in the lower extremity. Similarly, the lower extremities were most frequently injured in the 1999 earthquake in the Sea of Marmara in Türkiye, the Barakott earthquake in Pakistan, the Bam earthquake in Iran, and the Wenchuan earthquake in China. Serious injuries such as head, chest, abdomen and crush syndrome were observed less frequently (Emami et al., 2005; Bai and Liu, 2009; Yang et al., 2009). However, the frequency of complications such as crush injury, multiple fractures, head, spine, pelvis and abdomen injuries, rhabdomyolysis, acute kidney failure and death in a larger area increases in patients who cannot be removed from the dent in the early hours (Emami et al., 2005).

In our study population, the percentage of pediatric patients was 19.5%, and the percentage of patients over the age of 65 was 10.4%. In a study conducted after the 2008 Wenchuan earthquake, 15% of the patients who applied were children and 15% were over 65 years old (Yang et al., 2009). The reason why the patient population was younger in our study may be due to the intense migration of the Kahramanmaraş earthquake region and the higher fertility potential in this region. Although in our study, similar to the study of Naghi et al. in 2003 Iran Bam earthquake, slightly female gender was dominant (female/male:1.1); other post-earthquake studies had slight male predominance (Emami et al., 2005; Naghi et al., 2005; Bozkurt et al., 2007). The mean age of the patients in our study was 34.6 years. In many post-earthquake epidemiological studies, the mean age ranged from 30-40 (Emami et al., 2005; Sarı et al., 2023). These data show that our study is not very different from the literature.

Due to the existence of various forms of bending and stretching of the body parts in the earthquake, the characteristics of the injured areas during the earthquake are extremely complex. The dermal abrasion healed with a simple dressing, and the fractures were successfully treated with closed reduction. It can occur in patients who require fasciotomy and amputation or who die due to acute renal failure or multi-organ injury. Soft tissue and extremity injuries are the most common type of injury observed in earthquakes and are an important cause of morbidity. Crush injuries and fractures occur mostly in the lower and upper extremities in earthquakes (Gonzalez, 2005; Yang et al., 2009). Therefore, compartment syndrome and fasciotomy operations are frequently observed with crush injury in earthquakes.

Compartment syndrome is a painful condition caused by increased pressure within the closed osteofascial space. It can be both acute and chronic. Acute compartment syndrome is a condition that may require emergency surgery, and soft tissue necrosis and permanent disability can occur if pressure is not rapidly reduced (Via et al., 2015). It can even result in death (Schwartz et al., 1989). Compartment syndrome is associated with high mortality and emergency diagnosis and treatment are very important. Fasciotomy performed in compartment syndrome can be life-saving and prevent some of the serious and dangerous complications (Duman et al., 2003). In our hospital, we frequently encountered patients who underwent fasciotomy and amputation after the earthquake. Of the 220 earthquake survivors we evaluated, 59 (26.8%) had fasciotomy and 33 (15%) had amputation. According to another study conducted in the earthquake region after the 2023 Türkiye Kahramanmaraş earthquake, 338 patients were examined. Of these, 47 (13%) underwent fasciotomy and 39 (12%) underwent amputation (Akkaya et al., 2023). In our study, fasciotomy and amputation rates were higher than in this study. We think that this is due to the fact that our hospital is not located in the earthquake zone, but because it is a large hospital close to the earthquake zone, patients who stay under the collapse for a longer time, are more risky and have more severe injuries are referred to our hospital from the earthquake zone. In one study, it was reported that the risk of amputation increased by 8.8 times in earthquake victims who were removed from the dent more than 23 hours later (Bingol et al., 2023). This shows the importance of the relationship between prognosis and recovery time in earthquake victims. Early recovery is very important for a more successful treatment management in future disasters.

5. Conclusion

The knowledge and experience of physiatrists and other health workers regarding frequently observed injury patterns after earthquakes should be increased. This study is generally coherent with most other studies reporting the epidemiology of injury after earthquakes. However, there is no standardization among the studies. Therefore, standardization in reporting earthquake injuries is necessary for evidence-based response policy planning after natural disasters.

Limitation

The distribution of patients to many hospitals has reduced the burden of hospitals in the earthquake area. But this made it difficult to conduct epidemiological research. This was because the patients had studied were transported to too many hospitals to allow the sample to be representative of the entire population.

Author Contributions

The percentage of the author(s) contributions is presented below. All authors reviewed and approved the final version of the manuscript.

	A.G.	M.K.	H.T.Ç	F.G.Ü.D.
C			80	20
D	50		50	
S	20	60		20
DCP	50	50		
DAI	100			
L	50	50		
W	50			50
CR			50	50
SR	100			
PM	50		50	
FA		40	30	30

C= concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision, PM= project management, FA= funding acquisition.

Conflict of Interest

The authors declared that there is no conflict of interest.

Acknowledgments

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Ethical Approval/Informed Consent

All the study protocols were approved by ethics committee of Kayseri City Education and Research Hospital (approval date: April 25, 2023, protocol code: 830).

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