ABSTRACT

Objective: Earthquakes are among the most common causes of mortality and morbidity due to natural disasters. In particular, soft tissue and musculoskeletal system injuries are the most common types of injuries reported after earthquakes and the most common reason for hospital admission. We aimed to review the epidemiological data of patients who were rescued from under the rubble in the Kahramanmaraş earthquakes on February 6 and developed earthquake-related spinal vertebral fractures.

Materials and Methods: Our study included 69 patients with spinal vertebral fractures and/or spinal cord injuries (SCIs) who were admitted to the Physical Medicine and Rehabilitation Clinic of Adana City Training and Research Hospital after the 6 February Kahramanmaraş Pazarcık and Elbistan earthquakes. Our study is a cross sectional-observational study. Patients with peripheral nerve damage or loss of muscle strength due to pelvic and extremity fractures were not included in the study.

Results: The mean age of the patients was 40.43±15.24 years (min=8-max=72). The median time of rescue from under the rubble was 15 (1-106) hours. The median visual analogue scale (VAS) pain score was 7 (0-10). 69.6% of the patients were female. Among the patients with a vertebral spinal injury, 72.5% had an incomplete SCI and 27.5% had a complete SCI. 84.5% of the patients underwent surgery, and posterior spinal instrumentation was performed in 56.5% of them.

Conclusion: There has been a significant increase in the number of SCI cases after the Kahramanmaraş earthquakes. Rehabilitation centers should be established, patients' access to these centers should be facilitated, and complications should thus be prevented or optimized. Injured people should be helped to return to their social lives.

Keywords: February 6th Kahramanmaraş, Earthquake, Spinal Cord Injury

INTRODUCTION

Earthquakes are among the most common causes of mortality and morbidity due to natural disasters. In particular, soft tissue and musculoskeletal system injuries are the most common types of injuries reported after earthquakes and the most common reason for hospital admission[1]. Türkiye is a high-risk country for earthquakes; however, cities built on fault lines, unplanned urbanization, and non-earthquake-resistant and unsupervised structures increase the number of deaths and injuries. 100,000 people lost their lives due to earthquakes between 1908 and 1995. Poor disaster organization also increases earthquake-related losses[2,3]. Despite the developing technology, it is not possible to predict an earthquake. Because earthquakes frequently affect crowded urban areas with poor structural standards, they usually cause high mortality rates and mass casualties with many traumatic injuries.

A massive earthquake with a magnitude of 7.7 hit Türkiye with an epicentre of Pazarcık, Kahramanmaraş at 04.17 on February 6. A second earthquake measuring 7.6 occurred at 13.24 approximately nine hours later in Elbistan, Kahramanmaraş. These earthquakes affected 11 provinces as the most destructive earthquakes in the history of our country. After these two devastating earthquakes, thousands of aftershocks occurred, and thousands of people were killed and injured. Due to the collapse of thousands of structures and even hospitals, most of the injured were transferred to other cities.

Soft tissue and musculoskeletal system injuries are the most common types of injuries and the most common reason for hospital admission in earthquake victims stuck under the rubble for hours or even days. It is thought that most of the earthquake survivors have spinal vertebral fractures and/or SCIs.

The literature has very few studies on earthquake-related SCIs. Although the studies conducted after the 2005 Pakistan, 2008 China, 2010 Haiti, and 2015 Nepal earthquakes contributed significantly to the literature on earthquake-related SCIs, the data are still insufficient[4–7]. Studies have shown an increased female rate, decreased

cervical SCI and increased complications in earthquake-related SCIs compared to SCIs emerging from other causes[8].

Given the continuing risk of earthquakes, the approach to earthquake-related SCIs and patient management in the acute period and rehabilitation programs afterwards grow in importance.

In this study, we aimed to review the epidemiological data of patients who were admitted to our clinic with earthquake-related spinal fractures.

MATERIALS AND METHODS

Our study included 69 patients with spinal vertebral fractures and/or SCIs who were transferred from the earthquake-hit provinces to the Physical Medicine and Rehabilitation Clinic of ….. Training and Research Hospital or were later admitted to the clinic after the 6 February Kahramanmaraş Pazarcık and Elbistan earthquakes. Ethical approval was obtained for the study from the Clinical Research Ethics Committee of …… (No:2633, Date: 08.06.2023). Our study is a cross sectional-observational study. Patients with peripheral nerve damage or loss of muscle strength due to pelvic and extremity fractures were not included in the study. The demographic data of the patients (age and gender), the duration of being trapped under the rubble, the level of injury, the presence of a surgical operation and if present, the use of spinal instrumentation, the presence of crush injury, the use of a urinary catheter, and the history of urinary tract infection (UTI) were recorded. Pain intensity was measured with the VAS. Physical examinations were performed to determine the presence of an SCI, and if present, the American Spinal Injury Association (ASIA) impairment scale was used to determine injury levels.

Statistical analysis was performed using SPSS software. Continuous variables were expressed as mean ± standard deviation and median (min-max), while categorical data were expressed as numbers and percentages.

RESULTS

The mean age of the patients was 40.43±15.24 years (min=8-max=72). The median time of rescue from under the rubble was 15 (1-106) hours. The median VAS pain score was 7 (0-10). 69.6% of the patients were female. Among the patients with a vertebral spinal injury, 72.5% had an incomplete SCI and 27.5% had a complete SCI.

84.5% of the patients underwent surgery, and posterior spinal instrumentation was performed in 56.5% of them. 39.1% of the patients had a crush injury, 5.8% had pressure ulcers, 44.9% had an indwelling catheter, and none of the patients developed a UTI.

Sensory examinations revealed hypoesthesia and anesthesia in 53.6% of the patients, pain in 98.6%, and numbness-tingling in 51.5% (Table 1).

94.2% of the patients had thoracolumbar vertebral fractures, especially in T12 (15.9%) and L1 (31.9%) vertebrae. Only four patients had a cervical injury.

Table 2 and Table 3 show patients' muscle strength grades and injury levels.

DISCUSSION

Earthquakes are destructive natural disasters, and it is not possible to predict when and where an earthquake will occur[5]. Earthquakes cause greater losses in developing countries. SCIs due to post-earthquake trauma or compression are important causes of mortality and morbidity[5–8]. The epidemiology of SCIs in earthquakes is different from that of SCIs resulting from other traumatic causes. Therefore, complications and rehabilitation processes are also different.

The search and rescue phase and early treatment are of vital importance for earthquake victims. There is a race against time to rescue as many people as possible; therefore, local people without search and rescue training also participate in rescue operations. In these cases, the injured are dragged out of the rubble piles without spinal immobilization, thereby resulting in SCIs. The posture of the victims at the time of the earthquake also plays a key role in the injury location[9,10].

Because the first earthquake in our country on 6 February occurred at 04.17 midnight, people were caught asleep by the earthquake. Most of the SCI patients woke up with a strong tremor and found themselves trapped under the rubble.

In our study, 69.6% of the patients were female. 94.2% of the patients had thoracolumbar vertebral fractures, especially in T12 (15.9%) and L1 (31.9%) vertebrae. Only four patients had a cervical injury. Although 21 (30.4%) patients had vertebral fractures, no neurological deficit was detected. 27.5% of the patients had a complete SCI, and 21.7% had a muscle strength score of 4/5. One patient had tetraplegia, one patient had monoplegia, and one patient had a drop foot.

Maruo et al.[10] found spinal fractures in 995 out of 1675 patients with bone injuries after the great earthquake that occurred in Japan in 1995. However, only 21 (2.1 %) had a SCI. Similar to our study, spinal fractures were found most commonly in the thoracolumbar region and T12 (29%) and L1 (29%) vertebrae. They attributed the low number of SCIs to the advanced search and rescue team and rapid rescue of the victims.

Tauqir et al.[11] assessed SCI cases after the 2005 earthquake in Pakistan. They found paraplegia in the majority of cases and observed cervical injury and tetraplegia in only four of 194 cases.

In another study conducted by Rathore et al[5] after the 2005 earthquake in Pakistan, paraplegia was found in 89.3% of the cases. The low number of cervical injuries and tetraplegic cases was attributed to the high mortality rate in cervical injuries and the lack of sufficient time to survive[5]. Likewise, in our study, cervical injury was observed in only four cases. We also believe that this may be associated with the high mortality rate in cervical injuries and victims died before they had the opportunity to be rescued.

Many studies have shown that traumatic SCI is observed more frequently in men in developing countries[12–14]. In the literature, the rate of women was found to be high in studies conducted in earthquake-related SCI cases. This rate was found to be 54% in Raissi et al[15], 74% in Tauqir et al[11], 70% in Maruo et al[10], and 56% in Groves et al[4]. Similarly, the rate of women (69.6%) was higher in our study. Social, behavioral, and occupational risk factors increase the risk of traumatic SCI in men, while in natural disasters, more people are at home in the early hours of the morning and women are more affected[9].

These major disasters in our country have once again demonstrated the importance of search and rescue activities, trained teams, rapid access to the rubble, and rehabilitation processes for survivors.

LIMITATIONS

Due to the high number of cases after the disaster, the hospital registration system was inadequate, and most of the cases were rapidly transferred to the surrounding provinces after they were stabilized. Only the cases admitted to our clinic could be evaluated; therefore, the number of cases in our study is insufficient. We believe that there are more SCI cases.

CONCLUSION

There has been a significant increase in the number of SCI cases after the Kahramanmaraş earthquakes. Spinal cord injury rehabilitation centers should be established under the leadership of physical medicine and rehabilitation physicians. Access to these centers should be facilitated to prevent and optimize complications. Patients should be followed up regularly. Injured people should be helped to return to their social lives as soon as possible.

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Table 1. Demographic Data And Clinical Characteristics

	n(69)
Age (year) (Median±Sd)	40,43±15,24
Time to get out of the rubble (hour) [median (min-max)]	15 (1-106)
Pain VAS [median (min-max)]	7 (0-10)
ASIA (n,%)	
A	19 (27,5)
C	7 (10,1)
D	23 (33,3)
E	20 (29,0)
Gender (n,%)	
Female	48 (69,6)
Male	21 (30,4)
Type(n,%)	
İncomplete	50 (72,5)
Complete	19 (27,5)
Surgery (n,%)	
No	11 (15,9)
Yes	58 (84,5)
Fixation (n,%)	
No	30 (43,5)
Yes	39 (56,5)
Crush İnjury (n,%)	
No	42 (60,9)
Yes	27 (39,1)
Pressure Ulcer (n,%)	
No	65 (94,2)
Yes	4 (5,8)
Urinary Catheter (n,%)	

No	31 (44,9)
Yes	31 (44,9)
Spontaneus	7 (10,1)
Sensory Examination (n,%)	
Normal	32 (46,4)
Hypoesthesia	19 (27,5)
Anesthesia	18 (26,1)

Table 2: Muscle Strength Grades

Muscle Strength	**n**	**%**
0/5	18	26.1
1	1	1.4
1/5	2	2.9
2+/5	1	1.4
3-/5	2	2.9
3/5	4	5.8
3+/5	2	2.9
4-/5	1	1.4
4/5	12	17.4
4+/5	2	2.9
5/5	21	30.4
(R)Lower extremity 1/5	1	1.4
(R)Upper extremity 2/5, (R)Lower extremity 1/5	1	1.4
Left Foot Dorsiflexion 1/5	1	1.4
Total	69	100.0

Table 3: İnjury Levels

Level	n	%
C5	2	2.9
C6	2	2.9
L1	22	31.9
L1,L2	1	1.4
L1,L2,L3	1	1.4
L2	5	7.2
L3	3	4.3
L4	3	4.3
L4,L5	1	1.4
L5	1	1.4
T10	2	2.9
T11	1	1.4
T11-L4	1	1.4
T11,L1	1	1.4
T11,T12	3	4.3
T11,T12,L2,L3	1	1.4
T12	11	15.9
T12, L1-5	1	1.4
T12,L1	3	4.3
T4	1	1.4
T6	1	1.4
T9	2	2.9
Total	69	100.0