



Original Article

Epidemiology of Traumatic Spinal Fractures and Spinal Cord Injuries in Guilan, North of Iran



Sara Ramezani^{1,2}, Zahra Mohtasham-Amiri²,
Leila Kouchakinejad-Eramsadati², Hadiseh Shokatjalil²,
Shahrokh Yousefzadeh-Chabok^{1,2*}

¹ Neuroscience Research Center, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran

² Guilan Road Trauma Research Center, Guilan University of Medical Sciences, Rasht, Iran

*Corresponding author: Shahrokh Yousefzadeh-Chabok

Email: sh.yousefzadeh@gmail.com

ABSTRACT

Background: Epidemiological knowledge of traumatic spinal fractures and spinal cord injuries (SCIs) is essential for preventive planning and health policy-making. The present study was conducted to investigate the epidemiological features of traumatic spinal fractures and SCIs in Guilan province, Iran.

Methods: The present cross-sectional study was performed on all 15-80 years old patients with trauma admitted to Poursina Hospital from January 2015 to December 2017. The individual characteristics, time, place and mechanism of trauma and diagnostic characteristics of spinal trauma were gathered using trauma registry system. The incidence and epidemiological distribution of spinal fractures among traumatic patients were then estimated.

Results: The incidence of traumatic spinal fractures was found to be 0.6% in 2015, 0.3% in 2016 and 0.2% in 2017. The men to women ratio was 2.33:1. Motor Vehicle Accident (MVA) and falls were respectively the most common mechanisms of trauma and their incidence were higher in rural communities than in urban communities. There was significant relationships between mechanism of trauma and the site of vertebral fracture (P-value = 0.02). Lumbar vertebrae mostly caused by falls while cervical vertebrae caused by MVA. The incidence of SCI in all the patients with spinal fractures was 18.23% in 2015-17. SCIs were found to be more prevalent in 15-45 year olds compared to other age groups. Quadriplegia (54.83%) and paraplegia (38.7%) were the most prevalent SCI-induced types of paralysis. The incidence of SCI was significantly associated with the site of spinal fractures, although it was not associated with mechanism of trauma.

Conclusion: This study revealed that the incidence of spinal fractures were decreased in recent years and MVA is the major cause of spinal fractures. Preventive programs are recommended to focus on traffic engineering and the training of drivers and pedestrians, especially in high-risk populations.

Keywords: Epidemiology, Spinal cord injuries, Spinal fracture, Traffic accident, Trauma

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Introduction

The global prevalence of traumatic spinal cord injuries (SCIs) has been estimated at 15-40 cases in every one million individuals (1). According to existing statistics, the annual incidence of SCI is 25 cases in every one million

people in developing countries (2). Moreover, men and younger individuals were reported to be at higher risks for SCI in developing communities (2-4). The annual prevalence of SCI has been reported to be ten in one million in Tehran, Iran, with a higher prevalence in men and

younger people (4). Traffic accidents and falls are generally the most common potential traumatic causes of SCI (2-4). Meanwhile, the most common cause of traumatic SCI has been variously reported in different Iranian cities (2, 4).

The incidence of SCI appears to be significantly affected by demographic, geographic and socioeconomic factors and community-specific health policies (5-11). Moreover, physical disabilities following SCI cause great damage to the psychological well-being of the patients and their families (12, 13). Depending on the damaged segment following traumatic SCIs, the symptoms and sensorimotor impairments emerge with different degrees and intensities (14), which often disrupts the functional independence of the injured and prevents them from participating in social activities and returning to their profession and life that existed prior to the damage (15). Post-SCI disabilities impose a heavily burden on the patient and their family and huge financial costs on the society and the health system (16-19). Identifying individual and environmental determinants of spinal trauma is therefore crucial for presenting strategic preventive programs in different communities. Therefore, the present study was conducted to examine the incidence and epidemiological features of traumatic spinal fractures and SCIs in Guilan province in 2015-17.

Methods

The present descriptive cross-sectional study was performed on traumatic patients admitted to Poursina hospital, the main referral trauma center in Rasht, North of Iran during 2015-2017. Using the comprehensive trauma registry system available in the trauma center, demographic and trauma-associated details of patients with spinal fractures were extracted. Patients' registration at the trauma registry system was based on the international classification of disease codes version 10 (ICD10). Spinal fracture was basically diagnosed using radiological techniques including CT scan and MRI and was defined ICD10:T08. Traumatic injuries (ICD10:V01-Y98) were extracted from the whole traumatic population admitted in these years. SCI was diagnosed according to the American Spinal Injury Association (ASIA) Impairment Scale (20) and was defined as ICD10:T06.1. Mechanism of trauma was classified as motor vehicle accidents (MVA), falls, fighting and falls of heavy objects on the body. Place of injury was generally considered as rural and urban areas. The cumulative incidence of spinal fractures among all traumatic patients and epidemiological distribution of gender, age group, place of injury and mechanism of trauma was determined. The association between variables was explored using Chi-square test for trend. A P-value less than 0.05 was considered as statistical significance. All analysis were conducted in SPSS version 16.

Results

During 2015 to 2017, a total of 39294 patients with trauma admitted to Guilan trauma center among them 170 cases were identified with spinal fracture. The total number of traumatic patients was 17166 cases in 2015, 11176 cases in 2016 and 10952 cases in 2017. Figure 1 shows the incidence of spinal fractures among traumatic population by year. As illustrated, there is a decrease from 0.6% in 2015 to 0.3% in 2016 and 0.2% in 2017. Seventy percent of all the patients with spinal fractures were male and 30% were female, with a men to women ratio of 2.33:1. Rural areas was the place of injury in 60% of the cases. The mean age of patients with spinal fractures was 40.2 (SD = 17.35, min: 15, Max: 80). Sixty two percent of the patients were belonged to the age group of 15-45 years old followed by the 46-60 years old (22.35%) and 61-80 years old (15.9%). All patients with spinal fractures referred to the trauma center in these years were found to suffer from non-penetrating spinal injuries. A total of 45% of the incidence of spinal fractures were caused by MVA, 43% by falls and 12% to other factors, including fights, the fall of heavy objects on the spinal cord and exercise. Lumbar spinal fractures was the most prevalent fracture (47.64%), followed by cervical (30.58%) and thoracic (21.76%) fractures. Moreover, SCIs were observed in 18.23% of the whole study patients.

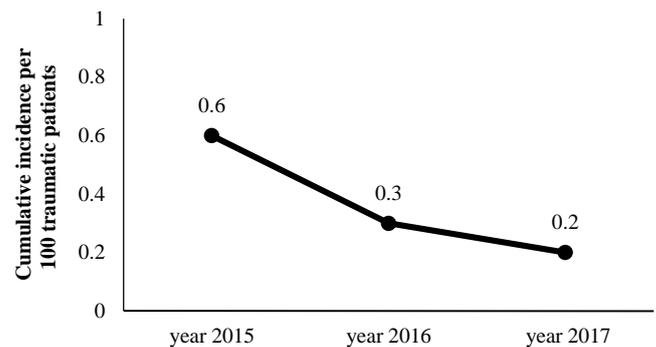


Figure 1. The incidence of spinal Fractures Among Traumatic Patients by Year

Table 1 presents the frequency of spinal fracture location and occurrence of SCI according to mechanism of trauma and trauma mechanism. There was significant relationship between location of SF and mechanism of trauma (P-value = 0.02). Cervical fractures had the highest frequency among patients injured by MVA (49.3%), while lumbar fractures was highest among patients injured by falls (70.3%). No significant differences were observed between different types of trauma mechanism and occurrence of SCI. Table 2 presents the frequency of SCI by location of spinal fracture. The highest frequency of SCI was observed among patients with cervical fractures (P-value = 0.04).

Table 1. The Frequency of Spinal Fracture Location and SCI According to Trauma Mechanism

Variable	Mechanism of Trauma			P-value
	MVA (n = 77)	Fall (n = 74)	Others (n = 19)	
Location of SF				
Cervical	38(49.3)	10(13.5)	4(21.1)	0.021
Thoracic	15(19.5)	12(16.2)	10(52.6)	
Lumbar	24(31.2)	52(70.3)	5(26.3)	
SCI	14(18.18)	14(18.91)	3(15.78)	0.91

Abbreviation: SCI, Spinal cord injury; SF, Spinal fractures, MVA, Motor vehicle crashes. Values in the parenthesis are percent

Table 2. The Frequency of Spinal Cord Injury According to the Location of Spinal Fracture

SCI	Location of spinal fracture			P-value
	Cervical (n = 52)	Thoracic (n = 37)	Lumbar (n = 81)	
Yes	22 (42.3)	3 (8.1)	6 (7.4)	0.042
No	30 (57.69)	34 (91.89)	72 (88.88)	

Abbreviation: SCI, Spinal cord injury. Values in the parenthesis are percent

There was no significant differences between gender and age groups in terms of the frequency of SCI. Quadriplegia was the most prevalent type of SCI-induced paralysis (54.83%), followed by paraplegia (38.7%), whereas hemiplegia was very rare in this population (6.45%).

Figure 2 shows the type of trauma mechanism in terms of gender, age group and place of residence. There was significant association between mechanism of trauma with gender (P-value = 0.02) and age (P-value = 0.04). In men, 37.07% of spine fractures was due to MVA and 29.21% due to falls, which are higher than the corresponding figures in women, i.e. 10.11% for MVA and 15.73% for falls. According to figure 2, the most prevalent trauma mechanism in men was MVA (37.07%), while women predominantly suffered by falls (15.7%). In terms of age, MVA was the most prevalent trauma mechanism in the 15-45 year olds and falls was the major reason of trauma in older age groups. The most prevalent cause of spinal fracture in both the urban (26.47%) and rural (42.35%) populations was due to MVA.

Discussion

The present study results showed that MVA and falls are the most prevalent trauma mechanisms causing spinal fractures in Guilan province, which is consistent with the results of a study conducted on traumatic spinal injuries in Guilan province (3). The present findings are, however, inconsistent with a study conducted in Tehran, the capital city of Iran revealing falls as the most prevalent cause of spinal traumas (4). This discrepancy of the results can be explained by social, geographic and differences between Guilan and Tehran provinces. A potential mechanism explaining this difference is the higher number of construction workers in Tehran compared to Guilan province, which increases the likelihood of spinal traumas caused by falls. Moreover, given the abundance of pedestrians and motorcyclists in rural areas of Guilan province, the likelihood of MVA-induced spinal traumas is higher. The incidence of spinal fractures and SCIs was

found to be higher in 15-45 year-old men, which is consistent with the previous studies of the authors (3) and other researchers (21). The highest prevalence of traumatic spinal fractures and SCIs was observed in 15-45 year olds, which can be justified by the fact that younger men, as the active group of the community, tend to spend more time outdoors, and are therefore at higher risks for traumas, whereas women spend more time at home and face lower trauma risks, especially in rural areas. According to the present results, the majority of patients with traumatic spinal fractures belonged to the rural population, who are at greater risks for MVA and traumas, as they often work, walk or use motorbikes near rural roads. Unlike the study conducted in 2005-6 and reporting thoracolumbar (T11, T12 and L1) as the most prevalent spinal fracture segment (3), the present study reported only the lumbar segment (L1-L5) as the most prevalent injured level, while no cases of thoracolumbar fracture were observed; nevertheless, the highest risk of SCIs appears to be associated to cervical fractures compared to lumbar and thoracic fractures, which was consistent with the high percentage of quadriplegia in the SCI population. Scientific evidence suggests that cervical injuries lead to quadriplegia (22), explaining the high prevalence of quadriplegia in the SCI population. It is worth noting the decreasing incidence of traumatic spinal fractures between 2015 and 2017, which may have been caused by the enhanced public awareness about trauma risk factors and observing safety precautions based on the effective trainings provided by national and provincial media in the previous two years. The present study found traumatic spinal fractures to be mainly associated with MVA and occur mostly in rural populations of Guilan province. The frequency of spinal fractures caused by both MVA and falls was higher in young men. MVA causes cervical fractures and falls lead to lumbar fractures. The likelihood of SCI is significantly related to the site of spinal injury rather than to trauma mechanism. Preventive strategies taken in the previous two years appear to have reduced the incidence of spinal traumas.

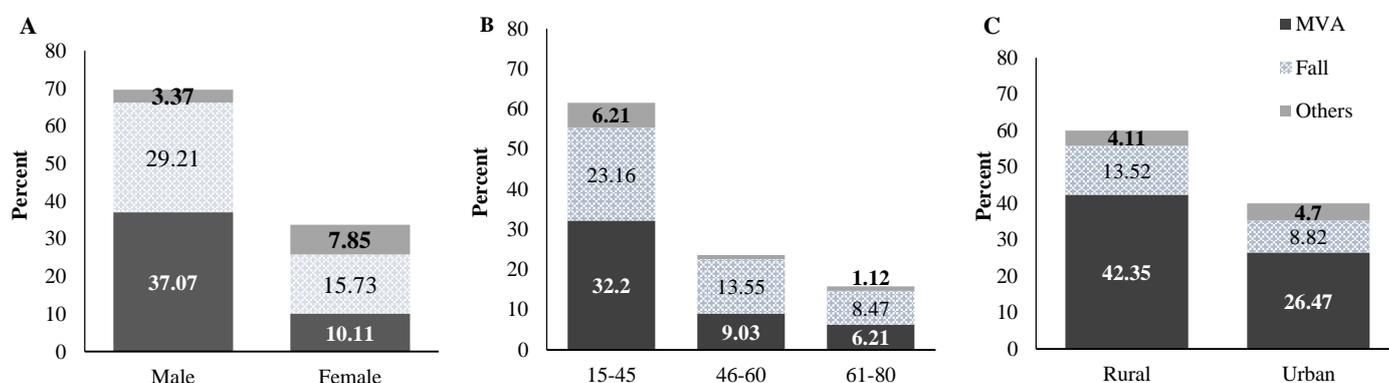


Figure 2. The Frequency of Mechanisms of Trauma According to Gender (A), Age (B) and Place of Residence (C).

Abbreviation: MVA, Motor vehicle accident

Future research is recommended to focus on determining the most effective preventive strategy in different regions of Guilan province.

Conclusion

This study revealed that the incidence of spinal fractures is reduced in recent years. MVA plays a major role in occurrence of spinal fractures followed by falling that accounted 88% of all spinal fractures. Males compared to female, younger compared to older ages and rural compared to urban communities had higher frequency of spinal fractures. This study recommended effective traffic engineering and the training of drivers and pedestrians, especially in high-risk populations.

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Ethical consideration

The study protocol has been approved by trauma research center of Guilan University of medical sciences.

Conflicts of interests

Authors declared no conflict of interest.

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