

**Original Research Article****Epidemiology and Radiologic Findings of Patients with Traumatic Spine Injuries in Iran: Methodological and Epidemiological Study**

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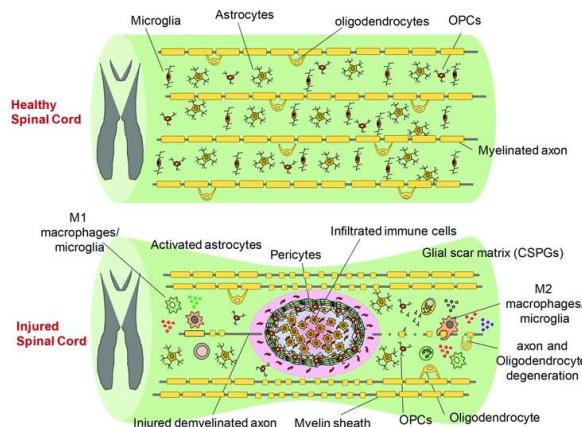
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ABSTRACT

Spinal cord injury is known as a kind of injury that causes inability. The investigation of the epidemiology of spinal cord injury and time in different regions might help to collect information for preventative measures of work. This study was conducted to investigate the epidemiology and radiologic findings of patients with traumatic spine injuries among patients subjected to Emergency Department of Shahid Mohammadi Hospital of Hormozgan University of Medical Sciences. A retrospective descriptive-analytic method was adopted with an analysis of all the patients who were admitted by the diagnosis of traumatic spine injury in Shahid Mohammadi hospital. They all underwent a radiologic study. After receiving permission from the ethics committee, we extracted the data from patients' files and carried out the analyses. Mean of age for subjects was 40.2 and 148 patients (71.50%) were men and 59 patients (28.50%) were women. The most trauma was associated with road accidents (n=124, 59.9%) and 83 cases (40.10%) were related to falling from height. Ten patients (4.80%) were dead due to trauma and 197 patients (95.20%) survived. Compress fracture (n=88, 42.50%), burst fracture (n=64, 32.40%), fracture dislocation (n=57, 27.50%) and transverse process fracture (n=43, 23.80%) accounted for all the cases. The most fracture was associated with L1 vertebrae (n=53, 15.9%), T12 (n=43, 13.40%), L2 (n=36, 11.20%) and C5 (n=16, 5%). The results for fracture in main parts showed that highest fractures were observed in cervical (n=69, 21.63%), thoracic (n=98, 30.72%) and lumbosacral (n=152, 47.64%). Our results showed that the most common causes of spinal injury in Bandar Abbas are accidents that must be reduced by observing traffic rules and guaranteeing transport safety.

GRAPHICAL ABSTRACT

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Introduction

Spinal cord injury is known as a kind of injury that causes inability, injury and loss of sensation, motor function and organ dysfunction [1]. There is no efficient method for the treatment of spinal cord injury [2]. It also exerts high costs, long time recovery and labor force that influence individual and family, and the society [1]. Trauma causes 10% deaths in all over world, especially among young individuals in an age range between 5-44 years of old [3]. Studies have reported annual incidence of trauma for spinal fractures in a range from 0.019%-0.088% [4] and 19%-51% for spinal trauma cases [5]. Based on reports, it is ranged from 13.0 [6] per million to 163.4 [7] per million people. However, the incidence rates in developed countries range from 13.1 [8] to 163.4 [7] per million people. The rates in non-developed countries had a range from 13.0 [6] to 220.0 [9] per million people. In addition, it was reported a male:female ratio from 1.10:1 [10] to 6.69:1 [8] in developed countries, but it was in a range of 1.00:1 [11] to 7.59:1 [12]. The mean age for spinal cord injury in developed countries was in a range of 14.6 [13] to 67.6 years [14]. It was reported a range of 29.5 [15] to 46.0 years [16] in non-developed countries. Several studies have reported cervical injury of spine as the most common part of injury in developed and non-developed countries [17, 7].

The investigation of the epidemiology of spinal cord injury and time in different regions might help to collect information for preventative measures of work [17, 18]. Considering regional differences in the patterns and causes of injuries have significant roles in prevention policies. Preventive policies should be based on available regional data in order to make important decisions [19]. This study was conducted to investigate the epidemiology and radiologic findings of patients with traumatic spine injures among patients subjected to Emergency Department of Shahid Mohammadi Hospital of Hormozgan University of Medical Sciences. A retrospective descriptive-analytic method was

embraced to determine the epidemiology and radiologic findings of patients with traumatic spine injures. Our findings can help to identify the key opportunities for decreasing burden of traumatic spine injures, cost-effective prevention and treatment of traumatic spine injures.

Material and methods

In this retrospective descriptive-analytic study, the data of patients ($n = 207$) with traumatic spine injures admitted to Emergency Department of Shahid Mohammadi hospital of Hormozgan University of Medical Sciences during 2017 year was collected. The administrative dataset of Shahid Mohammadi hospital was used in the current study. Medical records of patients with spinal trauma were obtained from the Medical Records Department of the hospital. This hospital is a referral teaching hospital in Bandar Abbas city. Bandar Abbas is a city placed in the southern part of Iran with a population of about 686000 and hence is a crowded city in Iran. This hospital adopts patients with trauma. A check list was prepared including age, gender, education, marital and mechanism of injury. Types of injuries, ASIA Impairment Scale (AIS) and the relation between variables were also investigated. All the patients with traumatic spine injures registered in Emergency Department of Shahid Mohammadi Hospital of Hormozgan University of Medical Sciences that had radiologic images were sampled. Exclusion criteria included the death for other reason exception of traumatic spine injures, faults in documents and lack of radiologic images.

The data were analyzed by SPSS 22.0 software. $P < 0.05$ was considered significant. Spearman correlation was used for investigation the relation between variables.

Result and discussions

In the current study, 229 patients were studied, but 22 patients were excluded from the study and this study was conducted by 207 patients. Mean of age for subjects was 40.2. The patients were divided into 3 groups: 18 subjects <18years (8.6%), 159 patients 18-60 years (76.80%) and

30 patients >60 years (14.4). In the current study, 148 patients (71.50%) were men and 59 patients (28.50%) were women. 147 patients (71%) were married and 60 patients (29%) single.

The most trauma was associated with road accidents ($n=124$, 59.9%) and 83 cases (40.10%) were related to falling from height. The data showed that 10 patients (4.80%) had died due to trauma and 197 patients (95.20%) survived. In sum, 319 cases vertebrate fractures were observed. Compress fracture ($n=88$, 42.50%), burst fracture ($n=64$, 32.40%), fracture dislocation ($n=57$, 27.50%) and transverse process fracture ($n=43$, 23.80%) accounted for the whole cases. The most fracture was associated with L1 vertebrate ($n=53$, 15.9%), T12 ($n=43$, 13.40%), L2 ($n=36$, 11.20%) and C5 ($n=16$, 5%).

The results for fracture in main parts showed that highest fractures were observed in cervical ($n=69$, 21.63%), thoracic ($n=98$, 30.72%) and lumbosacral ($n=152$, 47.64%) (Figure 1).

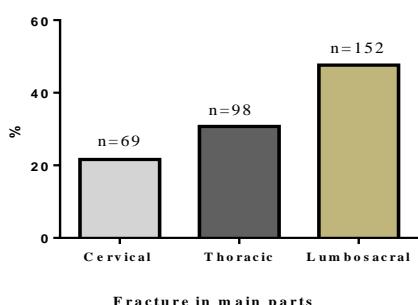


Figure 1: Types of fracture in main parts

The most fracture with vertebrate fracture was associated to pelvic fracture ($n=32$, 42.10%) and Tibia ($n=14$, 18.40%) and lowest was associated with pneumothorax ($n=3$, 3.9%) (Figure 2).

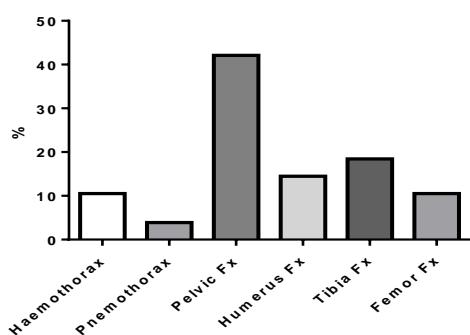


Figure 2: Fracture with vertebrate fracture

The results also showed that 178 patients (86%) did not have neural defect and 7 (3.38%), 7 (3.38%), 9 (4.34%) and 6 (2.89%) cases had grades of B, C, D and E, respectively. The results showed that only 1 case had B grade in women and the rest was associated with men. It means there is a close relation between males and neural injuries in trauma ($P<0.05$) (Table 1).

Table 1: The relation between AIS score and sex

	Non	B	C	D	E	Total
Men	120	6	7	9	6	148
Women	58	1	0	0	0	59
Total	178	7	7	9	6	207

The results for the relation between trauma mechanism and sex was not significant. 88 men (42.51%) and 36 women (17.39%) had road accidents and 60 men (28.98%) and 23 women (11.11%) were injured from falling (Figure 3).

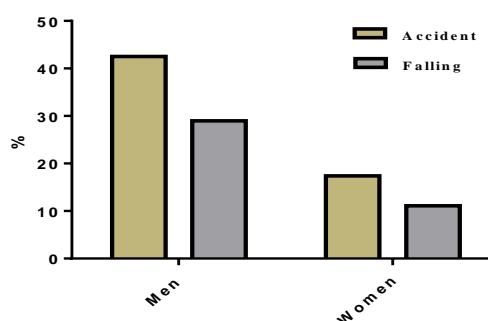


Figure 3: The investigation of relation between trauma mechanism and sex

The results also showed some patients with fracture dislocation had burst fracture. However, 66% of the patients had 66% burst fracture and 88% fracture dislocation. The results showed a significant relation between fractures and neural defect ($P<0.05$). A significant relation was observed between AIS with Odontoid and Jefferson fractures.

The results in Table 2 showed a significant relation between radiologic findings. Three patients with Transverse process fx had Fracture dislocation ($P<0.05$). This was not found between other parameters. The results also showed that most fractures were observed in throacolumbar junction.

Table 2: The relation between radiologic findings

		Burst Fx		Compress Fx		Dislocation		Lamina Fx		Spinous Fx		Transverse	
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Burst Fx	Yes	-	-	14	53	17	50	3	64	6	61	10	57
	No	-	-	74	66	40	100	5	135	3	137	33	107
Compress Fx	Yes	-	-	-	-	8	80	2	86	0	88	7	81
	No	-	-	-	-	49	70	6	113	9	110	36	83
Dislocation	Yes	-	-	-	-	-	-	4	53	1	56	3	54
	No	-	-	-	-	-	-	4	146	8	142	40	110
Lamina Fx	Yes	-	-	-	-	-	-	-	-	0	8	1	7
	No	-	-	-	-	-	-	-	-	9	190	42	157
Spinous Fx	Yes	-	-	-	-	-	-	-	-	-	-	3	6
	No	-	-	-	-	-	-	-	-	-	-	40	158

The results showed that mean age for subjects was 40.2 years and most patients were 18-60 years. Similarly, other studies in Iran reported a mean age of 34.7 years [20] and 21-40 years [19]. Different values were reported in different countries. The mean age for spinal cord injury in developed countries was in a range of 14.6 [13] to 67.6 years [14]. It was reported a range of 29.5 [15] to 46.0 years [16] in non-developed countries. It was reported that the age of spinal cord injury patients trends to be bimodal distribution in ranges of 15-29 and over 65 years [21].

In the current study, 148 patients (71.50%) and 59 patients (28.50%) were men and women, respectively. Fakharian et al. (2019) [20] also reported that most patients were men in Iran. It was also reported that the incidence of traumatic spine fracture was higher in males compared with females in Iran [22]. It was reported a male:female ratio from 1.10:1 [10] to 6.69:1 [8] in developed countries, but it was in a range of 1.00:1 [11] to 7.59:1 [12]. In sum, the number of male spinal cord injury patients is more than the number of female patients that could be attributed to the fact that males are the main

undertaker of family and social work. It is a fact that most men are involved in dangerous activities. It was reported that laborers, farmers and the unemployed were three spinal cord injury groups with high risk [23].

The most trauma was associated with road accident (n=124, 59.9%) and 83 cases (40.10%) were related to falling from height. Fakharian et al. (2019) [20] reported that traffic accident is as the most common source of the trauma (35.2%) followed by the falls (26.95%) motorcycle accident (17.9%). Falls and motor vehicle accidents are most common reasons for spinal injury. Other studies in Iran showed that the most common reason for spinal injuries were motor vehicle accidents (52%) and falls (43%) [24]. The data showed that 10 patients (4.80%) were dead due to trauma. Fakharian et al. (2019) [20] reported 2% death for trauma injuries that is attributed to 1.5% and 0.5% for accidents and falling. Similarly, Heidari et al. (2010) [19] reported 4% death for patients with spinal fractures 96%. It was reported that mortalities are 3.1% to 22.2% in developed countries and 1.4% to 20% in non-developed countries [1]. The findings showed that mortality is very low in

Bandar Abbas that are parallel to findings reported for non-developed countries.

Compress fracture, burst fracture, fracture dislocation and transverse process fracture were common reasons for fractures [Figures 1 and 2]. Tabesh and Rabiei (2019) [25] reported that the most common type of fracture was compression and burst fractures in Iran. Other studies also reported similar results [19, 26, 27].

The most fractures were observed in cervical, thoracic and lumbosacral, respectively [Figure 1]. Similar to our findings, Fakharian et al. (2019) [20] reported that most common area of traumatic injury was thoracolumbar spine fracture (46.9%). Yousefzadeh et al. (2015) [24] reported thoracolumbar spine was common area for fracture. Haidari et al. (2010) showed that cervical spine fractures were significantly frequent in lumbar fractures.

The most fracture with vertebrate fracture was associated with pelvic fracture ($n=32$, 42.10%) and Tibia ($n=14$, 18.40%) and lowest was found with pnemothorax. Clayton et al. (2012) [28] in the United States showed that the pelvic fracture and head injury may have a greater effect than the multiplicative interaction that is a high risk for cervical spine injury. It was also reported that traumatic injuries cause injuries, including head injuries, ribs fractures, limb or pelvic fractures and injuries of the rest of body [1].

The relation between trauma mechanism and sex was found insignificant. It means that men and women could equally be threatened. The results showed a significant relation between fractures and neural defect. Neural defects can be created due to the effects of fractures on bone and injured neural system. The most fractures were observed in throacolumbar junction that must be considered.

Conclusion

This study was conducted to investigate the epidemiology and radiologic findings of patients with traumatic spine injures in Iran. Our results showed that the most common causes of spinal injury in Bandar Abbas are accidents that must be

reduced by observing traffic rules and guarantying transport safety. It could be advised a National Registry for spinal cord injuries be established by the national Ministry of Health, so that the etiological pattern of spinal cord injuries in the world can be identified.

Ethics Approval

All experimental procedure were approved by the Ethical Committee of Shahid Mohammadi Hospital of Hormozgan University of Medical Sciences, Bandar Abbas, Iran.

Author contributions

All authors contributed toward data analysis, drafting and revising the paper and agreed to be responsible for all the aspects of this work.

Disclosure

The authors report no conflicts of interest in this work.

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