Spinal Cord (2016) 54, 901–907

www.nature.com/sc

ORIGINAL ARTICLE

Epidemiological study of traumatic spinal cord injuries: experience from a specialized spine center in Iran

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Study design: A cross-sectional study.
Objectives: This study was performed for epidemiological assessment of Iranian Traumatic Spinal Cord Injuries (TSCI), referred to a specialized spine center.
Setting: Patient recruitment and evaluations were conducted at the Brain and Spinal Injury Research Center, Tehran, Iran.
Methods: This study was performed from September 2011 to March 2015 on 1137 consecutive TSCIs. History, clinicoradiological findings as well as chronic complications and social integration were recorded. The capture–recapture method was used to calculate a rough estimation of TSCI prevalence in Tehran Province.
Results: Our report includes 1137 cases with a mean age of 29.1 years (s.d. = 11.2 year)—79.2% of them being male (M/F = 3.8/1). Rough estimation of TSCI prevalence in Tehran province was 2.36 per 10 000 population. Regarding etiology, 61.8% were due to motor vehicle accident (MVA), followed by falling 24.5%, heavy drop 5.2%, violence 3.8%, sport 2.8% and others causes 1.9%. Regarding injury level, 31.5% were cervical, 57.9% thoracic and 10.6% lumbar. Complete lesions were 53.5% of patients and 46.5% were incomplete. Most common neurological type was T1-S5 (American Spinal Injury Association Impairment Scale: A, B, C, 61.7%). Most common complications included urinary tract infection followed by pressure sore (grade III and IV, 37.5%), autonomic dysreflexia (37%) and neuropathic pain (31.2%). Substance abuse was observed in 8.8% of cases. Overall, ~25% in our cases were employed after TSCI. Secondary divorce was also much more frequent than normal matched controls.
Conclusion: MVA was the most common cause for TSCI. The elderly subjects were less frequent among our patients than more developed countries. The high rate of unemployment and divorce in our cases deserves special consideration.
Spinal Cord (2016) **54,** 901–907; doi:10.1038/sc.2016.10; published online 16 February 2016

INTRODUCTION

Traumatic Spinal Cord Injury (TSCI) is a devastating neurological state causing long-term morbidity and marked changes in patients' lifestyle, especially in the young and healthy population.[1] Worldwide epidemiology of TSCI has been reported with spatial and temporal diversities.[2] Iran as a Middle East country, with its particular cultural differences, and a history of recent war, may have special TSCI characteristics. A glance at the population age pyramid reveals that Iran has a young population (mean = 29.86 years, according to 2011 national census; http://www.amar.org.ir/; 2011) and is among the countries with a high rate of trauma due to motor vehicle and industrial accidents, as well as natural disasters (http://amar.sci.org.ir/; 2011). As expected, the high rate of trauma in Iran is associated with high rate of TSCI, which demands meticulous epidemiological evaluation.[3] The worldwide distribution of TSCI has been reported elsewhere, with a variable etiological spectrum including motor vehicle accidents (MVAs), falling, sports, violence (gunshot, stab wound) and others.[4] In developed countries such as Canada, USA and Italy, MVA accounts for most TSCIs,[5–7] whereas falling (especially in youngster) has a far more important role for TSCI in the developing countries.[8] Determining national TSCI epidemiology needs a sophisticated registry system to obtain exact epidemiological information with temporal profiles.[9] In Iran, some studies have been conducted in this field, but it still does not draw an appropriate image of TSCI status nationwide.[10] Low sample size, focusing on the capital and not reporting detailed etiological and neurological findings are among limitations in this regard. Therefore, the role of different etiologies for Iranian TSCI still remains unclear.

Major complications are also quite common throughout patients' life as secondary morbidities associated with TSCI.[11] These complications make TSCI among the most costly human maladies;[12] therefore, their epidemiological evaluation is a necessity for proper health-care planning.[13]

Furthermore, social impacts of TSCI should be addressed for the caregivers and health policy makers for better strategic planning.[14] As a result, further indepth evaluation of TSCI characteristics in Iran in a greater scale is a necessity. Tertiary spine centers with wide spread patient referral could be a good source for obtaining representative samples, until national registries are available.[15] Moreover, as a temporary measure, employing the capture–recapture method[16] would

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Received 2 August 2015; revised 18 December 2015; accepted 4 January 2016; published online 16 February 2016

yield a rough estimation of the TSCI prevalence in the studied subpopulation.

In this study, the referred patients to Brain and Spinal Injuries Research Institute as a specialized spine center, for outpatient rehabilitation programs, were evaluated to further determine the impact, demographic and clinical features of TSCI. Also, we have reported a rough estimation of TSCI prevalence in Tehran province (the most crowded province with approximately one-fifth of the total Iranian population).

MATERIALS AND METHODS

This cross-sectional study was performed on TSCI patients referred to Brain and Spinal Injury Research Center center, which began its services since 2005 for TSCI subjects. The center had been introduced to TSCI patients, and acute care spine centers, as a specialized facility for rehabilitation since 2007. These cases had been referred from all provinces over the country for outpatient rehabilitation programs, monitoring of health indices and chronic complications of TSCI. Most of these cases had not undergone the early optimal postacute rehabilitation program. Also, prognostication of neurological outcome was an important question for many of these cases. In this center, patients had the opportunity to participate in multidisciplinary outpatient and inpatient programs for TSCI. The outpatient multidisciplinary team studied patients recruited from September 2011 to March 2015 among those referred for rehabilitation programs from 32 provinces. Institutional Review Board of Tehran University of Medical Sciences had approved the study.

All the participants had informed consent for participation in the study, and a medical record for documenting their TSCI, and were assured that their information would remain confidential. Demographic and background data as well as neurological status were obtained from the patients by two separate trained research assistants. Data recheck was performed to ensure prevention of possible random errors. Each case was examined by two neurosurgeons for at least 30 min to determine detailed neurological characteristics of injury including level and American Spinal Injury Association Impairment Scale (AIS). Meanwhile, classification of spinal injury mechanism based on either sub-axial injury classification and severity score[17] or thoracolumbar injury classification and severity score[18] was performed according to imaging and medical records. Patients were registered in the database, regardless of their willingness to join the outpatient or inpatient rehabilitation programs. The patients' data were recorded in the registration software (Microsoft Office Access 2007, Redmond, WA, USA) on presentation. Missing parameters of the patients' records were completed in their consecutive visits. The geographical distribution of the provincial residence of our patients was recorded, and the referral frequencies from 31 different provinces were recorded. As a sampling method, we employed the capture–recapture technique, to estimate point prevalence of TSCI in Tehran province. The study cases formed the first sample, and the second sample was obtained from the database of 'Protection Center of Spinal Cord Disabled of Iran'.

Variables included gender, age, marital status, etiology, education level, occupational status, duration of injury, neurological level, spinal pathology, severity of injury and complications. The neurological level and severity of TSCI were categorized according to standard protocols recommended by Wyndaele[19] and Burns.[20] Complications were evaluated as follows: neuropathic pain by Visual Analogous Scale, spasticity by Modified Ashworth Scale, depression categories by Beck Depression Index and pressure ulcers (PUs) graded from I to IV by the classification scheme of Ennis and Sarmiento. We used the Petersen statistic for population size estimation in the capture–recapture method. Point prevalence of TSCI in Tehran province was calculated according to the following formula:

$$\hat{\tau} = \frac{y}{x} \times X(\text{estimation of total number of TSCI in Tehran province})$$

$$\hat{P} = \frac{\text{Estimation of total number of TSCI in Tehran province}}{\text{Total poppulation in Tehran province}}$$

In these formulae, $\hat{\tau}$ represents estimated total number of TSCI in Tehran province; x represents the number of overlapped cases between the two samples; y and x represent the total number of cases in each sample, and finally $\hat{P}$ represents the estimated prevalence of TSCI in Tehran province.

Clinically relevant associations between categorical variables were assessed by χ^2 or Fisher's Exact test, if indicated. The data analyses were performed with SPSS software version 22 (IBM, Chicago, IL, USA). A P-value <0.05 was considered as significant.

RESULTS

Among a total of 1215 patients with TSCI referred to Brain and Spinal Injury Research Center center, 78 cases were excluded because of

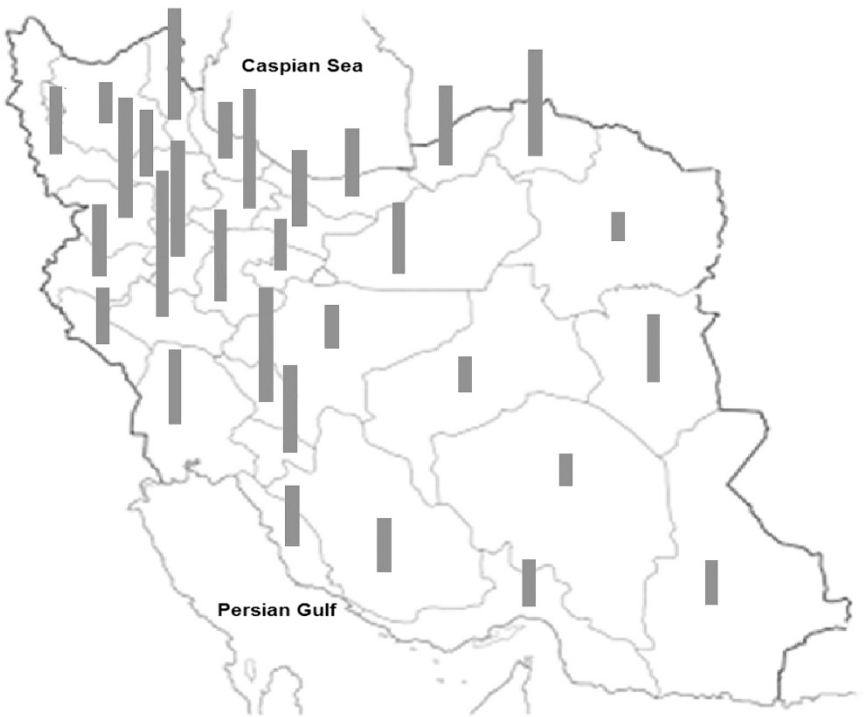

Figure 1 Geographic distribution of spinal cord injury patients in 31 Iranian provinces.

either non-traumatic SCI (68 cases) or a lack of informed consent for the study (10 cases). The study was performed on 1137 cases with TSCI. Missing parameters of 12 cases were completed in their consecutive visits. The geographical distribution of relative frequency (number of referred cases/province population) of referred TSCIs has been depicted in Figure 1.

By the capture–recapture sampling method, the point prevalence of TSCI in Tehran province was estimated. The number of cases in our series from Tehran province was 218 cases. The second sample for capture–recapture analysis was obtained from 'Protection Center of Spinal Cord Disabled of Iran' database for Tehran province (1256 cases). The two centers overlapped in 95 cases. Peterson statistics in our cases for $\hat{\tau}$ and $\hat{P}$ yielded the following:

$\hat{\tau} = \frac{1256}{95} \times 218 = 2882$ (estimation of total number of TSCI in Tehran province)

$\hat{P} = \frac{2882}{12\,183\,391} = 2.36$ (in 10 000 population, 95% confidence interval = 2.02–2.71).

Dividing the number of our cases from Tehran province, by the total estimation of the province (see Results), shows that we are reporting about one-thirteenth of the TSCI population of Tehran province (218/2882).

Table 1 Demographic and background data of the studied cases

Patient characteristics	*Frequency (%)*
Age at the time of injury (in years)	
Mean ± s.d. (min–max)	29.1 ± 11.2 (0.8–70.5)
Age groups (in years)	
0–15	76 (6.7)
16–30	646 (56.8)
31–45	316 (27.8)
46–60	86 (7.6)
61–75	13 (1.1)
Sex	
Male	901 (79.2)
Female	236 (20.8)
Education	
Illiterate	80 (7.0)
Elementary	225 (19.8)
High school	326 (28.7)
GED	285 (25.1)
University degree	221 (19.4)
Adult marital status	
Single	397 (34.9)
Married	646 (56.8)
Divorced/emotional separation	79 (7.0)
Widowed	15 (1.3)
Level of Injury	
Cervical	358 (31.5)
Thoracic	658 (57.9)
Lumbar	121 (10.6)
AIS	
A	608 (53.5)
B	213 (18.7)
C	200 (17.6)
D	109 (9.6)
E	7 (0.6)
Etiology	
MVA	703 (61.8)
Falling	279 (24.5)
Heavy drop	59 (5.2)
Violence	43 (3.8)
Sport	32 (2.8)
others	21 (1.9)

Abbreviations: AIS, ASIA Impairment Scale; GED, General Education Development diploma; MVA, Motor Vehicle Accidents.

The demographic and background data have been shown in Table 1. The mean age of our cases was 29.1 (s.d. = 11.2) years, 50% of them being between ages 21.6 and 35.7 years, and 79.2% were males (M/F = 3.8/1). There was not a significant age difference between the males and females ($P = 0.615$). As seen in Figure 2, histogram of frequency for age at the time of injury shows a unimodal pattern. The mean duration of TSCI in our patients was 29.3 months (s.d. = 27.7). The mean education year was 9.54 years (range: 0–19 years), and ~7.0% were illiterate (Table 1). As shown in Table 1, ~56.8% of patients were married. Regarding the impact of TSCI on marital status at the time of assessment, the percentage of divorce and/or emotional separation was 6.5% in males and 9.3% in females after TSCI. This figure was 0.67% for males and 1.4% for females in the Iranian general population (>10 years of age; http://www.amar.org.ir/; 2011). As seen that the prevalence of divorce in TSCI is much more than general population. The mean age of divorced cases was significantly lower than that of non-divorced cases (32.8 vs 34.8 years; $P = 0.037$). The higher the level of injury, the more was the divorce percentage ($P = 0.097$). Multiple logistic regression analysis revealed that females had 1.42 (95% confidence interval = 0.81–2.5) times more chance to be divorced or separated in comparison with males adjusted for age, education and occupation ($P = 0.11$). The most common cause of injury was MVA (61.8%) followed by falls (24.5%), heavy drop (5.2%), violence (3.8%), sports (2.8%) and others (1.9%). Different mechanisms for MVA included car (46.5%), bike (11.3%) and pedestrian (4.0%) accidents. Surprisingly, walnut trees were a common cause for falling and included 72% of all falls from trees (9.0% of all falls). Different etiologies for sport injuries included diving (2%), gymnastics (0.2%), wrestling (0.1%) and others (0.5%).

The occupational status of our patients has been tabulated in Table 2. About 35.1% of cases did have an independent income source to live (employed, retired and housekeeper), whereas 64.9% were dependent either on their family support or social welfare and insurance organizations for their care costs. The more severe and rostral the TSCI, the higher was the prevalence of unemployment ($P < 0.001$). Accordingly, the highest prevalence of unemployment was found in patients with complete tetraplegia (78.9%).

Overall, most participants had thoracic cord injuries (57.9%) followed by cervical lesions (31.5%). Figure 3 shows distribution of neurological levels in our patients. As shown, a bimodal distribution with two peaks at C5 (11.8 %) and T12 (17.0 %) levels is observed. The most common morphology for the spinal injury was facet dislocation for cervical and translation rotation for thoracolumbar injuries (Table 3). Spinal Cord Injury Without Radiological Abnormality (SCIWORA) was found in 6.15% of all participants (51.4% cervical and 48.6% thoracic). Childhood TSCIs (⩽15 years) were 74 cases (6.7%). In children, the etiologies were MVA (68.5%), child abuse (12.3%), fall (11.0%), sport (5.5%) and heavy drop (2.7%). Also, SCIWORA was the most common mechanism for all childhood TSCI (46.4%). Childhood SCIWORA was mostly due to

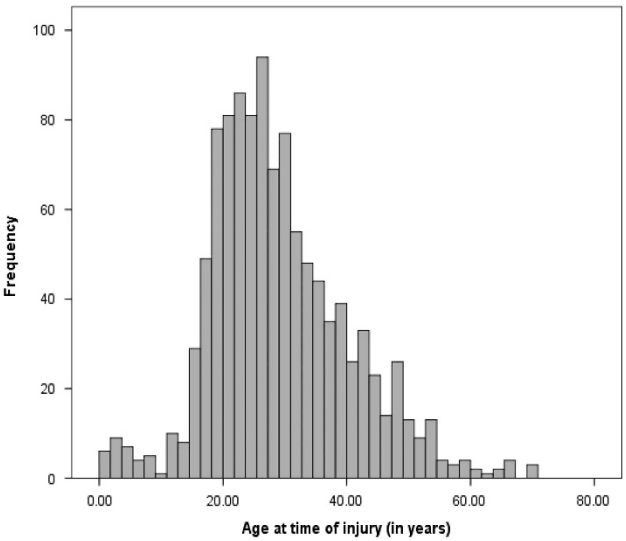

Figure 2 Age distribution of the patients.

Table 2 Occupational consequences in adult patients with spinal cord injury (age ⩾ 18 years)

Occupation status	*Frequency (%)*
Employed	191 (18.2)
Housekeeper (females)	39 (3.7)
Left job (temporary)	64 (6.1)
Fired	495 (47.1)
Retired	139 (13.2)
Remained unemployed	122 (11.6)
Total	1050 (100.0)

MVA (73.2%), followed by falling (16.9%). Regarding the severity of TSCI in children, ~56.7% were AIS A. All child abuses had a penetrative etiology in our cases—five cases due to bullet and four cases due to stab wound.

According to Wyndaele categorization (Table 4), as expected, most participants (61.7%) belonged to the third group (that is, injury level T1-S5 with AIS A, B or C). In the same way, according to Burns classification (Table 5), the most common category in our participants was complete paraplegia (43.6%).

Falling and sports as the etiology for TSCI were much more common in men compared with women (28.0% vs 13.6% and 3.5% vs 0.4%, respectively; $P<0.001$). There was a significant association between age and etiology ($P<0.001$). Falling was more common (48.4 vs 11.0%) in older participants (⩾46 years) in comparison with children (⩽15 years). With increasing years of education, sport-related injuries became more common, whereas violence and heavy drop became less common ($P=0.022$). In illiterate subjects, there was no case of sport-related injuries, whereas 5.5% of TSCI in patients with university education was athletics. In contrast to all other causes, incomplete tetraplegia was the most common category in sport-related injuries (75.0%), and thoracic lesions were very rare in these patients (6.3%, $P<0.001$).

Frequencies of various complications after TSCI in our patients have been tabulated in Table 6. The most common complications after TSCI were PUs (37.5%, grade III or IV), followed by autonomic dysreflexia (37%) for lesions above T6. Smoking was observed in

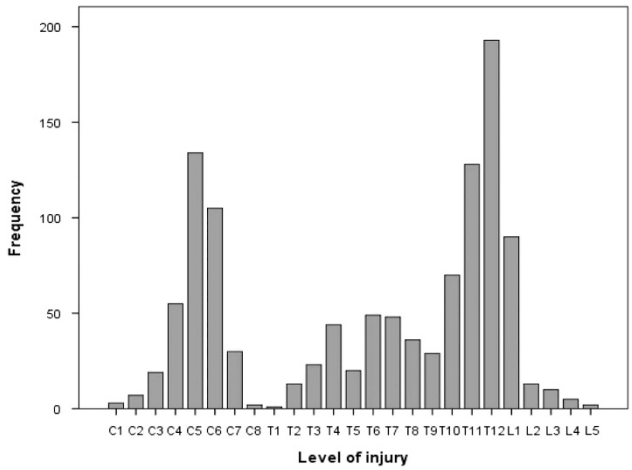

Figure 3 Bar chart for frequency distribution according to the neurological level of the injury.

16.0% of all subjects; the mean (pack/year) for smokers was 5.03 (s.d. = 5.59). Illicit drug abuse following TSCI was observed in 8.8% (mostly opium 8.7%, and stimulants 0.1%), whereas alcohol abuse was found in 3.2% of cases.

DISCUSSION

Epidemiological studies for TSCI show significantly different indices among various societies.[2] Information about these differences helps health policy makers make more efficient decisions for that region.[13] The obtained data may be of benefit for developing and even developed countries.[8] Most epidemiological studies on TSCI give an estimation for disease prevalence or incidence in their target population. In a systematic review for worldwide TSCI epidemiology, prevalence of TSCI was reported to be 236.0–1298.0 per million population. Although the current study may not provide the exact figures for TSCI incidence and prevalence in Iran, nevertheless a rough estimation of TSCI prevalence in Tehran was 236 per million population. Despite a high national rate for accidents, this relatively low figure in comparison with most developed countries may be due to higher mortality at the accident scene, and acute care service. Accordingly, in a population-based study in Tehran, the point prevalence of TSCI was estimated to be 440 per million population.[10] The discrepancy may be due to the fact that our estimation is for Tehran province, whereas that report was for Tehran city only.

The geographical distribution of TSCI is very important for planning establishment of the outpatient care centers. Distribution of our cases in Iran (Figure 1) shows the referral pattern from various provinces. The cases had been referred more frequently from less privileged cities, situated over the Alborz and Zagros mountains. This may be a notification for the necessity of building local spine centers in those cities.

The mean age in our cases was 29.1 years and 56.8% of our cases were between 16 and 30 years, and this is in concordance with reported age (between 15 and 30 years) from Canada[21] but still less than world average (33 years).[4] Many developed countries have reported much older mean age for their TSCI in some centers—for example, 50 years for an acute trauma center in Canada.[15] Our finding shows a propensity for the youngster in Iran and the necessity of considering preventive measures to be started for lower age groups. Also, the high costs of care in the younger population due to longer survival is a special concern in this regard.[22] Studies have reported a

Table 3 Morphology of spinal pathology in the studied cases

Vertebrae	*Fracture morphology*	*Frequency (%)*
Cervical (SLICS)	Compression	3 (0.3)
	Burst	66 (20.8)
	Odontoid	4 (1.3)
	Distraction (for example, facet perch and hyperextension)	5 (1.6)
	Rotation/translation (for example, facet dislocation and unstable teardrop or advanced-staged flexion compression injury)	206 (64.7)
	SCIWORA	36 (11.3)
Total		318 (100)
Thoracolumbar (TLICS)	Compression	7 (1.1)
	Burst	163 (25.9)
	Translational/rotational	423 (67.3)
	Distraction	2 (0.3)
	SCIWORA	34 (5.4)
Total		629 (100)

Abbreviations: SLICS, Subaxial Injury Classification and Severity Score System; SCIWORA, Spinal Cord Injury without Radiographic Abnormality; TLICS, Thoracolumbar Injury Classification and Severity Score.

Table 4 Severity categories according to Wyndaele *et al.* categorization

Severity category (Wyndaele)	*Frequency (%)*
C1-4 & (A or B or C)	70 (6.2)
C5-8 & (A or B or C)	250 (22.0)
T1-S5 & (A or B or C)	702 (61.7)
AIS D	109 (9.6)
AIS E	6 (0.6)
Total	1137 (100.0)

Abbreviation: AIS, American Spinal Injury Association (ASIA) Impairment Scale.

Table 5 Neurological and severity categories according to Burns *et al.*

Neurological category	*BASIR study frequency (%)*	*NSCISC (%) 2014*
Incomplete tetraplegia	218 (19.2%)	45
Incomplete paraplegia	308 (27.1%)	21
Complete tetraplegia	115 (10.1)%	14
Complete paraplegia	496 (43.6%)	20

Abbreviations: BASIR, Brain and Spinal Injuries Research Institute; NSCISC, National Spinal Cord Injury Statistical Center.

Table 6 Frequency of complications after spinal cord injury

Complications	*Frequency (%)*
Pressure sore (grades 3 and 4)	426 (37.5)
Heterotopic ossification	72 (6.3)
ADR	421 (37.0)
Neuropathic pain (VAS $\geqslant$ 50 mm)	355 (31.2)
Spasticity (MAS $\geqslant$ 3)	289 (25.4)
Major depression (BDI)	16 (1.4)
Attempted suicide	17 (1.5)
Illicit drug abuse	
Opium	99 (8.7)
Stimulants	1 (0.1)
Alcohol abuse	36 (3.2)
Not reported	69 (6.0)
None	932 (82.0)
Smoking	238 (20.9)

Abbreviations: ADR, Autonomic Dysreflexia; BDI: Beck Depression Index; MAS, Modified Ashworth Scale; VAS: Visual Analogous Scale.

bimodal pattern with two peaks at 15–29 and above 65 years of age.[23] However, our study shows a single peak at late 20s. This difference may be due to the very low number of elderly people in our study, which in turn could be a result of either lower survival in older Iranian spinal cord injury patients or accessibility issues in older cases to attend our center.

Regarding gender, 79.2% of our cases were males, and this figure is at the level of the world average (79.8%).[4] Despite cultural differences between developed and developing countries, male-to-female ratio is nearly the same worldwide.

In our study, falling and sport have been reported to be more common in men (M/F: 7.65/1, 31.0/1 respectively, $P<0.001$), which is quite different with other reports where women have fairly equal frequencies,[24] and this may be due to cultural differences regarding female lifestyle in Iran. Again falling has been reported as a major etiology for the elderly (65+ years) in developed countries.[24] Although in our cases falling was more common in older ages, nevertheless we had very few cases in the elderly (65+ years) because TSCI in Iran is mainly a disorder of youngster. Overall, falling was the etiology of TSCI in 24.5% of our cases. High falls (work related) in our cases were ~86.3% of all the falls, and this is in contrast to developed countries where work-related falls were less common, ~25% (building (16%), ladder (9%) in those aged 16–45 years). Low falls in the elderly (slipping, tripping, stumbling, stairs and steps) have been reported to constitute ~36% of the falls in developed countries.[25]

MVAs have been the most common etiology in our cases, and this pattern is a common finding in other studies. The percentage of MVA as the cause of TSCI was 61.8% in our cases, and this figure is very high with respect to developed countries (38%: North America and 47% United Kingdom). Some countries in the Middle East and Africa also have reported very high figures—Saudi Arabia (85%),[26] Qatar (72%),[27] Kuwait (63.3%),[28] Botswana (68%) [29]and Nigeria (88.8%).[30] On the other hand, developed countries report a much less figure for MVA etiology—North America (38%),[22] Iceland (42.5),[31] Norway (40.8%),[32] Spain (40.9%)[33]and United Kingdom (47%).[1] Also, in some countries, the figure is very low for MVA, such as India (28%)[34] and Bangladesh (18%),[35] which may be due to less usage of motor vehicles for their land transport. The high percentage of MVA as etiology of TSCI in Iran[36] demands nationwide effort for considering preventive measures.

Education level may be of concern as a risk factor for TSCI—for example, violence and heavy drop were more common in less educated subjects, whereas sport/leisure-related injuries were more common in those with university education. In our study, violence and heavy drop were inversely related to literacy, in contrast to sport injuries, which were directly correlated with the education level. PubMed search did not disclose a similar association reported by other studies.

The relative frequency of cervical cases in our study (31.5%) was much less than developed countries (59–82%);[22,37,38] this may be due to older age at the time of injury,[39] as well as better survival of cervical

cases in those countries.[40] This lower frequency in our cases also may be due to accessibility issues.

The bimodal distribution of the neurological level has been mentioned elsewhere;[37] the reported C5 and T12 peaks were also found in our study. In addition, another minor peak was found at the T6 level not reported in other studies. Regarding morphology of spinal injuries in the cervical region, the percentage of facet dislocations in our study was 64.7%, whereas this figure was 32.1% in other studies.[41]

Regarding complications of TSCI, PUs have been the second most common cause for hospitalization in patients with TSCI after urinary tract infections.[42] Excluding urinary tract infections, in the current study, PUs have been the most common complication (67.8%), followed by neuropathic pain (66.1% overall, 31.2% Visual Analogous Scale $\geqslant 50$), and autonomic dysreflexia (37.0%). The incidence of moderate-to-severe neuropathic pain (Visual Analogous Scale $\geqslant 50$) has been reported to be ~77.7% in other studies.[43] Significant spasticity defined as Modified Ashworth Scale $\geqslant 3$ was found in 25.4% of our cases. Overall, spasticity has been reported up to 70% of TSCI, but the observed Modified Ashworth Scale scoring has not been clarified.[44]

The female preponderance on divorce and/or emotional separation may be explained on the basis of more familial adherence among the partners of the male TSCI cases in Iran. The high divorce rate found in the young subjects may be due to more economic vulnerability in young couples.

Regarding social integration, 86 (4%) of them had been employed before injury. However, after ~29 months post TSCI, 21.9% of our cases were employed (C1–C4: 1%, C5–C8:11.2%, T1-S1: 68.8% for AIS A, B and C, cases; AIS D and E: 19%). The 1-year employment figure in Canada has been 32%, whereas 62% of their cases had been employed before TSCI,[45] their employment rate was near 50%, this figure was 25% for Iranian TSCIs. Risk factors for unemployment after TSCI are reported to be older age, not being married, unmet SCI needs, as well as lower functional independence measure score, and no participation in social roles.[45,46] The same trends were observed in our cases as the rational for lower employment rate.

There are some limitations in generalizibity of our results to the Iranian TSCI population, because our sampling method was not population based; however, the sample is to a large extent a representative sample for TSCI in Iran. Also, there are some limitations in our study for assumptions of the capture–recapture method, such as independence of samples and equal chance to be included in each sample.

CONCLUSION

The study shows a young age for victims of TSCI in Iran—MVA being its most common cause. The rough estimation of TSCI prevalence needs sophisticated registry system. The elderly subjects were less frequent than in the developed countries. The high rate of unemployment and divorce in our cases deserves especial consideration for social integration and supporting programs.

DATA ARCHIVING

There were no data to deposit.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENTS

We thank 'Protection Center of Spinal Cord Disabled of Iran' for their kind support of the study. Also, we thank Dr Ahmad Audeh, Asal Derakhshanrad, MSc, and Dr Shadi Derakhshanrad for their kind contribution to the program. Also, our thanks go to Dr Abolghassem Nikfallah, Dr Mohsen Maghari, Dr Amirhossein Tavakkoli, Dr Seyed Hassan Emami Razavi and Dr Abbas Norouzi Javdan for their participation in the multidisciplinary team and their contributions to the study.

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