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Traumatic spinal cord injuries in Turkey: a nation-wide epidemiological study

İ Karacan*[,1], H Koyuncu[2], Ö Pekel[3], G Sümbüloğlu[4], M Kırnap[5], H Dursun[6], A Kalkan[7], A Cengiz[8], A Yalınkılıç[9], HI Ünalan[2], K Nas[10], S Orkun[11] and İ Tekeoğlu[12]

[1]Bakırköy Istanbul, Turkey; [2]IU, Cerrahpaşa Medical Faculty, PMR Dept. Istanbul, Turkey; [3]PMR Dept, Medical Faculty, Dokuz Eylül University, Turkey; [4]PMR Dept, Medical Faculty, Akdeniz University, Turkey; [5]PMR Dept, Medical Faculty, Erciyes University, Kayseri, Turkey; [6]GATA, Military Hospital, Ankara, Turkey; [7]Kastomonu Rehabilitation Center, Turkey; [8]Afyon State Hospital, Turkey; [9]Medical PMR Dept, Trakya University, Turkey; [10]PMR Dept, Medical Faculty, Dicle University, Turkey; [11]Ankara Rehabilitation Center, Ankara, Turkey; [12]PMR Dept, Medical Faculty, 100.Yıl University, Van, Turkey

Study design: An epidemiological study conducted all over the country.
Objective: The present retrospective study was conducted to survey the new traumatic spinal cord injury (SCI) cases during 1992 in Turkey.
Setting: Intensive care units, emergency services and departments of orthopaedic surgery, neurosurgery and rehabilitation of state hospitals, rehabilitation centers, military and university hospitals.
Methods: Postal questionnaires were used for data collection and the records from medical institutes nation-wide were reviewed for the analysis of the epidemiological factors.
Results: Five hundred and eighty-one new traumatic SCI cases were reported in 1992. The annual incidence was found to be 12.7 per million population. Male to female ratio was 2.5 : 1 and the average age at injury was 35.5 ± 15.1 (35.4 ± 14.8 for males and 35.9 ± 16.0 for females). The most common cause of injury was motor vehicle accidents (48.8%) followed by falls (36.5%), stab wounds (3.3%), gunshot injuries (1.9%) and injuries from diving (1.2%). One hundred and eighty-seven patients (32.18%) were tetraplegic and 394 patients (67.8%) were paraplegic. The most common level of injury was C5 among tetraplegics and T12 among paraplegics. The most prevalent associated injury was head trauma followed by extremity fractures. Severe head trauma resulting in death may obscure the real incidence of SCI and may cause underreporting of cases in epidemiological studies.
Conclusion: Considering that motor vehicle accidents and falls were found to be the leading causes of traumatic SCI, it was concluded that the prevention measures should be focused mainly on these in order to reduce the frequency of SCI in Turkey.
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Keywords: spinal cord injury; epidemiology; Turkey

Introduction

Published data about the epidemiology of SCI in Turkey is limited to a few regional studies such as those conducted in Istanbul, Ankara and Southeast of Turkey. To our knowledge, a nation-wide epidemiological survey on SCI has not yet been available.[1,2,3]

The present study was conducted considering the fact that epidemiological aspects of this serious and disabling condition in Turkey need further investigation.

*Correspondence: İ Karacan, Incirli Cad Asiller sk No 2A/3, 34740 Bakirköy, Istanbul, Turkey

Methods

Procedure and data collection

The study was conducted between January 1 and December 31, 1992. Study charts as questionnaires were sent to the medical institutes nation-wide. Records of patients with SCI were obtained from intensive care units, emergency services and departments of orthopaedic surgery, neurosurgery and rehabilitation. Patients who died before reaching hospital were not taken into account. In Turkey the overall population was estimated as 59 296 687 in 1992. Out of a total of 73 cities, 49 returned the full questionnaire forms and the estimated population in these 49 cities was 45 784 957.[4,5]

Data analysis
Demographic and medical data was analyzed descriptively in terms of frequency and percentages for categorical data and mean ± standard deviation for continuous data.

Results

Incidence
Five hundred and eighty-one new traumatic SCI cases were reported between January 1 and December 31, 1992. The estimated annual incidence of traumatic SCI was found to be 12.7 per million population.

Gender and age
There were 415 males and 166 females; male to female ratio was 2.5/1. The average age at injury was 35.5 ± 15.1 (35.4 ± 14.8 for males and 35.9 ± 16.0 for females). The most prevalent age group was 20 – 29 followed by 30 – 39 years (Figure 1).

Causes of SCI
The most common cause of injury was motor vehicle accidents (48.8%) followed by falls (36.5%), stab wounds (3.3%), gunshot injuries (1.9%) and injuries from diving (1.2%).

Falls were more prominent in the first, second and seventh decades. Motor vehicle accidents, on the other hand, were more frequent in middle aged groups. In the eighth and ninth decade, the frequency of motor vehicle accidents and falls were similar (Figure 2).

SCI level
Eighty-seven patients (32.18%) were tetraplegic and 394 patients (67.8%) were paraplegic. The most common level of injury was C5 (57.4%) among tetraplegics and T12 (17.7%) among paraplegics (Figure 3).

Seasonal distribution
Frequency of SCI showed an increase during summer (32%). Spring (27.6%) was the second commonest season. During all seasons, motor vehicle accident was the leading cause of SCI, but took place most frequently in summer (37.3%).

Associated trauma
In 71.4% of cases no associated trauma or injury was identified. The most prevalent associated injury was head trauma (9.8%) followed by extremity fractures (7.9%), hemothorax (2.2%), burns (1%) and pneumothorax (0.5%).

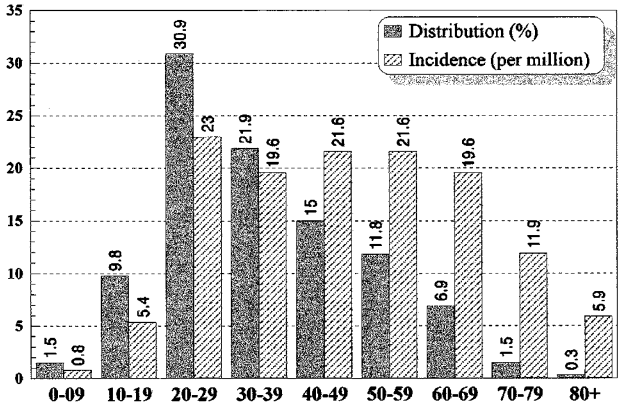

Figure 1 Distribution and incidence of SCI by age groups

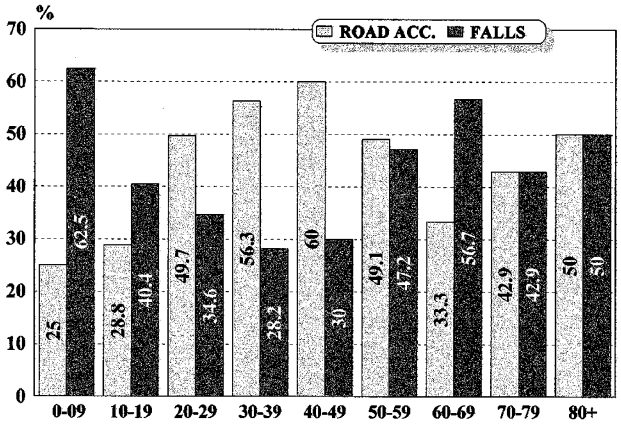

Figure 2 Age and cause of SCI

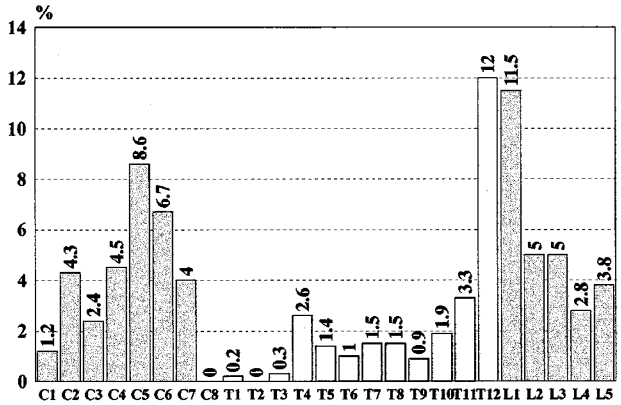

Figure 3 SCI level

Discussion

SCI incidence was reported to range between 6 – 56.1/million in previous studies from different countries throughout the world.[1,3,6–17] The incidence of SCI was found to be 12.7/million in Turkey in 1992. Discrepancies in reports on incidence may arise from the methodological differences between these studies.

SCI incidence may also show a discrepancy in different regions of the same country. This is the case in Turkey, where the reported incidence is 21-million in Istanbul and 16.9-million in Southeast Anatolia.[1,3] Istanbul is the most cultural, industrial and economically developed city in Turkey. Motor vehicle usage is much more common in this city. Public health services are more widely distributed in Istanbul compared with the other parts of the country. On the other hand, Southeast Anatolia is an underdeveloped rural region, with agriculture being the most important source of income. The usage of motor vehicles is not as common as it is in Istanbul. Public health services are not sufficient. Despite no methodological difference, different incidence rates were reported from these two distinct regions of Turkey. Socio-economic, cultural and political factors may well play a role in the discrepancy of SCI incidence reported in these two studies. Similar factors might also be responsible for the different reports on incidence from various countries throughout the world.

In the present study the average age of new spinal cord injured victims in 1992 was found to be 35.5. However, this result should not be interpreted as meaning that individuals in their fourth decades are at highest risk for SCI. The structure of the population in Turkey looks like a pyramid with a very high proportion of younger people.[4] When the SCI incidence for each decade was calculated, the distribution of the cases among the decades between 20–70 years was found to be similar. It can be argued that the relatively lower mean age of SCI patients in our country most likely results from the inherent structure of the population.

In this study, motor vehicle accidents were responsible for SCI in almost half the cases, followed by falls. In several epidemiologic studies motor vehicle accidents were reported to be the most common cause of SCI (34.4 to 61.6%).[1,6,7,8]

According to the motor vehicle accident statistics from the General Directorate of Security of Ministry Interior, Republic of Turkey, 171 741 motor vehicle accidents caused death and/or injury in 1992. Of these accidents 6.15% of the victims were dead and 93.85% injured. Compared with other European countries, Turkey ranks as the country with the highest rate of death per motor vehicles (Tables 1 and 3).[5,18] As the percentage of motor vehicles was the lowest in Europe (Table 2), the rate of death due to road accidents per population seemed lower than expected in spite of the highest rate of death per motor vehicles (Table 3). In addition, due to the insufficiency of first aid, lack of trained paramedicals and difficulties of transportation, the rate of death at the scene of accident might be elevated, which in turn might lower the incidence of SCI and associated trauma, as the victims who died before reaching hospitals were not included in the study. This methodological factor seemed as a universal bias in almost all of these types of studies.

In the present study, the male to female ratio of SCI was found to be 2.5/1. This ratio changed between 3/1 and 5.8/1 in various previous studies.[1,3,6–17] The

Table 2 Motor vehicle and road accident in different countries[5,18]

Country-year	*Motor vehicle/ population* (%)	*Road accident/ Motor vehicle* (%)
Sweden-91	46.16	0.40
Norway-92	49.54	0.41
Finland-90	44.84	0.42
Denmark-91	39.17	0.43
France-92	48.27	0.54
Italy-90	52.07	0.54
Switzerland-91	60.48	0.56
Iceland-91	52.04	0.58
Spain-91	41.65	0.60
United Kingdom-92	44.15	0.94
Germany-90	55.65	1.09
Austria-91	49.68	1.18
Turkey-92	8.53	3.40

Table 1 Population, motor vehicles and road accidents resulting in injuries and/or deaths in different countries.[5,18]

Country-year	*Population* (n)	*Motor vehicles* (n)	*Road accidents* (n)	*Dead* (n)	*Injured* (n)
Sweden-91	8 640 000	3 988 138	16 003	745	21 057
Norway-92	4 260 000	2 110 452	8 677	323	11 712
Finland-90	5 030 000	2 255 529	9 374	632	11 547
Denmark-91	5 150 000	2 017 478	8 757	606	10 265
France-92	57 050 000	27 538 833	148 890	9617	205 968
Italy-90	57 050 000	29 705 794	161 782	6621	221 024
Switzerland-91	6 790 000	4 106 771	22 821	860	28 240
Iceland-91	260 000	135 294	784	27	1128
Spain-91	39 020 000	16 253 349	98 128	6797	148 850
United Kingdom-92	56 400 000	24 900 000	233 000	4229	306 000
Germany-90	63 230 000	35 186 231	385 147	11 300	505 535
Austria-91	7 820 000	3 884 991	46 013	1385	60 355
Turkey-92	59 296 687	5 055 968	171 741	6214	94 824

Table 3 The percentage of dead and injured per motor vehicle and population in different countries[5,18]

Country-year	*Dead/motor vehicle* (%)	*Injured/motor vehicle* (%)	*Dead/population* (%)	*Injured/population* (%)
Sweden-91	0.019	0.528	0.009	0.244
Norway-92	0.015	0.555	0.008	0.275
Finland-90	0.028	0.512	0.013	0.230
Denmark-91	0.030	0.509	0.012	0.199
France-92	0.035	0.748	0.017	0.361
Italy-90	0.022	0.744	0.012	0.387
Switzerland-91	0.021	0.688	0.013	0.416
Iceland-91	0.020	0.834	0.010	0.434
Spain-91	0.042	0.916	0.017	0.381
United Kingdom-92	0.017	1.229	0.007	0.543
Germany-90	0.032	1.437	0.018	0.800
Austria-91	0.036	1.554	0.018	0.772
Turkey-92	0.123	1.875	0.010	0.160

higher incidence in men can be explained by examination of the etiologic factors.

The most common cause of SCI in Turkey is motor vehicle accidents. Statistical reports from the General Directorate of Security revealed the fact that 3.92% of men and 5.31% of women involved in the accidents died and 97.07% of men and 95.21% of women were injured as a result of these accidents.[5] According to these reports male or female gender cannot be considered as a risk factor for death or injury. In the present study, the male to female ratio among spinal cord injured victims was 2.77. This result may be interpreted as meaning that men are more prone to motor vehicle accidents than women in Turkey.

Reported data from the National Statistics Institute revealed that 35.9% of the working population are women in Turkey.[4] In fact the rate of falls and traffic accidents are almost equal between men and women but because of different working ratios, women are less prone to traffic accidents and falls and hence to SCI.

Seasonal distribution of SCI showed a marked increase during the summer. Although SCI cases due to motor vehicle accidents are more common during summer, the General Directorate of Security reported that motor vehicle accidents are more common in winter and autumn. These seemingly contradictory results can be best explained by other reported data from General Directorate of Security indicating that the number of accidents resulting in death and injury is greater in summer compared to winter and autumn.[5]

According to the results of the present study the most common levels of injury were C5 and C6 among tetraplegics and T12 and L1 among paraplegics. Cases with paraplegia were twice as common as those with tetraplegia. This may well be the result of high death risk among tetraplegics during critical care and transportation, leading to underreporting of these cases. The finding that the most prevalent associated injury was head trauma seems to support this hypothesis. Severe head trauma as a common cause of death might obscure the actual incidence of SCI. It was estimated that 12% to 15% of deaths at the time of admission to hospital were associated with SCI.[19,20] Gennarelli *et al* reported that the mortality rate was 18.2% after head trauma and 60% of deaths in their trauma center was due to head trauma.[21]

Considering that motor vehicle accidents and falls are the leading causes of traumatic SCI, we conclude that the prevention measures should be focused mainly on these types of traumas in order to reduce the frequency of SCI in Turkey.

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