Spinal Cord. 2017; 55:588-594

Epidemiology of traumatic spinal cord injury in Galicia, Spain: trends over a 20-year period

A Montoto-Marqués[1,2], M E Ferreiro-Velasco[1], S Salvador-de la Barrera[1], V Balboa-Barreiro[3], A Rodriguez-Sotillo[1] and R Meijide-Failde[4]

[1] *Unidad de Lesionados Medulares, Complexo Hospitalario Universitario A Coruña (CHUAC), Coruña, Spain*
[2] *Departamento de Medicina, Universidade da Coruña, Coruña, Spain*
[3] *Unidad de Epidemiología Clínica y Bioestadística. INIBIC, Complexo Hospitalario Universitario de A Coruña (CHUAC), Coruña, Spain*
[4] *Departamento de Medicina, Universidade da Coruña. INIBIC, Complexo Hospitalario Universitario de A Coruña (CHUAC), Coruña, Spain*

Abstract
Study design. Observational study with prospective and retrospective monitoring.
Objective. To describe the epidemiological and demographic characteristics of traumatic spinal cord injury (TSCI), and to analyze its epidemiological changes.
Setting. Unidad de Lesionados Medulares, Complejo Hospitalario Universitario A Coruña, in Galicia (Spain).
Methods. The study included patients with TSCI who had been hospitalized between January 1995 and December 2014. Relevant data were extracted from the admissions registry and electronic health record.
Results. A total of 1195 patients with TSCI were admitted over the specified period of time; 76.4% male and 23.6% female. Mean patient age at injury was 50.20 years. Causes of injury were falls (54.2%), traffic accidents (37%), sports/leisure-related accidents (3.5%) and other traumatic causes (5.3%). Mean patient age increased significantly over time (from 46.40 to 56.54 years), and the number of cases of TSCI related to traffic accidents decreased (from 44.5% to 23.7%), whereas those linked to falls increased (from 46.9% to 65.6%). The most commonly affected neurological level was the cervical level (54.9%), increasing in the case of levels C1–C4 over time, and the most frequent ASIA (American Spinal Injury Association) grade was A (44.3%). The crude annual incidence rate was 2.17/100 000 inhabitants, decreasing significantly over time at an annual percentage rate change of −1.4%.
Conclusions. The incidence rate of TSCI tends to decline progressively. Mean patient age has increased over time and cervical levels C1–C4 are currently the most commonly affected ones. These epidemiological changes will eventually result in adjustments in the standard model of care for TSCI.

INTRODUCTION

Traumatic spinal cord injury (TSCI) is a severe injury whose management requires substantial healthcare resources, as it entails a coordinated and multidisciplinary effort, not only due to the highly specialized treatment required during its acute phase but also given the associated secondary complications that could potentially arise in the long term.[1]

The global incidence of TSCI is highly variable, and although it was calculated at 2.3 cases/100 000 inhabitants in 2007,[2] the range of values published in the available literature is very wide, which brings to light the difficulty of obtaining reliable epidemiological data to carry out a comparative study between different communities, mainly owing to the different periods studied, the demographic particularities of each country or community, the therapeutic procedures and the data collection system used. Specifically in Spain, the existing epidemiological studies are scarce and are only partial studies that cannot be extrapolated to our region, with figures ranging from 0.8 to 2.3 cases/ 100 000 inhabitants.[3–6]

Several epidemiological studies published over the past few years indicate that developed countries are facing a change in the epidemiology of TSCI, characterized by a global decrease in its incidence (drop in the number of traffic and occupational accidents), an increase in the incidence of incomplete spinal cord injuries (improved initial care and treatment modalities, increase in the number of fall-related injuries in elderly patients, and so on). Furthermore, as a result of the improved prevention measures and the early care in the accident site on the part of the emergency services, the percentage of upper cervical injuries requiring mechanical ventilation are increasingly more frequent.[7–9] This epidemiological change could result in a series of consequences affecting the current healthcare attention model for TSCI, such as a greater morbi–mortality related to the increase in patient age and the endowment of the necessary resources for the care of patients with mechanical ventilation due to the greater number of upper cervical spinal cord injuries. Additionally, the increase in the number of incomplete spinal cord injuries causes rehabilitation treatments to be more specialized, thus requiring expensive technological resources. Within the context of healthcare systems, knowing the epidemiological and demographic characteristics of a disease is essential for planning priorities, assigning adequate healthcare resources to manage them and identifying prevention guidelines.

The overall objective of this study is to describe the epidemiological and demographic characteristics of patients with TSCI in Galicia (Northwestern Spain) over a 20-year period, as well as to determine the incidence of TSCI and analyze the epidemiological changes that have taken place in our community.

MATERIALS AND METHODS

Study setting

The study was carried out in the Unidad de Lesionados Medulares, Complejo Hospitalario Universitario de A Coruña (Spain) inaugurated in March 1988 as a leading center for the treatment of spinal cord injuries in Galicia. The clinic is located in northwestern Spain and serves a population of 2 750 000 inhabitants. The unit holds 31 beds, is integrated in a tertiary-level hospital and counts with a multidisciplinary team that provides comprehensive care for spinal cord injuries, including treatment during its acute phase, rehabilitation therapy and long-term medical follow-up. It serves patients with TSCI, vertebral fractures with a high risk of evolving into a spinal cord injury and non-traumatic spinal cord injuries associated with a severe disability.

Study characteristics

This is an observational study with a prospective and retrospective monitoring carried out on patients with a spinal cord injury who were admitted to our unit between 1 January 1995 and 31 December 2014 and who met the following inclusion criteria: acute spinal cord injury, traumatic etiology and no age limits. Patients with ASIA (American Spinal Injury Association) grade E upon their admission to the Clinic were excluded from the study.

The following data were collected: age, sex, date of the spinal cord injury, date of admission, date of discharge, injury etiology, neurological level, severity of the injury upon the patient's admission to the Clinic, characteristics of the bone injury, associated injuries, cause of admission to the Intensive Care Unit (ICU), mortality, rehabilitation therapy and destination after hospital discharge. The following groups were established with regard to the age at which the injury took place: <15, 16–30, 31–45, 46–60, 61–75 and >75 years. The etiology of the injury was categorized as caused by traffic accidents, falls (considering it a fall from a height if it took place from >1 m and a fall from standing height if it took place from <1 m), sports/leisure-related accidents and other traumatic causes. The presence or absence of a traumatic spinal injury was assessed by means of the conduct of a computerized tomograhy (CT) scan and magnetic resonance imaging (MRI) and was classified as follows: absence of an injury, fracture, dislocation, fracture-dislocation and others. International Standards for the neurological classification of spinal cord injuries according to the ASIA grade, revised in 2011, were used to assess the affected neurological level and the extent of the spinal cord injury.[10] The affected neurological level was classified as C1–C4, C5–C8, thoracic and lumbosacral. Additionally, the ASIA grade of the spinal cord injury was also categorized as complete/incomplete tetraplegia and complete/incomplete paraplegia.

Statistical analysis

Software SPSS 19.0 (IBM, Madrid. Spain) was used to analyze the study data. A descriptive study of relevant variables was carried out. Quantitative variables were expressed as a mean value ± s.d. Qualitative variables were expressed as an absolute value and percentage. The multiple comparison of means was carried out with either the ANOVA (analysis of variance) or the Kruskall–Wallis test, and the normality of these variables was contrasted with the Kolmogorov– Smirnov test. The association between qualitative variables was calculated with the χ^2-test.

The crude incidence rate for each type of injury was calculated using the population estimates for Galicia on the 1st of July of each year, segregated by age and sex group, and provided by the National Institute for Statistics, as denominators. Moreover, standardized rates per age were also calculated by means of the direct method, using the global population as a reference. All rates were calculated per total population and sex, and were expressed as a rate per 100 000 inhabitants per year.

Joinpoint regression models were used to analyze the trends in crude rates, as they are a useful tool to identify significant changes in these trends and to estimate the magnitude of the increase or decrease in each interval. Said increase or decrease was expressed as an annual percentage change with its corresponding confidence interval of 95%.

Ethical–legal aspects

Patient data were extracted from the unit’s admissions registry and the electronic health record, and was subsequently coded anonymously in a database. Data were processed and transmitted in accordance with the provisions of Organic Law 15/1999 of December 13th on the Protection of Personal Data. The study was approved by the Autonomic Research Ethics Committee of Galicia (registration code 2015/155).

RESULTS

A total of 1567 patients with a spinal cord injury were admitted to the Spinal Cord Injury Unit (SCIU) between 1 January 1995 and 31 December 2014. Of these, 1195 patients had suffered a TSCI, with 73.6% (880) having been admitted within the first 24 h of the onset of the injury. Of the total sample of patients with a TSCI, 282 (23.6%) were female and 913 (76.4%) were male (Table 1).

Table 1 Etiology of TSCI in Galicia according to demographic characteristics (1995–2014)

	Total n (%)	Traffic accidents	Falls	Sport or leisure-related accidents	Other traumatic causes	P-value
Gender						<0.001
Female	282 (23.6)	84 (29.8)	188 (66.7)	2 (0.7)	8 (2.8)	
Male	913 (76.4)	358 (39.2)	460 (50.4)	40 (4.4)	55 (6)	
Age						<0.001
<5	17 (1.5)	12 (70.5)	2 (11.8)	2 (11.8)	1 (5.9)	
15–30	266 (22.2)	170 (63.9)	65 (24.4)	21 (7.9)	10 (3.8)	
31–45	230 (19.2)	97 (42.2)	97 (42.2)	10 (4.3)	26 (11.3)	
46–60	257 (21.5)	79 (30.7)	153 (59.5)	7 (2.7)	18 (7.0)	
61–75	257 (21.5)	63 (24.5)	188 (73.2)	2 (0.8)	4 (1.6)	
>75	168 (14.1)	21 (12.5)	143 (85.1)	0 (0.0)	4 (2.4)	
Total	1195 (100)	442	648	42	63	
Mean age±s.d.	50.20±21.09	39.98±19.35	58.83±18.95	33.07±15.24	44.58±15.91	<0.001

Abbreviations: TSCI, traumatic spinal cord injury; s.d., Standard Deviation.

Etiology

The most frequent cause of TSCI during the study period was falls (54.2%), of which 75.85% were falls from a height and 24.15% were falls from standing height. The most common type of falls were falls down staircases (21.9%), followed by falls at home (13.8%), falls from trees (11.8%), falls from roofs (10.8%), falls from tractors (8.4%), falls from buildings (5.7%), falls from haystacks (3%) and other types of falls (21.7%).

The second most frequent cause of the spinal cord injuries treated in our center were traffic accidents (37%), with car accidents being the most common cause (54.7%), followed by motorcycle accidents (25.5%), pedestrian accidents (8.2%), bicycle accidents (6.7%), tractor accidents (3%) and truck accidents (1.9%).

Other causes were sports or leisure-related accidents (3.5%), most of which resulted from swimming dives (64%), and other traumatic causes (5.3%), mainly direct concussions (90%). Moreover, of the 1195 patients with TSCI treated at our center, 222 (18.5%) had experienced occupational accidents which were included into the categories of falls, traffic accidents and other traumatic causes.

With regard to the evolution of the etiological distribution of the injuries over the study period, the most relevant changes were a decrease in the number of traffic and occupational accidents, and an increase in injuries caused by falls, both on a significant scale. The percentage of traffic accidents as a cause of the spinal cord injuries dropped from 44.5% during the 1995–1999 period to 23.7% during the 2010–2014 period, whereas the percentage of occupational accidents dropped from 20.5% to 11.4% and that of falls increased from 46.9% to 65.6% ($P<0.001$) (Table 2).

Table 2 Characteristics of TSCI in Galicia in different periods studied

	n (%)				Total (n %)	P-value
Year	1995–1999	2000–2004	2005–2009	2010–2014		
Number of cases	335 (28)	292 (24.4)	289 (24.2)	279 (23.3)	1.195 (100)	<0.001
Mean age±s.d.	46.40±20.17	47.42±21.95	51.29±20.77	56.54±20.10		<0.001
Age						<0.001
<15	9 (2.7)	3 (1.1)	2 (0.7)	3 (1.1)	17 (1.4)	
15–30	84 (25.1)	85 (29.1)	62 (21.5)	35 (12.5)	266 (22.3)	
31–45	66 (19.7)	62 (21.2)	55 (19.0)	47 (16.9)	230 (19.2)	
46–60	82 (24.5)	44 (15.1)	62 (21.5)	69 (24.7)	257 (21.5)	
61–75	65 (19.4)	60 (20.5)	66 (22.8)	66 (23.7)	257 (21.5)	
>75	29 (8.6)	38 (13.0)	42 (14.5)	59 (21.1)	168 (14.1)	
Etiology						<0.001
Falls	157 (46.9)	147 (50.3)	161 (55.7)	183 (65.6)	648 (54.2)	
Traffic accidents	149 (44.5)	121 (41.4)	106 (36.7)	66 (23.7)	442 (37)	
Sports/leisure related	14 (4.2)	6 (2.1)	10 (3.5)	12 (4.3)	42 (3.5)	
Other traumatic cause	15 (4.5)	18 (6.2)	12 (4.2)	18 (6.5)	63 (5.3)	
Neurological level						<0.001
C1–C4	44 (13.5)	76 (27.4)	95 (34.6)	90 (33.2)	305 (26.6)	
C5–C8	129 (39.6)	79 (28.5)	58 (21.2)	59 (21.7)	325 (28.3)	
Dorsal	118 (36.2)	85 (30.7)	87 (31.8)	82 (30.3)	372 (32.4)	
Lumbosacral	35 (10.7)	37 (13.4)	34 (12.4)	40 (14.8)	146 (12.7)	
ASIA						
A	146 (44.4)	131 (46.1)	121 (43.7)	114 (42.7)	512 (44.3)	0.370
B	49 (14.8)	35 (12.3)	34 (12.3)	28 (10.5)	146 (12.6)	
C	66 (20.1)	75 (26.4)	66 (23.8)	65 (24.3)	272 (23.5)	
D	68 (20.7)	43 (15.2)	56 (20.2)	60 (22.5)	227 (19.6)	
Exitus						0.060
No	296 (88.4)	247 (84.6)	265 (91.7)	249 (89.2)	1057 (88.46)	
Yes	39 (11.6)	45 (15.4)	24 (8.3)	30 (10.8)	138 (11.54)	

Abbreviations: ASIA, American Spinal Injury Association; s.d., Standard Deviation; TSCI, traumatic spinal cord injury.

Age

Mean patient age was 50.20 years (s.d.±21.09). In patients age 30 and under, the most common etiology were injuries caused by traffic accidents, whereas in patients age 45 and over, the main causative factor of these injuries were falls, as in the case of patients age 75 and older (85.1%) (P<0.001) (Table 1).

The mean age of patients with a TSCI caused by falls was 58.83 (s.d.±18.95), which is significantly greater than that of the other causes (Table 1). Mean patient age rose significantly over the years, increasing from 46.40 (s.d.±20.17) years during the 1995–1999 period to 56.54 (s.d.±20.10) during the 2010–2014 period (P<0.001). Furthermore, the percentage of patients with TSCI under the age of 30 decreased (27.8% in 1995–1999 and 13.6% in 2010–2014), whereas that of patients aged 75 and over increased (8.6% in 1995–1999 and 21.1% in 2010–2014) (Table 2).

Characteristics of the spinal cord injury

The most frequent neurological level affected by the injury was the cervical level (C5–C8 28.3%; C1–C4 26.6%), followed by the dorsal level (32.4%) and the lumbosacral level (12.7%). Individually, the most commonly affected levels were C4 (19.3%) and C5 (17.1%). The percentage of cases affecting the cervical levels varied the most over the years, increasing from 13.5% in 1995–1999 to 33.2% in 2010–2014 in the case of levels C1–C4, and decreasing from 39.6% to 21.7% in levels C5–C8 (Table 2).

With regard to the extent of the injury, 44.3% of cases were classified as ASIA grade A, 12.6% as grade B, 23.5% as grade C and 19.6% as grade D. ASIA grade A was the most prevalent grade for all causes of TSCI (P=0.152). As shown in Table 2, the distribution of the different cases of TSCI based on their ASIA grades remained constant over the years. Incomplete tetraplegia was the most common category of TSCI, accounting for 36.6% of cases, followed by complete paraplegia (26.2%),

incomplete paraplegia (19.7%) and complete tetraplegia (17.5%) (P<0.001). Incomplete tetraplegia was the most frequent type of injury in all etiologies (with sports/leisure-related accidents and falls prevailing significantly), except in the case of other traumatic causes in which cases of complete and incomplete paraplegia prevailed above the others (32.8% in both cases) (Table 3).

Table 3 Clinical Characteristics of TSCI in Galicia according to etiology (1995–2014)

	Traffic accidents	Falls	Sport or leisure-related accidents	Other traumatic causes	P-value
Neurological level					<0.001
C1–C4	100 (23.5)	180 (28.9)	12 (30.0)	13 (21.3)	
C5–C8	138 (32.5)	158 (25.4)	20 (50.0)	9 (14.7)	
Dorsal	139 (32.7)	202 (32.5)	4 (10.0)	27 (44.3)	
Lumbosacral	48 (11.3)	82 (13.2)	4 (10.0)	12 (19.7)	
Total	425 (100)	622 (100)	40 (100)	61 (100)	
ASIA					0.152
A	196 (45.9)	268 (42.5)	18 (46.2)	30 (50.0)	
B	58 (13.6)	69 (10.9)	7 (17.9)	12 (20.0)	
C	92 (21.5)	162 (25.7)	6 (15.4)	12 (20.0)	
D	81 (19.0)	132 (20.9)	8 (20.5)	6 (10.0)	
Total	427 (100)	631 (100)	39 (100)	60 (100)	
Category of TSCI					<0.001
Complete tetraplegia	85 (19.7)	96 (15.0)	14 (34.1)	10 (16.4)	
Incomplete tetraplegia	152 (35.3)	247 (38.6)	19 (46.3)	11 (18)	
Complete paraplegia	111 (25.7)	172 (26.9)	4 (9.8)	20 (32.8)	
Incomplete paraplegia	83 (19.3)	125 (19.5)	4 (9.8)	20 (32.8)	
Total	431 (100)	640 (100)	41 (100)	61 (100)	

Abbreviations: ASIA, American Spinal Injury Association; TSCI, traumatic spinal cord injury.

The length of stay in the SCIU was 131.00 days (s.d.±83.02), with a global mortality rate of 11.5% (including exitus in the ICU) and of 6.4% in the SCIU (Table 2). A total of 41.2% of patients had to be initially admitted to the ICU, with respiratory insufficiency and polytrauma being the main causes of admission to said unit.

Table 4 describes other characteristics, such as the type of bone injury, associated injuries, the continuity of rehabilitation therapy and the patients' destination after their discharge from the hospital.

Table 4 Others characteristics of TSCI in Galicia (1995–2014)

	n	%
Type of bone Injury		
No	269	22.7
Fracture	587	49.6
Fracture–luxation	277	23.4
Luxation	50	4.3
Unknown	12	
Total	1195	
Admission in ICU		
No	703	58.8
Yes	492	41.2
Associated injuries		
No	531	44.4
Chest trauma	130	10.9
Abdominal trauma	3	0.3
Limbs trauma	67	5.6
TBI	81	6.8
Other bone injury	52	4.4
Facial trauma	21	1.8
Others injuries	5	0.4
Several injuries	305	25.5
Total	1195	
Rehabilitation after discharge		
No	506	50.6
Yes	494	49,4
Unknown	195	
Total	1195	
Discharge destination		
At home	843	88.8
Geriatric center	40	4.2
Care facility handicapped	4	0.4
Other Rehabilitation hospital	38	4
Chronic diseases hospital	21	2.3
Psychiatric hospital	3	0.3
Unknown	246	
Total	1195	

Abbreviations: ICU, Intensive Care Unit; TBI, traumatic brain injury; TSCI, traumatic spinal cord injury.

Incidence

The mean crude incidence rate of TSCI over the 1995–2014 period was 2.17/100 000 inhabitants per year. Moreover, the age-adjusted incidence rate of TSCI, using the global population as a denominator, was 1.86/100 000 inhabitants per year, being greater in the case of males (3.04/100 000 inhabitants per year) than in females (0.72- /100 000 inhabitants per year) (Table 5). Figure 1 shows the evolution of the age-adjusted incidence rates of TSCI over the years.

Table 5. Crude and age-adjusted incidence rates of TSCI in Galicia (1995–2014)

	1995	2000	2005	2010	2014	Mean 1995–2014	APC	95% CI	
Total crude incidence rate	2.50	2.16	2.43	2.14	1.89	2.17	− 1.4	− 2.4	− 0.5
Males	3.74	3.73	3.46	3.04	2.71	3.44	− 1.7	− 2.7	− 0.7
Females	1.35	0.70	1.47	1.31	1.13	0.98	− 0.7	− 2.9	1.6
<15 years	0.96	0.30	0.32	0.00	0.30		− 7.0	− 10.9	− 2.9
15–29	2.53	3.27	3.31	2.00	1.33		− 2.8	− 4.9	− 0.6
30–44	2.56	2.39	1.92	1.20	1.41		− 2.9	− 4.9	− 0.9
45–59	2.54	1.20	2.04	3.00	1.53		− 2.2	− 4.7	0.3
60–74	2.94	2.00	3.06	1.52	2.14		− 0.6	− 3.2	2.1
>74	4.28	3.60	3.85	5.73	5.18		2	− 0.5	4.7
Overall age-adjusted incidence rate	2.34	1.97	2.09	1.67	1.38	1.86			
Males	3.53	3.30	3.06	2.49	2.15	3.04			
Females	1.24	0.76	1.13	0.90	0.64	0.72			

Abbreviations: APC, annual percentage change; CI, confidence interval; TSCI, traumatic spinal cord injury.

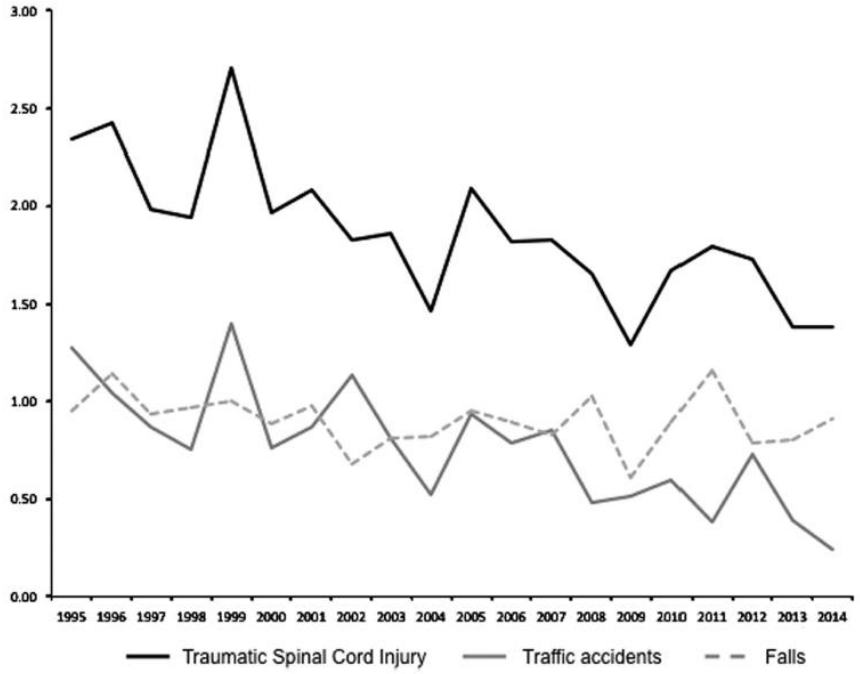

Figure 1 Evolution of the age-adjusted incidence rates of TSCI in Galicia (1995–2014).

The crude incidence rates of TSCI experienced a significant annual decline, with an annual percentage rate change of − 1.4% (95% confidence interval (CI): − 2.4 to − 0.5), decreasing from 2.5/100 000 inhabitants per year in 1995 to 1.89/100 000 inhabitants per year in 2014. This decrease was greater in the younger age groups and was the most significant in patients 44 and under (Table 5). Additionally, the number of cases of TSCI caused by traffic accidents also dropped significantly at an annual percentage rate change of -4.9% (95% CI: − 6.9 to − 2.7), with a crude incidence rate of 1.25/100 000 inhabitants per year in 1995 and of 0.25/100 000 inhabitants per year in 2014 (Table 6). The annual decline in the number of cases of TSCI resulting from traffic accidents over this period was more significant in female patients; − 5.9% (95% CI: − 9.2 to − 2.5), than in male patients; − 4.3% (95% CI: −7 to − 1.4). In the case of injuries caused by falls, the crude incidence rate increased from 1.14/100 000 inhabitants per year in 1995 to 1.38/100 000 inhabitants per year in 2014, although the rise was not statistically significant (annual percentage rate change= 0.9%, 95%: 0.3 to 2) (Table 6).

Table 6. Crude and age-adjusted incidence rates of TSCI in Galicia (1995–2014) caused by traffic accidents and falls

	1995	2000	2005	2010	2014	Mean 1995–2014	APC	95% CI	
TSCI caused by traffic accidents									
Crude incidence rate	1.25	0.81	1.01	0.64	0.25	0.80	− 4.9	− 6.9	− 2.7
Age-adjusted incidence rate	1.27	0.76	0.93	0.60	0.24	0.76			
TSCI caused by falls									
Crude incidence rate	1.14	1.10	1.23	1.32	1.38	1.22	0.9	−0.3	2
Age-adjusted incidence rate	0.96	0.88	0.96	0.90	0.91	0.90			

Abbreviations: APC, annual percentage change; CI, confidence interval; TSCI, traumatic spinal cord inury.

DISCUSSION

This study provides information on the epidemiological and demographic characteristics of patients with TSCI treated in Galicia (Spain) between 1995 and 2014.

The crude incidence rate of TSCI in our Community over the 1995–2014 period was 2.17/100 000 inhabitants per year, which is similar to the rate described by Pérez et al.[6] (2.35/100 000) for our country in 2012 and greater than that reported by García Reneses et al.[3] (0.8/100 000) in 1991 and by Van Den Berg et al.[5] (1.55/100 000) in 2011. Globally, our incidence rate is considered moderate, particularly compared with the crude incidence rates described by Van Den Berg et al. in 2010,[11] which ranged from 1.21 cases/100 000 inhabitants in Holland to 5.78 cases/100 000 in Portugal, although it is similar to that published by Lee et al.[2] in 2014, who reported an incidence rate of 2.3 cases/100 000 inhabitants by extrapolating global incidence data. However, our incidence rate is lower than that reported for other countries such as the United States of America, where the incidence rate according to DeVivo ranges from 2.5 to 5.9/100 000, with a global mean of 4 cases/100 000.[7]

The crude incidence rates of TSCI in our region experienced a significant annual decline, with an annual percentage rate change of –1.4% (95% CI: –2.4; –0.5), decreasing from 2.5/100 000 inhabitants per year in 1995 to 1.89/100 000 inhabitants per year in 2014. The strongest determining factor of this decline is probably related to the decrease in the number of traffic accidents, as discussed below.

One of the most relevant pieces of data of our study was the percentage of patients who were admitted early to our SCIU after suffering the TSCI; 73.6% of patients were admitted within the first 24 h after experiencing the injury, which is a higher percentage than that reported by Amin et al.[12] (63%) and Ploumis et al.[13] (37.3%). The high percentage recorded in our region can be explained by the very close communication between the different hospitals receiving patients and the SCIU, the fact that it is a referring center, and by the referring protocol for spinal cord injury patients implemented jointly with the Emergency Care Services. This fact is consistent with one of the main priorities in the treatment of TSCI—patient referral, ideally direct, to hospitals specialized in the treatment of spinal cord injuries in order to optimize treatment and long-term results, as well as to lessen complications.[14–16]

The most frequent cause of TSCI in our Unit during the study period was falls, accounting for 54.2% of cases. The number of falls increased significantly throughout our study period, rising from 46.9% during the 1995–1999 period to 65.6% during the 2010–2014 period. The abovementioned incidence rates and the increase in the incidence of cases resulting from falls are very similar to those published in a recent study carried out by McCaughey et al.,[8] who reported an incidence rate of 51.7% and a rise in the number of falls from 41.6% to 60%. This increase in the number of fall-related injuries was also described by other authors.[5,7,17,18]

Additionally, falls were responsible for most cases of TSCI in patients 60 and over (73.2% in patients 61–74 years of age, and 85.1% in patients 75 and over). These percentages are related to population ageing (in our region 19.9% of the global population is 65 or over, and 8.9% is 75 or over)[19] and occupational activity, despite retirement, in many cases related to agricultural work.

Another relevant finding was the decrease in the number of traffic accidents, which dropped from 44.5% during the 1995–1999 period to 23.7% during the 2010–2014 period. Other studies carried out in Europe and developed countries also prove that the number of cases of TSCI resulting from traffic accidents has dropped over the past years.[2,6,20,21] In the case of our country, this drop could probably be associated with the improvement in road infrastructures that took place during the nineties and to the several interventions carried out to increase road safety during the past decade in Spain (the entry into force of the point system on driving licenses in 2006, the reform of the penal code in 2007 and the implementation of the Road Safety Act in 2011), as well as the use of prevention campaigns and the greater public awareness. This fact is consistent with the significant decrease in the number of traffic fatalities reported in Spain over the study period, with the number of fatalities having dropped from 5957 in 1998 to 1688 in 2014.[22]

Additionally, the decline in the number of occupational accidents was also significant, probably due to the downturn in the construction sector in our country resulting from the economic crisis.

The mean age of patients with a TSCI in our region (50.20 years) is greater than that recorded in other European countries and USA,[8,18,23,24] presumably due to the greater number of cases of TSCI caused by falls in elderly patients and to the low incidence of sports related injuries, and the practically null occurrence of violent acts, which are typical injuries in younger patients. Furthermore, mean patient age was seen to have increased by 10.14 years over the past years (46.40 vs 56.54) as a result of the decrease in the number of cases of TSCI caused by traffic accidents (the most common cause of TSCI in the patients 30 or under treated in our unit) and an increase in patients over 75 years of age.

The characteristics of the spinal cord injury did not change over the years of our study, with the ratio of cervical injuries to dorsal and lumbosacral injuries remaining constant, as well as the different ASIA grades. The proportion of cervical spinal cord injuries (54.9%) recorded in our study is similar to that reported in other European countries and USA.[7,8,25] The most relevant finding of our study was the significant increase in the number of cases affecting neurological levels C1–C4 and the decrease in those affecting levels C5–C8, which falls in line with the data published in recent studies carried out by DeVivo and McCaughey,[7,8] and is probably related to the increase in the number of cases of TSCI resulting from falls in elderly patients, which are mainly cervical injuries, and to the improved survival rates in TSCIs affecting upper cervical levels, due to the more immediate care and the effective coordination between emergency care services.

Study limitations

Although our SCIU is a reference center for the treatment of patients with acute TSCI, no registry of TSCI patients is available at a regional level; hence, the incidence rate could have been affected by this fact and underestimated due to the number of patients deceased in the accident site or early in other hospitals, as a result of which they were never transferred to our center. Furthermore, some cases of incomplete TSCI with scarce motor involvement or lesions related to the cauda equina syndrome without affecting the sphincters could have remained in rehabilitation facilities without a request for their transfer to a reference center having been issued.

CONCLUSIONS

The incidence rate of TSCI in our region is moderate compared with the global incidence rate, having experienced a significant annual decline over the years of our study, associated with a significant decrease in the number of traffic accidents.

The most frequent cause of TSCI in our unit was falls, being responsible for most spinal cord injuries in patients 60 and over, consequently resulting in a significant increase in mean patient age, which in our study was greater than that reported in other countries. In our case, although the affected neurological level and extent of the spinal cord injury did not change over the years, we did evidence a significant increase in the number of cases affecting cervical levels C1–C4.

These epidemiological changes could eventually result in adjustments in the standard model of care for spinal cord injuries in terms of prevention strategies and resource endowment in our region.

DATA ARCHIVING

There were no data to deposit.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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