Epidemiology of Traumatic Spinal Cord Injuries in Colombia

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Abstract

Study Design: Retrospective cohort study.

Objectives: To determine the incidence and characteristics of newly injured individuals admitted to a traumatic spinal cord injury (TSCI) referral center during a 4-year period.

Setting: University Hospital of Valle, Cali, Colombia.

Methods: Individuals were identified, and their data was recorded based on the International Spinal Cord Injury Core Data Set. The outcome of interest was the American Spinal Injury Association Impairment Scale (AIS) grade at last follow-up.

Results: There were 491 individuals admitted in the 4-year period. The mean annual incidence of TSCI was 56.27 per million inhabitants. Considering TSCI in individuals exclusively from Cali, the mean annual incidence was 27.78 per million. The leading cause of TSCI was interpersonal violence (47.25%) and falls (33.60%). There was a 96.52% ($p<0.0001$) correlation between AIS grade at admission and last follow-up. The most common AIS grade at last follow-up was E (34.01%) caused mostly by falls (57.48%), followed by A (31.16%) caused mostly by interpersonal violence (76.27%). The reported employment rate dropped from 75.56% to 18.94% before and after TSCI ($p<0.05$). AIS grade A was associated with more post-injury complications ($p<0.05$).

Conclusions: This is the first cohort study in Colombia describing the incidence and AIS grades of individuals with TSCI from a trauma referral center. Interpersonal violence was overrepresented in this population. Future research should include the evaluation of prevention strategies, as well as research on interventions towards quality improvement in patient care and post discharge services especially for individuals with AIS grade A.

Introduction

Traumatic Spinal cord injuries (TSCI) are a global public health problem due to their high mortality and morbidity [1, 2]. TSCI can cause temporary or permanent changes in sensory, motor, or autonomic functions, frequently associated with trauma of intentional and non-intentional origin. According to the World Health Organization (WHO), the main causes of TSCI are road traffic injuries (RTI), violence, and falls [1]. Each year there are between 250,000 and 500,000 new cases of TSCI worldwide [1], resulting in an annual incidence that ranges between 10.4 and 83 cases per million inhabitants [3]. This varies between countries and regions, since these injuries results from the interaction of different contextual factors.

Individuals with TSCI are not only affected at the physical level. TSCI confers concomitant restrictions in participation and working activities, especially in low resource settings [1], which adds to patient distress. Furthermore, the economic impact of TSCI is reflected by the high level of acute care and secondary complications following the injury. A study in the United States found that the average indirect cost incurred by a TSCI was $29,354 per person, with lifetime costs ranging from 0.4 to 2.3 million US dollars for people aged 25 and 50 years old [4].

Low to middle income countries have lower TSCI survival rates compared to high income countries [2], which could indicate decreased rates of improvement during hospitalization. In Norway, 23% of the people that were admitted with an American Spinal Injury Association Impairment Scale (AIS) grade A changed to a different grade at discharge [5]. However, there is currently no epidemiological data that compares AIS scales at follow-up and admission in the context of the Colombian population.

In a region that holds 14% of the world's population but has 42% of interpersonal violence mortality [6], Colombia is a hot spot for violence. Cali is one of the three most important cities in the country and has been one of the most violent cities in the world for the last two decades [7]. In 2018 it was estimated that Cali had a rate of injuries caused by interpersonal violence of 193.46 per 100,000 inhabitants, and 107.39 RTI per 100,000 inhabitants [8]. Approximately 370,000 disability-adjusted life year (DALY) are lost yearly due to these events, and 19% are lost in the group of 20-24 years [9]. It has been estimated that 1 out of every 40 Colombian persons who enters the emergency department has a TSCI [10], and despite efforts to strengthen surveillance in injuries and trauma in the country [8, 11], there is little available information about the epidemiological and clinical characteristics of individuals with TSCI [3, 12, 13]. The WHO has called attention to the lack of accurate identification of incidence and prevalence of TSCI both in high and low-income countries, but especially on the latter [1].

In this study we describe TSCI, its clinical outcomes based on the AIS and their associated etiologies experienced in Colombia's main referral trauma center in Cali. We aim to provide epidemiological information on TSCI as well as information related to hospitalization and rehabilitation, in order to identify areas for further research.

Methodology

Study type

Retrospective cohort study of individuals with TSCI who consulted to a trauma referral center in Cali between 2009-2012. We collected sociodemographic and clinical information from medical records using a standardized form based on International Spinal Cord Injury Core Data Sets [14].

Study setting

The study was carried out at the University Hospital of Valle (HUV), which is a public hospital of high complexity located in Cali. It is the main referral center in the public network of hospitals in Valle del Cauca (22,195 km^2) and the southwestern region of Colombia. The hospital treats approximately 7,081 individuals per year due to trauma and injuries [11].

Study population

We included all of the individuals treated in the trauma center, who reported there because of an emergency between 2009-2012. All the included individuals had a diagnosis of TSCI according to the International Classification of Disease in its tenth version (ICD-10) without discrimination by age, sex, origin, or ethnicity. Individuals were excluded if they had incomplete records (n=3).

Data collection

Information was collected by healthcare personnel who had received two-sessions of training in data collection and data quality with the researchers of the project. The medical records of persons diagnosed with TSCI were given by the Administrative department at the Hospital and the information was collected in a predesigned form in EpiInfo 7.0. This instrument enabled the collection of sociodemographic variables, injury mechanism, clinical examination at first and last assessment (general and neurological), and rehabilitation services [14]. When the staff were in doubt about including certain records due to issues with the quality of the information, the researchers made the decision whether or not to include the record.

The individuals were classified according to the neurological level and extent of the injury, applying the AIS upon admission and at the last consultation on the medical record [15]. In order to categorize the causes of TSCI we used the following groups: 1) unintentional injuries (RTI, falls, diving injuries, and working injuries) and 2) intentional injuries (interpersonal violence and self-inflicted injuries). Time to the last visit since injury was categorized in <30 days, 1-3 months, 3-6 months, and >6 months. Age of participants was categorized as <17, 18-25, 26-35, 36-45, 46-55, 56-65, and >66 years, and grouped as ≤60 or >60 years [16].

Statistical analysis

The database was exported into the statistical package Stata 16.0 (STATA Corp., Texas, US)® for analysis. An exploratory data analysis was carried out to identify missing values or typing errors. In the cases where typing errors were found, the information was validated using the medical record. Subsequently, a univariate descriptive analysis was performed calculating measures of central tendency and dispersion for quantitative variables, as well as frequencies and proportions for categorical variables. We used population estimates from the National Department of Statistics of Colombia [17] and calculated the mean annual rates of TSCI, both for the whole population and for individuals from Cali.

Group comparisons were made with specific statistical tests according to the assumptions of each one. For continuous variables, t-test was used when comparing two groups and ANOVA or Kruskal-Wallis test were used when comparing more than two groups. For categorical variables, Chi-square test or Fisher's exact test were used. R Studio was used to calculate Fisher’s exact test for count data with simulated p-value based on 1e+7 replicates. Simple linear regressions were used to estimate the change in frequencies of types of injuries over time with 95% confidence intervals (95%CI). Pairwise correlation coefficients were used to analyze the relation between AIS at admission and last follow-up. Statistically significant differences were defined as a p-value<0.05.

Results

Incidence

During the 4-year period, 491 individuals were admitted with TSCI. Almost half of the individuals came from Cali (49.29%). The mean annual incidence of TSCI for all the cases admitted to the referral center was 56.27 per million. For individuals only from Cali, the rate was 27.78 per million inhabitants. **Figure 1** describes the temporal trend of cases over time by injury type.

TSCI persons' characteristics

Mean age was 33±15 years (range 2-76), and 85.95% were male, for a male:female ratio of 6:1. Persons that were single and without insurance were younger compared to those married and with insurance (married vs. single, mean difference=9.15, 95%CI=6.33-11.99, p<0.0001; insured vs. without insurance, mean difference=3.90, 95%CI=1.02-6.78, p=0.008). It was found that 75.56% had an occupation before the injury and only 18.94% reported one after the injury, thus experiencing a 74.93% reduction in employment (p=0.006).

Based on the trauma mechanism, 47.45% of the TSCIs were caused by intentional injuries and 52.55% were caused by unintentional injuries. Falls were the most common cause of unintentional injuries (33.60%), followed by RTI (16.29%), and diving injuries (2.24%). Amongst intentional injuries, 99.57% (n=232) were caused by interpersonal violence and 0.43% (n=1) was caused by self-inflicted injuries.

Only 5.09% of the participants were older than 60 years old. TSCIs caused by violence were significantly higher in the ≤60 years old group (49.23% vs. 4.00%, p<0.0001), while falls caused a significantly higher proportion of TSCI in the >60 group (31.21% vs. 76.00%, p<0.0001).

The years with lowest and highest proportion of TSCI were 2012 (21.18%) and 2009 (24.86%), respectively. When comparing causes of TSCI over the years, we found a significant decrease in RTIs (β=-0.46, 95%CI=-0.73;-0.20, p=0.001, R^2=2.45%) and an increase in violence (β=0.20, 95%CI=0.007;0.40, p=0.042, R^2=0.85%) (**Figure 1**). We did not observe a change in either the age of the individuals over time (ANOVA, F=0.76, p=0.52) or when analyzing by subgroups of injury mechanism. The description of the injuries by mechanism is described in **Table 1**.

Most of the persons went directly to the referral center (80.45%) and only 1.83% of the individuals were seen in a different institution. Once in the hospital, 32.18% were seen by the Physical Medicine and Rehabilitation Department. Additional rehabilitation services were provided in the hospital to 49.49% of the individuals, including physical therapy (41.14%), respiratory therapy (36.05%), occupational therapy (14.66%), and phonoaudiology (2.85%). During hospitalization, 27.29% of the individuals developed complications; 11.20% developed pressure ulcers, 11% urinary infections, 10.39% neuropathic pain, 1.22% autonomic dysreflexia, and 1.02% developed deformities.

Follow-up with physical medicine within the same institution was provided to 41.75% of the individuals; 18.05% of these individuals were seen within the next 30 days, 34.15% within the next three months, 29.76% within the next 6 months, and 16.59% after more than 6 months. The median number of appointments for follow-up with the clinic of TSCI was 1 (interquartile range: 0-2).

TSCI by the mechanism of Injury

Table 2 describes the individuals' characteristics based on the type of injury and **Figure 3** describes the percentage of injuries by mechanism, sex, and age groups.

Unintentional injuries: Road traffic injuries

RTI occurrence was associated with weekend days (Friday to Sunday inclusive, 65% vs. 35%, $p=0.03$) and no other injury type was found related to the days of the week. Most of the individuals with a TSCI caused by a RTI were male, with a male:female ratio of 4:1, and 30% of the individuals were between 18 and 25 years of age.

Falls

Individuals with TSCI due to falls had a mean age of 42±16 years, most of them were male with a male:female ratio of 4:1, and 26.06% had ages between 46 to 55 years. Only two thirds of these individuals had healthcare insurance.

Intentional injuries: Interpersonal violence

Individuals with TSCI due to violence were the second youngest group with 40.52% in the age group of 18 to 25 years, with a male:female ratio of 9:1. In this subgroup the AIS grade was A in 53.02% of the individuals and the most common cause was a gunshot (98.37%), causing 100% of these injuries at the cervical and lumbar level, and 97.65% in the thoracic level. Individuals were injured mostly by a gunshot (90.52%) followed in a smaller proportion by a knife (8.62%), or other weapons (0.86%).

Individuals injured by a gunshot were younger (knife: n=20, mean=30±11, gunshot: n=210, mean=25±9, others: n=2, mean=50±31, Kruskal-Wallis $p=0.01$), had more traumatic brain injuries (knife 14.29%, gunshot 71.43%, others 14.29%, $p=0.04$), and the AIS grade A was more common when compared with individuals injured with other types of weapons (A 98.37%, B 85%, C 46.15%, D 61.54%, E 86.67%; $p<0.05$).

AIS at last follow-up

Comparing AIS grade at admission vs. last follow-up we found that the correlation between both variables was 96.52% ($p<0.0001$). AIS grades B and C were the classifications with higher changes in AIS grade from admission to last follow-up, with 57.58% (19) and 71.05% (27) of the individuals classified that way in admission remaining the same at the last follow-up, respectively. When individuals were admitted with an AIS grade B injury, they had at their last visit either AIS grade A or D in 15.15% (5) both, and when individuals were admitted with an AIS grade C, 28.95% (11) were AIS grade D at their last follow-up (See **Figure 2**). AIS grade A was also correlated with a higher rate of complications. AIS grade A had 53.59% of post-injury complications, whilst E had 4.19% of complications ($p<0.0001$).

Discussion

To the best of our knowledge, there are no other studies describing the incidence of TSCI in Colombia. Over the 4-year study period, we observed an overall decrease in the total rate of TSCI in Cali. We found a mean annual incidence of 56.27 TSCI cases per million. This is higher than estimates of global annual TSCI incidence being 23 cases per million [2]. It is also higher than estimates of Andean Latin America having an annual TSCI incidence of 19 cases per million [2]. Considering TSCI cases of individuals from Cali only, the annual incidence was 27.78 cases per million. This is higher than the incidence in the Andean region but lower than the rate in higher-income countries including Finland and North America, which had annual incidence rates of 36.6 and 40 cases per million respectively [2, 16], and is comparable to the annual incidence rate of 22 cases per million in the high income country of New Zealand [18]. The differences in incidence rates may reflect contextual factors such as population demographics, however a direct comparison of global incidence rates is hindered by the heterogeneity of different epidemiological studies [16].

Our study was based around the University Hospital of Valle, which was the main trauma referral center in the city. However recent years saw the growth of the Clinic Fundación Valle del Lili [11], from which we were not able to include data in our study. This could have resulted in an underestimation of TSCI rates in the city.

There were relatively few individuals aged 60 years or older (n=25; 5.09%) which differs from global trends of TSCI whereby falls in the elderly contribute to the higher mean age of individuals, such as in Finland where the mean age of TSCI individuals was 58.9 years [16]. Amongst those aged ≥60, falls caused a significantly higher proportion of injuries. This supports previous studies [1, 16], which therefore reinforces the importance of fall prevention amongst the elderly.

We observed a ratio of 6:1 male to female in all TSCI individuals, and a ratio of 9:1 male in those caused by interpersonal violence. Globally, whilst males remain overrepresented in the TSCI population [2], higher income countries report smaller gender gaps between male and female TSCIs [5, 19, 20]. Lower to middle income countries, such as Mexico, Afghanistan, Bangladesh, and India reported a similar ratio of male to female individuals as observed in our study [19, 21, 22]. Whilst the higher prevalence of male TSCI individuals may be explained by the higher risk-taking and impulsive behavior of males [23], in the context of our study, interpersonal violence amongst males is more likely to be a contributing factor [11]. Although an increase in the provision of public goods could be an effective strategy to improve urban safety [7], violence in Colombia is a complicated and multifaceted issue that requires a multidisciplinary approach.

Additionally, we found high rates of having low education levels, single marital status, and lack of insurance in the studied population. Low education levels being associated with TSCI were also reported in Mexico where 50% of the participants with a TSCI only had elementary school education [22]. Marital status may be a positive predictive factor in terms of independent living after TSCI [1]. Being single and lacking insurance was associated with younger age; therefore, prevention programs should target younger age groups.

Overall, we found that the most frequent cause of TSCI was interpersonal violence, followed by falls, RTI, and less frequently diving injuries, work injuries, and self-inflicted injuries. RTIs were associated with weekends. This may be explained by the higher prevalence of driving under the influence of alcohol on weekends in the city [24]. However, there was also a reduction in the proportion of RTI over time (Figure 1), which differs from a study in Sao Paulo, Brazil, which found an increase in the frequency of RTIs over time [25]. The different TSCI trends in these two cities may reflect the socioeconomic differences between them, and a less complicated transportation system in Cali with successful implementation of road safety interventions [26, 27].

Whilst RTIs did not cause nearly as many TSCIs as interpersonal violence did in our study, in higher income countries, the main causes of TSCI are RTIs, falls, and recreational activities [2, 18]. Across all TSCIs, the most common severity was AIS grade A, which was associated with the TSCIs caused by interpersonal violence. Within this group, gun violence had the most common etiology. This is higher than studies in other low- to middle-income countries, such as Mexico and Afghanistan which reported rates of firearms causing 16.8% and 15% of TSCIs, respectively [21, 22]. The high rate of gun related TSCIs can be explained by the high rates of gun violence in Cali [7]. Whilst there have been municipal programs attempting to control gun use in the city, a more effective national gun control scheme would be beneficial [28].

Regarding services accessed during hospitalization, 49.49% of individuals were provided with rehabilitation services. This is comparable to higher income countries such as Portugal, where after the patient becomes clinically stable, more than half are transferred to a rehabilitation center [20]. However, the reported rate of employment dropped 75% after the injury. In Portugal, in addition to hospital rehabilitation services, outpatient services including two specialized vocational rehabilitation programs are provided through the National Health System [20]. Therefore, the provision and engagement with such services in Colombia may be a strategy to increase the rate of post-injury employment.

Furthermore, 11.20% of individuals developed pressure ulcers during hospitalization. This is lower than the 37% prevalence of in-hospital pressure ulcer described in Afghanistan [21]. Urinary tract infections (UTIs) are another preventable issue which occurred in 11% of the observed individuals. This is a lower compared to other studies, from Turkey after 50 days post TSCI (22%) [29] and Afghanistan (57%) [21]. The fact that UTIs are much more prevalent in women compared to men and that the majority of participants in our study were male may partially explain the comparatively lower rate of UTIs in our study. However, when compared to Afghanistan which had a similar male:female ratio as in our study, [21] this may indicate that HUV was relatively successful in preventing and treating UTI. Additionally, 10.39% of individuals developed neuropathic pain and 1.22% developed autonomic dysreflexia. UTI may exacerbate SCI-related secondary complications [1]; therefore management and prevention of UTI is essential.

At last follow-up, a strong correlation (96.52%) was found between AIS grade at admission and at discharge. Grades B and C were had the highest overall deviation from initial AIS grade. More than 95% of AIS A individuals maintained AIS grade A status. In Norway, 77% of individuals remained grade A at discharge [5]. In this way, our study shows that whilst there has been improvement in medium level injuries (AIS grades B and C), there is potential for improvement for AIS grade A injuries. In our study, AIS grade A was also correlated with a higher rate of complications. This further supports the need for the increased provision of rehabilitation services within the hospital.

Strengths and limitations

Major strengths of the study are that it was carried out in a trauma referral center of the southwestern of Colombia [11], the data was collected by trained personnel and based on a standardized dataset [14], and the study avoided selection bias that would arise from only collecting data from specialized services. The study has some limitations that are adherent to the design. Firstly, the sampling method that we used limits the extrapolation of results. Secondly, its retrospective nature limits the conclusions; however, our study provides important information towards the development of future research to address issues such as complications and unemployment. Another limitation is the omission of data from Fundación Valle del Lili. Although our estimates could therefore be underestimating the incidence, our study provides a good approximation of the situation in the city and the region.

Conclusion

This is the first cohort study in Colombia describing the incidence and AIS grades of individuals with TSCI. Interpersonal violence, specifically gun violence in young males was overrepresented in this study. Greater provision of rehabilitation services during hospitalization would improve the follow-up outcomes of individuals, especially those with AIS A. There is also a need for provision of post-injury employment services. Further research is required to identify factors associated with complications and evaluate the efficacy of preventive strategies Our study provides relevant information towards preventive strategies and healthcare provision quality improvement locally and for the region.

Declarations

Data Availability

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

Acknowledgements

None.

Statement of Ethics

The study was approved by the University Hospital of Valle Ethics Committee and the Human Ethics Committee of the Universidad del Valle with code 143-018. The authors certify that all applicable institutional and governmental regulations concerning the ethical use of human's information were followed during the course of this research and the Institutional Review Board waived the requirement for informed consent to access patient health information as the study does not involved more than minimal risk to the privacy of individuals.

Conflicts of Interest

The authors declare that they have no conflicts of interest to disclose.

Authors' Contributions

YAG was responsible for designing the study, conducting the research, extracting and analysing data, and reviewing and approving the final version of the report.

JLC was responsible for designing the study, conducting the research, extracting and analysing data, and reviewing and approving the final version of the report.

MATS contributed to the design of study, supervision of the research, interpreting results, and reviewing and approving the final version of the report.

AAK contributed to the study design, interpreting results and writing the report.

SGPQ contributed to the study design, interpreting results and writing the report.

FJBE contributed to the study design, conducted the statistical analysis, contributed interpreting results, and writing the report.

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Tables

Table 1. Characteristics of individuals with spinal cord injuries in a referral center in Colombia by injury type, 2009-2012.

Characteristics	All injuries (n=491)*	Unintentional injuries (n=258)			Intentional injuries (n=233)	p-value
		Road traffic (n=80)	Falls (n=165)	Diving (n=11)	Interpersonal violence (n=232)	
Age, mean (standard deviation)	33.06 (14.75)	36.59 (13.64)	42.20 (15.66)	21.82 (6.85)	25.82 (9.81)	<0.0001
Sex: Male, n (%)	422 (85.95)	63 (78.75)	134 (81.21)	11 (100)	212 (91.38)	<0.002[+]
Educational level: ≥Secondary, n (%)	223 (45.42)	43 (53.75)	59 (35.76)	2 (18.18)	116 (50.0)	<0.0001[+]
Origin: Cali, n (%)	242 (49.29)	19 (23.75)	71 (43.03)	1 (9.09)	150 (64.66)	<0.0001[+]
Marital status: Without partner, n (%)	274 (55.80)	30 (37.50)	86 (52.12)	8 (72.73)	149 (64.22)	<0.0001[+]
Covered by health insurance, n (%)	323 (65.78)	76 (95.0)	104 (63.03)	3 (27.27)	139 (59.91)	<0.0001[+]
Injury level, n (%)						<0.0001[‡]
Cauda equina: Yes, n (%)	43 (8.76)	5 (6.25)	5 (3.03)	0 (0)	32 (13.79)	
Cervical: Yes, n (%)	151 (30.75)	32 (40.0)	41 (24.85)	10 (90.91)	68 (29.31)	
Lumbar: Yes, n (%)	104 (21.18)	17 (21.25)	72 (43.64)	0 (0)	14 (6.03)	
Thoracic: Yes, n (%)	192 (39.10)	26 (32.50)	47 (28.48)	0 (0)	118 (50.86)	
Associated injuries [n (%)]						
Hollow viscus injury	32 (6.52)	1 (1.25)	2 (1.21)	0 (0)	29 (12.50)	<0.0001[+]
Solid viscus injury	77 (15.68)	1 (1.25)	5 (3.03)	0 (0)	71 (30.60)	<0.0001[+]

Characteristics	All injuries (n=491)*	Unintentional injuries (n=258)			Intentional injuries (n=233)	p-value
		Road traffic (n=80)	Falls (n=165)	Diving (n=11)	Interpersonal violence (n=232)	
Traumatic brain injury	46 (9.37)	13 (16.25)	21 (12.73)	5 (45.45)	7 (3.02)	<0.0001+
Vascular injury	17 (3.46)	1 (1.25)	0 (0)	0 (0)	16 (6.90)	0.001+
Appendicular fractures	61 (12.42)	11 (13.75)	18 (10.91)	0 (0)	32 (13.79)	0.59+
Peripheral nerve injury	17 (3.46)	3 (3.75)	1 (0.61)	0 (0)	13 (5.60)	0.04+
AIS Grade Classification first assessment [n (%)]						<0.0001‡
A	158 (32.18)	26 (20.0)	17 (10.30)	2 (18.18)	123 (53.02)	
B	33 (6.72)	6 (7.50)	6 (3.64)	1 (9.09)	20 (8.62)	
C	38 (7.74)	10 (12.50)	13 (7.88)	2 (18.18)	13 (5.60)	
D	54 (11.0)	8 (10.0)	31 (18.79)	2 (18.18)	13 (5.60)	
E	165 (33.60)	36 (45.0)	93 (56.36)	4 (36.36)	30 (12.93)	

*Working injuries (n=1), Self-inflicted injuries (n=1)

* Kruskal-Wallis, + Fisher's exact test, ‡ Fisher's exact test for count data with simulated p-value based on 1e+7 replicates

Table 2. Demographic, injury characteristics, and post-injury complications of individuals grouped by AIS grade at last follow-up.

Characteristic	AIS at last follow-up						p-value
	A 153 (31.16%)	B 26 (5.30%)	C 33 (6.72%)	D 68 (13.85%)	E 167 (34.01%)	Not testable 19 (3.87%)	
Age, mean (standard deviation)	28.49 (11.86)	29.29 (13.58)	36.76 (11.92)	37.54 (15.38)	36.38 (16.29)	27.33 (10.28)	0.0001*
Sex: Male, n (%)	135 (88.24)	25 (93.94)	31 (93.94)	60 (88.24)	130 (77.84)	17 (89.47)	0.016^{+}
Educational level: Secondary or higher, n (%)	72 (47.06)	15 (57.69)	10 (30.30)	27 (39.71)	77 (46.11)	7 (36.84)	0.26^{+}
Origin: Cali, n (%)	79 (51.63)	16 (61.54)	11 (33.33)	34 (50.0)	74 (44.31)	13 (68.42)	0.046$^{\square}$
Marital status: Without partner, n (%)	92 (60.13)	13 (50.0)	19 (57.58)	36 (52.94)	91 (54.49)	6 (31.58)	0.052$^{\square}$
Covered by health insurance, n (%)	98 (64.05)	15 (57.69)	22 (66.67)	46 (67.65)	113 (67.66)	14 (73.68)	0.83$^{\square}$
Mechanism, n (%)							
RTI	15 (9.80)	5 (19.23)	9 (27.27)	11 (16.18)	36 (21.56)	1 (5.26)	0.021^{+}
Violence	117 (76.47)	19 (73.08)	13 (39.39)	21 (30.88)	29 (17.37)	12 (63.16)	<0.0001$^{\square}$
Fall	18 (11.76)	2 (7.69)	10 (30.30)	33 (48.53)	96 (57.49)	5 (26.32)	<0.0001$^{\square}$
Diving injury	3 (1.96)	0 (0)	1 (3.03)	3 (4.41)	4 (2.40)	0 (0)	0.83^{+}
Injury level, n (%)							<0.0001‡
Cauda equina	0 (0)	0 (0)	1 (3.03)	1 (1.47)	0 (0)	17 (89.47)	
Cervical	49	10	12	34 (50.0)	45	1 (5.26)	

	(32.03)	(38.46)	(36.36)		(26.95)		
Lumbar	3 (1.96)	3 (11.54)	5 (15.15)	10 (14.71)	81 (48.50)	1 (5.26)	
Thoracic	101 (66.01)	13 (50.0)	14 (42.42)	23 (33.82)	41 (24.55)	0 (0)	
Associated injuries, n (%)							
Hollow viscus injury	17 (11.11)	4 (15.38)	1 (3.03)	3 (4.41)	0 (0)	3 (15.79)	<0.0001⁺
Solid viscus injury	51 (33.33)	8 (30.77)	5 (15.15)	2 (2.94)	3 (1.80)	1 (5.26)	<0.0001⁺
Traumatic brain injury	16 (10.46)	2 (7.69)	2 (6.06)	10 (14.71)	14 (8.38)	0 (0)	0.48⁺
Vascular injury	11 (7.19)	2 (7.69)	0 (0)	1 (1.47)	0 (0)	1 (5.26)	0.001⁺
Appendicular fractures	20 (13.07)	2 (7.69)	3 (9.09)	4 (5.88)	23 (13.77)	5 (26.32)	0.22⁺
Peripheral nerve injury	6 (3.92)	2 (7.69)	1 (3.03)	6 (8.82)	0 (0)	0 (0)	0.003⁺
Complications, n (%)							
Urinary infection	35 (22.88)	4 (15.38)	4 (12.12)	6 (8.82)	1 (0.60)	1 (5.26)	<0.0001⁺
Neuropathic pain	26 (16.99)	4 (15.38)	1 (3.03)	8 (11.76)	1 (0.60)	3 (15.79)	<0.0001⁺
Pressure ulcer	43 (28.10)	7 (26.92)	2 (6.06)	2 (2.94)	0 (0)	0 (0)	<0.0001⁺

* Kruskal-Wallis, ⁺ Fisher's exact test, ‡ Fisher's exact test for count data with simulated p-value based on 1e+7 replicates, [?] Chi square test.

Figures

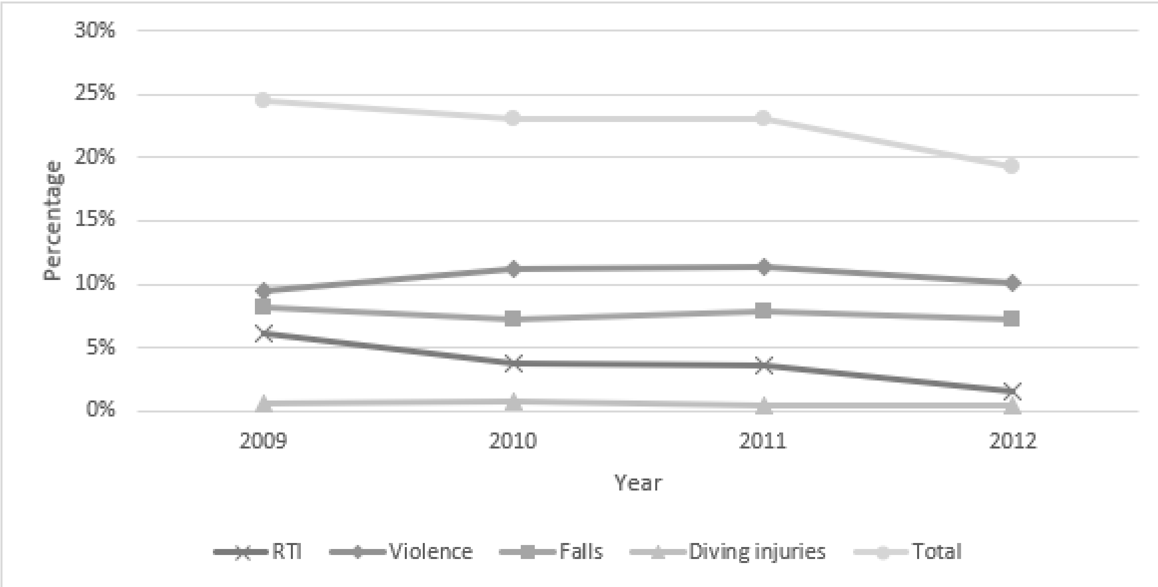

Figure 1

Trends of proportions of traumatic spinal cord injuries by cause over years, 2009-2012. *RTI: road traffic injury

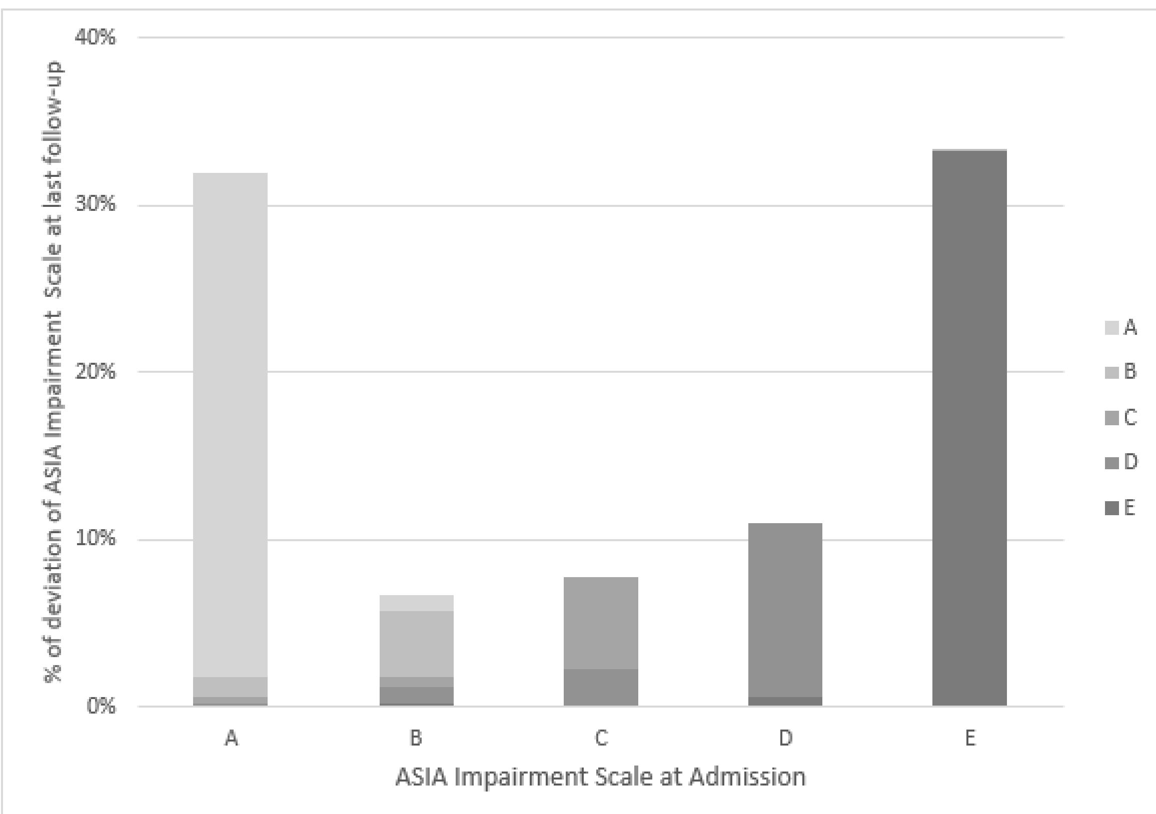

Figure 2

ASIA impairment scale deviation from admission (X axis) to last follow-up (Y axis)

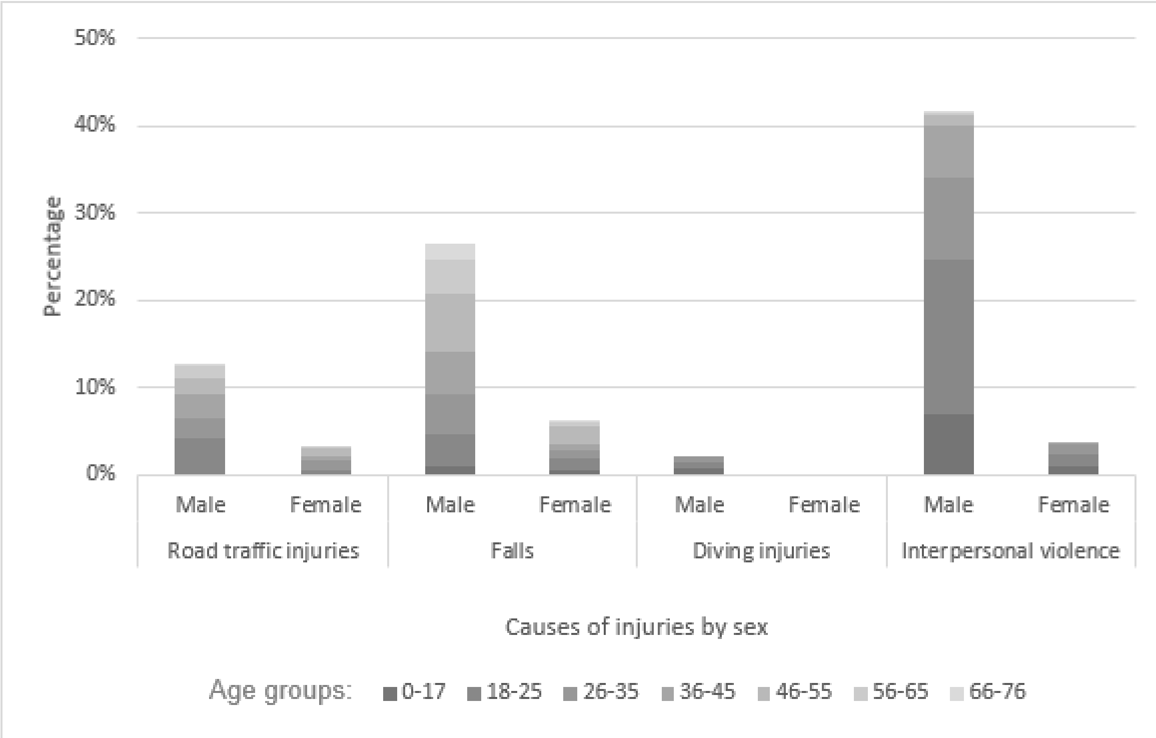

Figure 3

Etiology of spinal cord injury grouped into sex and age categories