Epidemiology of Traumatic Spinal Injury: A 15-Year Retrospective Study of 1092 Cases

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Abstract

Background: Spinal trauma is a well-documented problem in developed countries but literature has been mute on this problem in developing counties. The purpose of this study was to elucidate epidemiological characteristics of spine trauma in our center over a 15-year period.

Methods: All consecutive patients with acute spinal trauma who were admitted in our center from March 2003 to March 2018 were included. The analysis was focused on patient-related demographic characteristics, cause and mechanism of injury, level and type of injury, neurological deficit, associated injuries, management and outcome. All of the statistical calculations were performed using the Statistical Package for Social Sciences (SPSS). Statistical analyses were conducted using the Student t-test and nonparametric tests (Mann-Whitney U-test, Kruskal-Wallis test). Values for $p < 0.05$ were regarded as statistically significant and all confidence intervals were expressed at 95%.

Results: A total of 1,092 patients with acute traumatic spinal injuries were managed in our trauma center. There were 74.3% males and 25.7% females with mean age 34.5 years. Young adults (age group: 18-39 years) were more affected with 58.9%. The leading mechanism of injury was compression with 39.2%. The most common cause of accident was motor vehicle collision accident (58.5%) followed by high-energy falls (32.6%). Six hundred eighty-seven patients (62.8%) had spinal cord injury, with 14.4% complete tetraplegia and 7.7% complete paraplegia. Overall, the use of operative treatment (64.8%) exceeded that of conservative treatment (35.2%).

Conclusion: This study's unique feature of delineating variables with statistical significance trending toward better management provides useful data to guide future researches, benchmarking, public health policy, and efficient resource allocation for the management of spine trauma.

Introduction

Traumatic spinal injury (TSI) is a serious debilitating injury that exerts a devastating effect on an individual from a physical, psychological, and socioeconomic point of view, and places an immense burden on society from a public health perspective [1-4]. The estimated lifetime cost of treating a 25-year-old patient with a spinal cord injury (SCI) can reach 2.8 million US dollars [5-7]. The incidence of spinal trauma is region-specific due to unique geographic and demographic characteristics [8,9]. Worldwide incidence of spinal injury with or without cord damage is 12.1-57.8 cases per million per year [10,11]. Knowledge of current epidemiology of spine trauma trends assists in health care planning, fine-tuning of primary prevention methods, optimization of management and benchmarking purposes [12,13]. But now, only data from developed countries have been thorough undertaken [14-16]. The main purpose of this study was to elucidate epidemiological characteristics of spine trauma in our center over a 15-year period.

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Materials and Methods

All patients with acute TSI with or without SCI who were admitted in our center from March 2003 to March 2018 were retrospectively selected from trauma registry for all ages and all spinal injuries. Patients presenting minor injuries (isolated spinous process fractures), paravertebral soft tissue injury (muscular sprains) and injuries to the lumbar transverse processes attributable to the mechanism of avulsion lesion secondary to a pelvic injury were excluded. Patients with congenital, metabolic, rheumatologic diseases and neoplasms such as Klippel-Feil syndrome, osteoporosis, ankylosing spondylitis, and multiple myeloma were also excluded.

The analysis was focused on patient-related demographic characteristics, cause and mechanism of injury, level and type of injury, neurological deficit, associated injuries (AI), management and outcome. Based on the notion of dominant lesional vector force and increasing severity of trauma, three different mechanisms of injury were used to distinguish between three types of injuries with compression: Type A injury, distraction in either flexion or extension: Type B injury and rotation: Type C injury.

For the localization of spinal injuries, the spinal column was divided into 5 different segments according to anatomic and physiologic differences in each spinal segment, with upper cervical: occipital condyle (C0), atlas (C1) and axis (C2); lower cervical (C3-C7), thoracic (T1-T12), lumbar (L1-L5) and sacrococcygeal (SC) segments (Tables 1-4). Any patient sustaining an injury at more than one of the aforementioned segments was classified as having multi-segmental

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Neurological status	Admission	Discharge	1 year	Mean follow-up
ASIA grade A	241 (22.1%)	179 (16.4%)	117 (10.7%)	37 (3.1%)
ASIA grade B	119 (10.8%)	116 (10.6%)	96 (8.8%)	33 (3.1%)
ASIA grade C	157 (14.3%)	152 (13.9%)	170 (15.5%)	97(8.9%)
ASIA grade D	170 (15.6%)	179 (16.4%)	219 (20.1%)	146 (13.3%)
ASIA grade E	405 (37.2%)	429 (39.3%)	442 (40.4%)	694 (63.4%)
Death	0 (0%)	37 (3.4%)	48 (5.1%)	85 (7.9%)
Total	1092 (100%)	1092 (100%)	1092 (100%)	1092 (100%)

Table 1: Neurological evolution of spinal cord injured patients according to the American Spinal Injury Association (ASIA) grading system.

Variable	AI (n=523)	No AI (=569)	p-Value
Age	32.4	37.9	0.0018
Gender (M : F)	434 : 89	378 : 191	0.13
Injury localization (UC : LC : T : L : SC: MS)	51 : 107 : 113: 156 : 30 : 66	67 : 336 33: 91 : 13 : 29	0.0012
Injury type (A : B : C)	88 : 189 : 246	340 : 105: 124	0.0017
Number of injured levels (SL : MLC: MLNC)	441 : 47 : 50	541 : 25 : 3	0.0016
Neurologic deficit (Present: Absent)	161: 362	244 : 325	0.029

M: Male; F: Female; UC: Upper Cervical; LC: Lower Cervical; T: Thoracic; L: Lumbar; SC: Sacrococcygeal; MS: Multisegmental; SL: Single Level; MLC: Multilevel Contiguous; MLNC: Multilevel Noncontiguous

Table 2: Univariate analysis of variance (ANOVA) comparing patients who suffered from Associated Injuries (AI) with those who did not.

Variable	Odds ratio	95% confidence interval
Neurological deficit	1.2795	1.0009-2.1146
Male	1.7	1.0067-2.009
Type C injury	2.0045	1.0295-3.0397
Thoracolumbar junction injury	2.0379	1.0461-3.0172
Multilevel injury	6.0214	3.0995-8.0728
Multisegmental injury	7.0102	4.0998-9.0959
Traffic accident	7.5	3.2077-8.1708
High-energy fall	8.4132	4.1786-8.4271

Table 3: Factors that significantly increase the incidence of associated injuries.

injuries. For the level of injuries, we have classified spinal injuries into single level (SL) which are injuries to one vertebra and/or one intervertebral disc and multilevel injuries (injury at more than one level of the vertebral column). The later were further classified as multilevel contiguous (MLC) when ≥ 2 adjacent vertebrae were involved and multilevel noncontiguous (MLNC) if there was preservation of at least one uninjured vertebra between the injuries.

For the type of injuries (Table 4), based on diagnostic imaging studies including conventional radiographs, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI), upper cervical spine injuries were classified into occipital condyle fracture, Jefferson fracture (or burst fracture of C1: When there are both anterior and posterior arch fractures), odontoid type 2 (fracture through the base of the dens), odontoid type 1(oblique fracture through the odontoid tip), odontoid type 3 (fracture through the body of C2), C2 Hangman's fracture (fracture of both pedicles or pars interarticularis of C2), C1–2 dislocations, C1–2 miscellaneous fractures (affecting the C1–C2 lamina, body, lateral mass, or spinous process). The modified Argenson classification [17] was used for lower cervical spine injuries, whereas Magerl classification [18] has been used for thoracic and lumbar spine injuries (Table 4).

The American Spinal Injury Association (ASIA) grading system was used to document SCI with ASIA A: Complete; B-D: Incomplete and E: Normal. Two types of SCI without radiological abnormalities (SCIWORA) were differentiated. The SCIWORA type 1 was positive neurologic findings and negative plain x-ray and CT scan but pathologic spinal cord MRI. The second type was defined as abnormal neurologic examination with normal imaging (including MRI). Any improvement or deterioration in spinal injury grade during treatment and follow-up was documented. All the cases of death were recorded.

All of the statistical calculations were performed using the Statistical Package for Social Sciences (SPSS) for macOS version 24.0 (SPSS Inc. Chicago, Illinois, US). Values for p<0.05 were regarded as statistically significant and all confidence intervals (CI) were expressed at 95%. Descriptive statistics were presented as number of cases, percentage and mean. Statistical analyses were conducted using the Student t-test and nonparametric tests including the Mann-Whitney U-test and the Kruskal-Wallis test. The Pearson's Chi-square (χ^2) testing of frequency data was performed where appropriate. Analysis of variance (ANOVA), odd ratio (OR) of associated injuries (AI) was calculated using forward stepwise regressions.

Results

During the 15-year period, a total of 1,092 patients with acute TSI were managed in our trauma center. They represented 4.3% of patients admitted due to traumas (a total of 25,396 patients) in the same period. The average number of spinal trauma patients per year and per month is respectively 73 and 6. The cohort comprised 812 (74.3%) males and 280 (25.7%) females. The male-to-female ratio was 2.9:1. The mean age of the study population was 34.5 years (range, 11 months- 89 years). Young adults (age group of 18-39 years) were more affected with 58.9%. The typical patient was a male in the third decade. Distribution of different age group and gender, according to the World Health Organization (WHO) age group classification is presented in Figure 1.

The leading mechanism of injury was compression (type A injury) in 39.2%, followed by rotation (type C injury) in 33.9% and

Spine injury characteristics (per segment)	Number (n=1, 092)	Incidence (per total spine injuries)
Upper cervical spine (C0-C1)	**118**	**10.8%**
Occipital Condyle fracture	5	0.4%
Jefferson fracture (C1)	30	2.8%
Odontoid (type 2)	50	4.7%
Odontoid (type 1 and 3)	7	0.6%
C2 Hangman's fracture	8	0.7%
C1-C2 dislocation	6	0.5%
C1-C2 miscellaneous fractures	12	1.1%
Lower cervical spine (C3-C7): Argenson Classification	**443**	**40.6%**
Type A. Compression injuries	**141**	**12.9%**
A1 (Anterior wedge compression fractures)	13	1.2%
A2 (Burst fractures)	98	8.9%
A3 (Tear Drop fractures)	30	2.8%
Type B. Flexion-distraction injuries	**117**	**10.7%**
B1 (Whiplash injuries in flexion)	22	2%
B2 (Severe sprains in flexion)	62	5.7%
B3 (Bilateral facet fracture-dislocation in flexion)	33	3%
Type C. Extension-distraction injuries	**87**	**7.9%**
C1 (Whiplash injuries in extension)	51	4.6%
C2 (Severe sprains in extension)	29	2.7%
C3 (Bilateral facet fracture-dislocation in extension)	7	0.6%
Type D. Rotation injuries	**92**	**8.4%**
D1 (Unilateral facet fracture)	44	4%
D2 (Fracture-separation of the articular pillar)	35	3.2%
D3 (Unilateral facet dislocation)	13	1.2%
Type E. Traumatic cervical disc herniation	**8**	**0.7%**
Thoracic (T1-T12) + Lumbar (L1-L5) spine: Magerl Classification	**T (146) + L (247) = 393**	**T (13.4%) + L (22.6%)=36%**
Type A. Vertebral body compression	**T (48) + L (82)=130**	**T(4.4%) + L (7.6%)=12%**
A1 (Impaction fractures)	T (5) + L (8) = 13	T (0.5%) + L (0.7%) = 1.2%
A2 (Split fractures)	T (10) + L (17) = 27	T (0.9%) + L (1.7%)=2.6%
A3 (Burst fractures)	T (33) + L (57) = 90	T (3%) + L (5.2%) =8.2%
Type B. Anterior and posterior element injury with distraction	**T (41) + L (69) = 110**	**T (3.8%) + L (6.2%)=10%**
B1. Posterior disruption predominantly ligamentous (flexion–distraction injury)	T (3) + L (5) = 8	T (0.3%) + L (0.4%)=0.7%
B2. Posterior disruption predominantly osseous (flexion–distraction injury)	T (20) + L (34) = 54	T (1.8%) + L (3.1%)=4.9%
B3. Anterior disruption through the disc (hyperextension-shear injury)	T (18) + L (30) = 48	T (1.7%) + L (2.7%)=4.4%
Type C. Anterior and posterior element injury with rotation	**T (57) + L (96) = 153**	**T (5.2%) + L (8.8%)=14%**
C1. Type A injuries with rotation (compression injuries with rotation)	T (29) + L (49) = 78	T (2.7%) + L (4.4%)=7.1%
C2. Type B injuries with rotation	T (15) + L (25) = 40	T (1.3%) + L (2.4%)=3.7%
C3. Rotational-shear injuries	T (13) + L (22) = 35	T (1.2%) + L (2%) =3.2%
Sacrococcygeal spine (Sacrum and Coccyx)	**43**	**3.9%**
Multisegmental injuries (≥ 2 segments)	**95**	**8.7%**
Management		
Operative	707	64.8%
Non operative	382	35.2%

Table 4: Spinal injury characteristics of 1092 trauma patients with spinal injuries.

distraction (type B injury) in 26.9%. Our results revealed that specific spinal segments were more prone to certain injury mechanisms. For instance, the majority of compression injuries were found in lumbar spine, whereas injuries caused by a distraction mechanism more frequently occurred in the lower cervical spine. The rotational injuries were predominantly found in the mobile segments of the spine (lower cervical spine and thoracolumbar junction) as shown in Figure 2.

The most common cause of accident was traffic collision, also called motor vehicle collision accident (MVC, 58.5%) with 244 (22.3%) car accidents, 291 (26.6%) motorcycle accidents, 43 (4%) motor vehicle versus pedestrian accidents, 32 (3%) bicycle accidents and 29 (2.7%) wagon accident. Of the cases involving MVC, 92% were unrestrained at the time of the accident. The high-energy fall, which was defined as a fall from at least 2m was responsible of spinal injuries in 32.6%.

High-energy fall-related injuries included deep falls in 23 (2.1%), high building falls in 86 (7.8%), falls from trees in 84 (7.6%), electric pole falls in 31 (2.8%), accidental domestic falls 104 (9.6%) and falls from attempted suicide by defenestration in 21 (2%). Simple falls were responsible of spinal injuries in 8 patients (0.7%). Eighteen patients (1.7%) sustained a spinal injury as a result of a sport-related activity. A blunt, direct impact to the spine caused spinal injuries in 70 (6.4%) cases. In the remaining 8 (0.8%) patients the causes were gunshot injuries in 6 patients (0.6%) and railway accident in 2 patients (0.2%).

The analyses of correlation between the cause of accident and the resulting spinal injury type revealed that type A injuries were predominantly caused by falls (high-energy and simple falls), while type B injuries resulted from high-energy trauma including MVC and falls from great height. MVC were the leading cause of type C
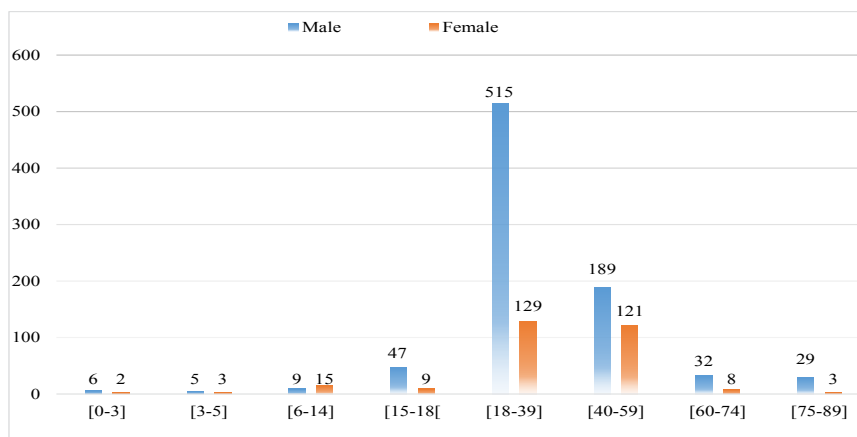
Figure 1: Age distribution of complete study population highlighting that the majority of patients sustained the spinal injuries between 18 and 59 years of age and the rarity of spinal column trauma in pediatric population (under 15 years of age).
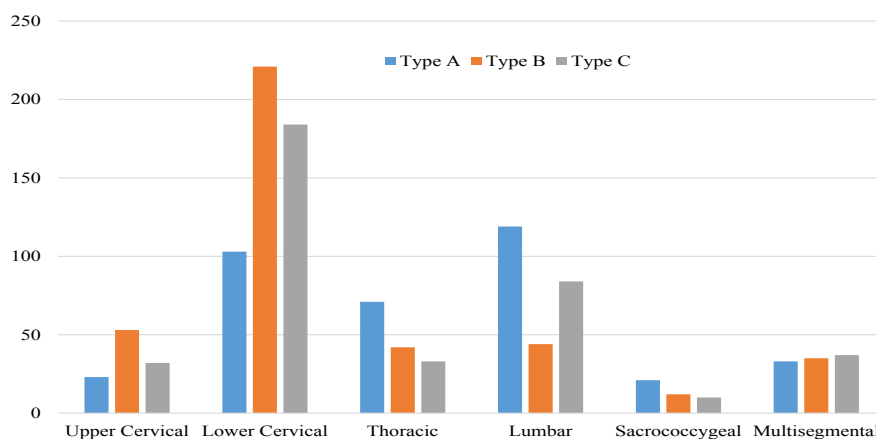

Figure 2: Incidence of injury mechanism in each spinal segment revealing that specific spinal segments were more prone to certain injury mechanisms with the majority of compression (type A), distraction (type B) and rotational (type C) injuries found respectively in lumbar spine, lower cervical spine and the mobile segments of the spine.
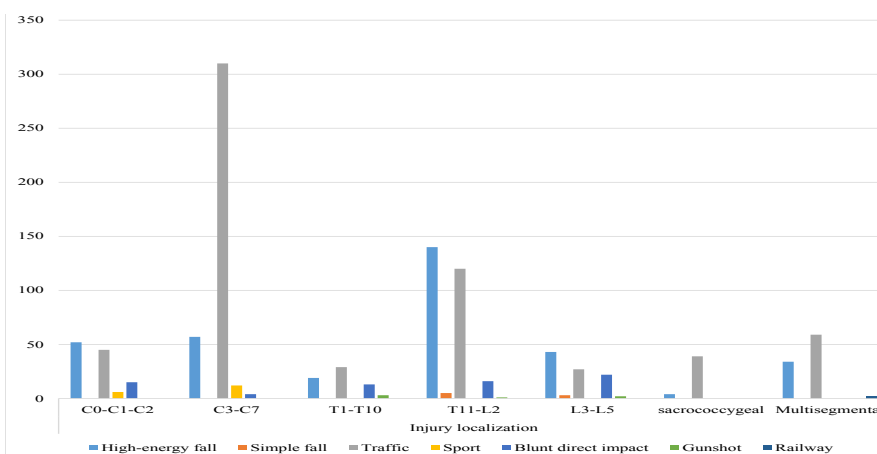

Figure 3: Correlation of cause of accident and injury localization showing that fall-related injuries occurred predominantly at the thoracolumbar junction (T11-L2) while patients involved in either traffic or sport accidents exhibited a significant increase in lower cervical spinal injuries.

injuries. Investigating the correlation between the cause of accident and the injury localization, our data Figure 3 showed that fall-related injuries (high-energy and simple falls) occurred predominantly at the thoracolumbar junction (T11-L2). However, patients that sustained MVC exhibited a significant increase in lower cervical spinal injuries (p=0.001). Furthermore, sports-related injuries occurred more often at
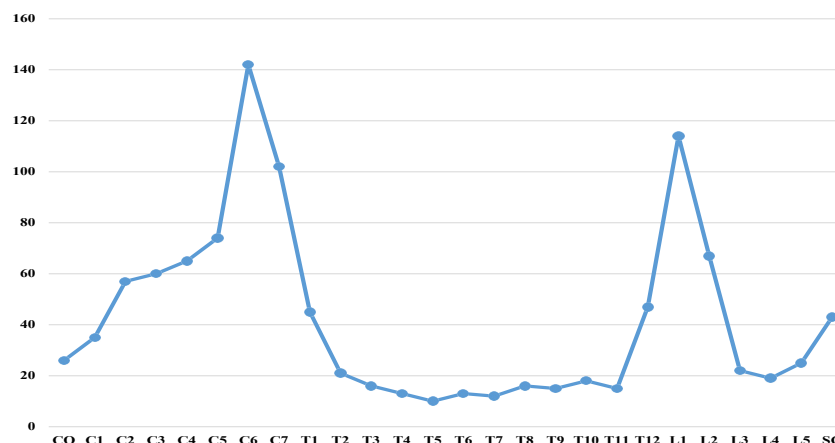
Figure 4: Distribution of spinal injuries for each vertebra showing that the most frequently injured vertebra was the sixth cervical vertebra followed by the first lumbar vertebra. The distribution mirrored the curve with two major peaks; one at the lower cervical level and the other at thoracolumbar level.

Figure 5: (A) Preoperative cervical CT scan of a 52-year-old driver, who sustained during a traffic collision a lower cervical spine trauma, showing fracture dislocation of C6-C7 with overlapping of C7 at the C5 level. **(B)** Sagittal T2-weighed MRI scan revealing severe spinal cord contusion and expansion of fractures into the spinal canal at the levels of C5-C6-C7 vertebrae. **(C)** Immediate postoperative CT scan, after reduction, hemicorporectomy of C7, discectomy C6-C7, interbody fusion with iliac crest bone graft and anterior fixation with cervical plate, showing restoration of spinal column alignment.

the lower cervical spine (p=0.003). The incidence of injuries due to a high-energy fall failed to show any correlation to the age of the patient (p=0.8), whereas patients with a simple fall exhibited a pattern with a maximum frequency after the age of 74.

Using the ASIA classification, 405 patients (37.2%) were neurologically intact (ASIA E). The remaining 687 patients (62.8%) had SCI secondary to spine trauma. Among them, 241 patients (22.1%) exhibited a complete motor and sensory deficit (ASIA A), with 14.4% complete tetraplegia and 7.7% complete paraplegia. One hundred and nineteen patients (10.8%) were ASIA B, 157 (14.3%) ASIA C and 170 (15.6%) ASIA D. Eight patients (0.7%) sustained the SCIWORA type 1 and 3 (0.4%) SCIWORA type 2. Neurological evolution of spinal cord injured patients according to the ASIA is shown in Table 1.

Most of the neurological deficits occurred in response to cervical spine (upper and lower) injuries (44.2%), followed by thoracic (36.5%) and lumbar spine (19.3%). Patients presenting sacrococcygeal trauma exhibited nerve root injury. The correlation between the incidence of a neurological deficit and the mechanism of injury revealed the lowest incidence of SCI for compression injuries (17.4%), followed by distraction injuries (36.3%). Rotational injuries were associated with the highest incidence of SCI (46.3%), and showed the highest probability of a complete motor and sensory deficit (p=0.0017). The occurrence of SCI was strongly correlated to the level of injury and number of injured vertebrae (p=0.0016). No correlation was found between the occurrence of the neurologic deficit, age and sex (p=0.87).

Five hundred and twenty-three patients (47.9%) sustained associated injuries, including head injury (10.4%), thoracic injury (7.5%), abdominal trauma (4.3%), and pelvic injury (2.1%) and orthopedic injuries (fracture of the upper or lower extremity) occurred in 23.6% patients. Among orthopedic injuries; the calcaneal fracture alone accounted for 14.2%; followed by fracture of the distal radius fracture 5.4%. Furthermore, 125 patients (11.5%) sustained a second vertebral injury. ANOVA revealed that age, gender, injury type, number of injured vertebrae and neurological deficit significantly differed among patient who suffered from associated injuries (AI) and from those who did not (Table 2). The number of injured vertebrae was the strongest predictor for an AI, followed by a type C injury, male gender and occurrence of neurological deficit (Table 3). Testing the relationship between a certain injury level and the occurrence of an AI, we found that patients with injuries of the thoracolumbar junction (T11-L1) had the highest risk of suffering from an AI representing 58.2% of all AI. For concomitant spinal injuries, 57.6% were at contiguous levels and 42.4% at noncontiguous levels. The highest incidence of AI was induced by multilevel noncontiguous spinal injuries (89%) (p=0.0016, Chi^2=13.7). We found that most of the AI resulted from traffic accidents and high-energy falls (p=0.0017, Chi^2=39.9).

In relation to the five anatomical segments of the spine, spinal traumas occurred most frequently in the lower cervical (40.6%), followed by lumbar (22.6%), thoracic (13.4%), upper cervical (10.8%), sacrococcygeal vertebrae (3.9%), whereas (8.7%) were multi-segmental injuries (Table 4). The thoracolumbar junction (T11-L2) was involved

in 232 patients (21.4%). The distribution of spinal injuries for each vertebra mirrored the curve with two major peaks; one at the lower cervical level and the other at thoracolumbar level. The most frequently injured vertebra was the sixth cervical vertebra in 13% followed by the first lumbar vertebra in 10% (Figure 4).

Both operative treatment (Figure 5) and conservative treatment were employed in this cohort. Overall, the use of operative treatment (64.8%) exceeded that of conservative treatment (35.2%). The cure rate for lumbar spine injuries was greater that of other segments and upper cervical spine injuries had the highest ineffective treatment and mortality rates. The overall mortality rate was 7.9%. Analyses of the univariate associations between spine trauma variables and mortality identified six univariate variables trending toward spine trauma mortality with statistical significance (p<0.05). They were upper cervical spine injuries (OR=3.2), motor vehicle occupants (OR=1.9), type C injuries (OR=4.1), multilevel injuries (OR=7.1), AI (OR=4.9), and ASIA A (OR=7.1). The mortality rate for male patients (5.3%) was twice that of female patients (2.6%). The mean follow-up time was 49 months (range, 3-158 months).

Discussion

In this study from our institution through one decade and half, we presented an overview of epidemiological features of spine traumas from occipital condyles to the coccyx among 1092 patients. This high number of spinal trauma patients reported in our series may be due to the fact that our hospital is a major trauma center for the state, and thus, an unusually high number of patients with traumatic spine injuries are flown in for treatment. However, our general cohort epidemiological findings concur with current literature. The analyses of the whole study group revealed that two-thirds of the patients were male, which was reported before [13,18,19]. In our context, the high male prevalence (74.3%) is explained by more hazardous socio-economic activities in men than in women. These are masonry, manual water well drilling, mounting electrical poles, combat sport (wrestling), driving, climbing, carpentry, harvesting fruits and leaves for livestock. Over all 58.9% of people with spinal injury were between 18 and 39 year-olds (young adults). This finding is confirmed by other studies [7,10,11,14].

Chiu and coauthors [20,21] reviewed global epidemiological studies of traumatic SCI within 2 decades and compared differences between developed and developing countries. They found that traffic accidents (MVC) were the leading cause of injury in developing countries, whereas falls were the leading cause of injury in developed countries. In our study, MVC (55.8%) rank higher than high falls (32.6%). This result agrees with the finding obtained by other authors in developing country [2,9,22,23]. Our result also contradicted with the findings of reports from developed countries which noted that most of the injuries were as a result of a fall from a height followed by MVC [3,12,19]. In our study, various factors incriminated for traffic collision were the poor quality of old-fashioned roads, non-compliance with traffic safety measures and sometimes young men's risk-taking with motor vehicles. High-energy fall-related injuries were due to deep fall for water well diggers, occupational and accidental domestic high building fall, fall from trees and defenestration. Fall-related injuries occurred predominantly at the thoracolumbar junction (p=0.001) because most of patients landed with either their back or buttocks, whereas lower cervical level was more common in MVC (p=0.001) as victims always hit their head on glass or door.

This study revealed that complete SCI (ASIA A) were more common (22.1%) followed by ASIA D (15.6%), ASIA C (14.3%) and lastly ASIA B (10.8%). This result agrees with the findings of others authors [4,24]. This might be a result of the mechanism of the injury. Majority of the injuries occurred as results of MVC (58.5%) and high-energy falls from a height (32.6%) which must have caused a severe damage to spinal cord resulting in complete SCI (ASIA A). Tetraplegia (14.4%) was more common than paraplegia (7.7%) and this in line with previous reports [25-28]. This greater number of tetraplegic patients compared to paraplegic patients in this study might be as a result of the greater number of cervical injuries (51.4%) with upper and lower cervical accounting for 10.8% and 40.6% respectively.

Spinal trauma is frequently associated with concomitant systemic injuries including head, intra-abdominal, thoracic injuries and long-bone fractures [8,9,29,30]. Unlike previous reports, head and facial injuries were the least common associated injuries because patients with these injuries were respectively managed in neurosurgery and maxillofacial departments. Most of our patients who were injured in a fall from height were known to have been involved in fall from trees with primary impact on foot soles and secondary on hand palms, which may explain the high number of associated calcaneal (14.2%) and distal radius (5.4%) fractures.

The treatment outcome assessment indicated a high in-hospital mortality rate (7.9%) for TSI than was found in previous studies [2,5,16]. We attribute this rate mostly to the medical insurance system and financial issues. However, the cost in pain, disability, social dependence and health care expenses are quite high. Most low-income people have to pay out of their own pockets because the rate of medical insurance coverage is low. There are not enough resources available to pay huge medical expenses associated with rehabilitation and a longer-term follow-up system for patients with SCI. In the present study, patients with ASIA A injuries had the highest mortality rate.

Overall, this study was able to investigate some interesting correlations that will be able to guide physicians in their initial diagnostic work up. However, the retrospective nature of our work goes along with limitations, the most obvious being the dependence upon the quality of the data recorded in the medical files. Furthermore; this study is a single-center epidemiological study. Despite treating the majority of spine trauma in our country, this study is unable to determine the nationwide incidence and prevalence of SCI and spine trauma.

Conclusion

This study provides baseline spine trauma epidemiological data. Many of the spinal injuries in this study could have been prevented, as most were a result of MVC and a fall from a height. Improved traffic safety standards, including road maintenance and protective devices (like helmets) for masons may have reduced the incidence of spinal trauma. The age distribution of patients with traumatic spine injuries revealed that the young adult group (18-39 years) is more affected (58.9%) and this group represents the main providers of financial and social security in our environment. The study's unique feature of delineating variables with statistical significance trending toward better management provides useful data to guide future researches, benchmarking, public health policy, and efficient resource allocation for the management of spine trauma.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Ethical Approval

This article does not contain any studies with human participants or animals performed by any of the authors.

Informed Consent

The informed consent was obtained from individual participant to this study

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Author Contributions

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2. Administrative support: All authors.
3. Provision of study materials or patients: All authors.
4. Collection and assembly of data: All authors.
5. Data analysis and interpretation: Jean Marie Vianney HOPE and Jean Claude SANE.
6. Manuscript writing: All authors.
7. Final approval of manuscript: All authors.

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