A retrospective study on traumatic spinal cord injury in an inpatient rehabilitation unit in central Saudi Arabia

Maher S. Al-Jadid, *JBPM&R, FAFRM (H).*

ABSTRACT

الأهداف: تحديد أسباب إصابات الحبل الشوكي الرضية، والاختلافات العمرية، والاختلافات بين الجنسين، ومدة الإقامة بالمستشفى، وانتشار إصابات الحبل الشوكي الرضية بأحد المراكز المرجعية لعلاج الإصابات الرضية بالمملكة العربية السعودية.

الطريقة: أُجريت هذه الدراسة الاستراجعية لسجلات المستشفى لجميع المرضى الذين أكملوا برنامج العلاج التأهيلي من إصابات الحبل الشوكي الرضية بمدينة الأمير سلطان الطبية العسكرية بالرياض، المملكة العربية السعودية وذلك خلال الفترة من شهر أغسطس 1982م وحتى نوفمبر 2010م. وقمنا بجمع المعطيات الخاصة بعمر وجنس المرضى، ونوع وآلية حدوث الإصابات الرضية، ونوع وشدة الاضطرابات العصبية، ومدة إقامة المرضى بالمستشفى وذلك بغرض تحليلها.

النتائج: تراوح متوسط أعمار المرضى ما بين 0.73±29.7 عاماً. وكان هناك من مجموع 466 من المصابين باصابات الحبل الشوكي الرضية 398 من الذكور (85.4%)، و68 من الإناث (14.6%). كما وجُد معدل التكرار العالي لحدوث إصابات الحبل الشوكي الرضية في الفئة العمرية التي تتراوح أعمارها ما بين 16– 30 عاماً، فيما كان معدل التكرار المنخفض لحدوث إصابات الحبل الشوكي الرضية في الفئة العمرية ما بين 15–0 عاماً والمجموعات العمرية التي تزيد أعمارها عن 45 عاماً. ولقد تعرض 377 مريض من مجموع 466 مريض من مرضى إصابات الحبل الشوكي الرضية (80.1%) لإصابات رضية نتيجة لحوادث المرور، وقد كانت المنطقة العنقية للحبل الشوكي أكثر مواقع الإصابة شيوعاً حيث كانت 34% (n=137) من الحالات وسط عينة الذكور وبالنسبة للإناث فقد كان الجزء العلوي من المنطقة الصدرية للحبل الشوكي هي أكثر مناطق الجسم تضرراً (45.6% n=31). وبلغ عدد مرضى إصابات النخاع الشوكي الرضية 250 مريضاً مكثوا بالمستشفى لمدة تتراوح مابين 70–1 يوماً فيما مكث 12 مريض فقط بالمستشفى لمدة تتجاوز 280.

خاتمة: أظهرت الدراسة بأنه قد كان هناك ارتفاع في معدل انتشار إصابات الحبل الشوكي الرضية في الذكور مقارنة بالإناث، وتعرض الأفراد من الفئة العمرية 30–16 عاماً لإصابات الحبل الشوكي الرضية بدرجة أكبر، وكانت الحوادث المرورية هي أكثر أسباب إصابات الحبل الشوكي الرضية شيوعاً ومكث أكثر من 50% من مرضى إصابات الحبل الشوكي الرضية بالمستشفى لمدة تقل عن 70 يوماً.

Objectives: To determine the causes, age and gender differences, hospital length of stay (HLoS), and prevalence of traumatic spinal cord injury (TSCI) in a Saudi referral trauma center.

Methods: We retrospectively reviewed hospital records of all patients who completed the TSCI rehabilitation program in the Rehabilitation Medicine Division, Department of Neurosciences at Prince Sultan Military Medical City, Riyadh, Kingdom of Saudi Arabia from August 1982 and November 2010. The age and gender of the patient, type and mechanism of trauma, type and severity of neurologic deficits, frequency, and HLoS of patient's were collected for analysis.

Results: The mean age of the patients was 29.7 ± 0.73 years. Out of 466 TSCI patients, 398 were males (85.4%) and 68 were females (14.6%). The higher frequency of TSCI was found in the 16-30 age group, and a lower frequency was found in the 0-15 and >45 age groups. Out of the 466 TSCI patients 377 (80.1%) sustained their injuries as a result from motor vehicle accidents. Cervical cord was the most common site of injury accounting for 34% (n=137) of cases in male population, and in females, the higher frequency was the upper thoracic (n=31 [45.6%]) There were 250 TSCI patients that stayed in the hospital for 1-70 days, and only 12 patients stayed in the hospital for >280 days.

Conclusion: Compared to females, the frequency of TSCI was higher in males, and 16-30 age group sustained more TSCI. Road traffic accident is the most common cause of injury, and more than 50% of the TSCI patients stayed in the hospital for <70 days.

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From the Rehabilitation Medicine Division, Department of Neurosciences, Prince Sultan Military Medical City, Riyadh, Kingdom of Saudi Arabia.

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Address correspondence and reprint request to: Dr. Maher S. Al-Jadid, Rehabilitation Medicine Division, Department of Neurosciences, Prince Sultan Military Medical City, Riyadh 11159, Kingdom of Saudi Arabia. Tel. +966 (1) 4777714 Ext. 25301. Fax. +966 (1) 4722400. E-mail: maljadid@rmh.med.sa / msjadid@yahoo.com

Traumatic spinal cord injury (TSCI) is a devastating neurological injury, resulting in varying degrees of paralysis, sensory loss, and sphincter disturbance, and involuntarily place a heavy burden on the health care system.[1] It causes death of neurons, disruption of motor and sensory nerve fiber (axon) pathways, and disruption of communication with the brain.[2] The extent of these impairments is dependent upon the severity of the injury level, at which the injury has occurred,[1,3] and associated medical conditions.[4,5] Each individual's experience is unique in terms of the degree of paralysis, pain, extent of spasticity, and therapies involved in stabilizing autonomic system dysfunction. Therefore, how TSCI impacts a person's life is highly individualized.[6] Over the past few decades, public health and prevention initiatives have targeted young males as the group known to be at highest risk for TSCI, primarily caused by motor vehicle collisions (MVC).[7] The life expectancy of persons with TSCI has increased in recent decades, although it is still lower than the life expectancy of the general population. However, most people suffering from TSCI can now be expected to live for many years.[8] On the other hand, treatment options are limited, and the reinstating function in the wake of TSCIs remains challenging.[9] Several studies have been published in the last few decades.[10-12] These include large scale epidemiologic surveys, multicenter research on interventions in acute TSCI, reports on complications from acute and chronic TSCI, and results of rehabilitation interventions and functional outcomes.[10-12] However, these reports cover only a part of the world population. On the other hand, more than 80% of TSCI population lives in more than a hundred developing countries, and only limited information is available regarding TSCI from these developing countries. Most preventable complications show a wide-ranging lack of awareness in health care professionals, and helplessness of the patients to adhere to a lifelong prevention regime. The aim of this study was to determine the causes, age and gender differences, hospital length of stay (HLoS), and prevalence of TSCI in a Saudi referral trauma center.

Methods. We retrospectively reviewed the hospital records of all patients who completed the TSCI rehabilitation program at the Rehabilitation Medicine Division, Department of Neurosciences in Prince Sultan Military Medical City (PSMMC), Riyadh, Kingdom of Saudi Arabia (KSA) from August 1982 and November 2010. The rehabilitation unit at PSMMC is the main TSCI rehab unit in the kingdom, and from neighboring countries during the past decade. Admission records of 466 patients were identified, and patients with a mean age of 29.75 ± 0.73 years were included in this study. The admission criteria includes: no pressure sore, no tracheostomy, and not more than 3 patients with quadriplegia in the unit at any time due to the loads on patients. All patients were involved in total of 3 hours of physical and occupational therapy daily during the working days. We identified all cases of TSCI as defined by the World Health Organization's International Classification of Diseases, Ninth Revision, Clinical Modification diagnostic codes 952.x (SCI without evidence of spinal bone injury), and 806.x (fracture of vertebral column with SCI).[13] We collected information on the age and gender of the patients, type and mechanism of trauma, type and severity of neurologic deficits, and HLoS of the patient.

Data analysis was carried out using Microsoft Excel 2002 (Microsoft Corporation, Seattle, WA, USA), and the Statistical Package for Social Sciences version 16 (SPSS Inc., Chicago, IL, USA). Data were presented as mean ± standard error of mean (SEM). A chi-square was used to analyze data. A $p<0.05$ was taken as statistically significant together with the 95% confidence interval.

Results. The mean age of the patients was 29.7 ± 0.73 years. There were 398 males (85.4%) with a mean age of 29.9± 0.67 years, and 68 females (14.6%) with a mean age of 28.4 ± 0.89 years. The male:female ratio of the study population was 6:1. **Table 1** shows the gender- and age wise frequencies of TSCI in the study population. The higher frequency of TSCI was found in the 16-30 age group, and a lower frequency was found in the 0-15 and >45 age groups. The study found that when compared to females (14.6%), the frequency of TSCI was higher in males (85.4%). **Figure 1** shows the causes of TSCI in the study population. Out of 466 TSCI patients 377 (80.1%) sustained their injuries as a result of MVC, and 44 sustained their injuries as a result of falling from height. **Figure 2** shows the gender difference in the level of spinal cord injury. The cervical cord was the most common site of injury, accounting for 34% (n=137) of cases of TSCI in the male population, and in females, the higher frequency was in the upper thoracic (n=31; 45.6%). The frequency of injuries to the cervical, upper thoracic, lower thoracic and lumbar

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Table 1 - The demographic and frequency of spinal cord injury of patient's included in a study at the Rehabilitation Medicine Division, Department of Neurosciences in Prince Sultan Military Medical City, Riyadh, Kingdom of Saudi Arabia.

Variables	n	(%)
Gender		
Male	398	(85.4)
Female	68	(14.6)
Nationality		
Saudi	434	(93.1)
Non-Saudi	32	(6.9)
Patient's background		
Military personnel	83	(18.6)
Military dependent	61	(13.6)
Civilian working with MOD	4	(0.8)
Civilian dependent	16	(3.5)
Eligible by referral	278	(62.3)
Special project	2	(0.4)
Others	22	(4.9)
Frequency of traumatic spinal cord injury, years		
0-15	32	(6.9)
16-30	270	(58.0)
31-45	100	(21.4)
≥45	64	(13.7)

MOD - Ministry of Defense

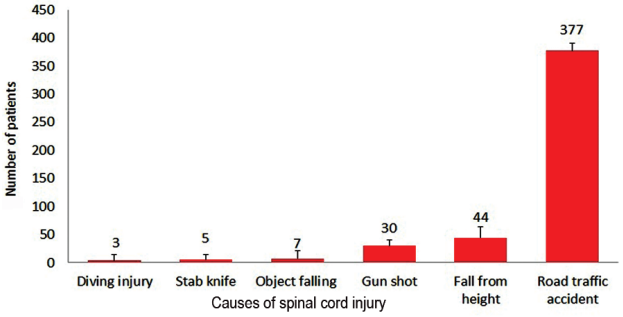

Figure 1 - Causes of spinal cord injury in the study population.

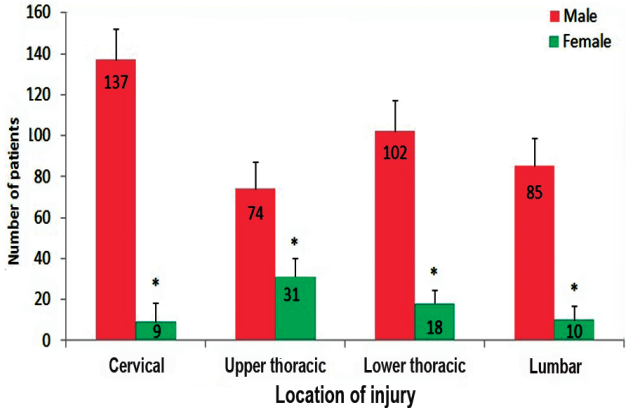

Figure 2 - The distribution of the gender and level of spinal cord injury among patients. *Female gender was compared using the chi-squared test (p<0.001).

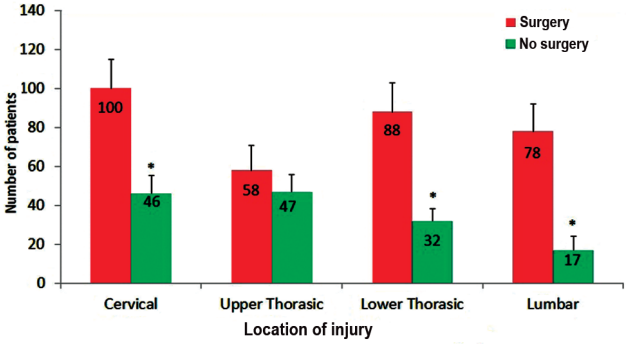

Figure 3 - A comparison of patients who underwent surgery versus those who did not. Groups were compared using the chi-squared test (*p<0.001).

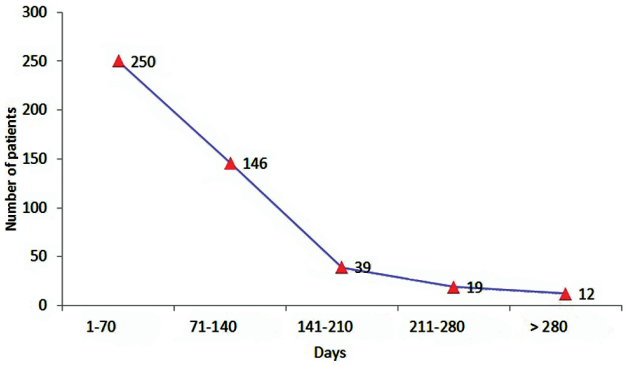

Figure 4 - Spinal cord injury patients and their hospital length of stay.

were significantly lower in females compared to male (p<0.001 95% CI). **Figure 3** shows patients who underwent surgery versus those who did not undergo surgery. **Figure 4** shows the HLoS stay among the TSCI patients in the study population. Results shows that 53.6% (n=250) TSCI patients stayed in the hospital for 1-70 days, and only 2.5% (n=12) patients stayed the hospital for >280 days.

Discussion. Traumatic spinal cord injury leads to varying degrees of neurological deficits producing long-term effects that continue over a lifetime. Epidemiological analysis of patients with TSCI at population level is important for public health management and the assessment of treatment achievements.[14] In this study, we observed that 85.4% TSCI patients were male, and 57.9% of TSCI patients were in the age range between 16-30 years. This is in accordance with the previous study that most of the individuals with spinal cord injuries are young adults, primarily males,[15] and the average age at the time of injury have increased in recent years.

In this study, the mean age of patients with TSCI was 29.7 years. Studies reported that the average age

of TSCI is rising due to the reflection of the shifting demographics of Western society.[15,16] There are several potential confounders that should be controlled for, when considering the impact of age on outcomes after TSCI. These include gender, severity, and level of spine trauma, pre-existing medical co-morbidities, mechanism of injury, interventions, dependence on mechanical ventilation, aggressiveness of acute care protocols, and access to rehabilitation services.[8] Studies reported that the events that lead to TSCI are common, such as road traffic accidents, falls, sports, and violence.[10-12,17]

In developed countries traffic accidents are the leading cause of SCI, whereas falls are the leading cause in developing countries.[6,18] The KSA, with its massive development of road construction and increase in the number of motor vehicles on the road, road traffic accidents (RTAs) are becoming a serious public health problem.[19] Road traffic accident is in fact, the second major health problem after infectious diseases.[19] The present study found that the most frequent cause of TSCI was RTA (80.1%). The results are in agreement with previous studies that road traffic spinal cord injury is, and will remain, the leading cause of TSCI, with high proportion of complete injury at rehabilitation onset, especially in car drivers groups.[20] The previous study from KSA showed that 79.2% of patients admitted for spinal injuries has sustained their injuries as a result of a motor vehicle accident.[21] However, the causes of injuries vary between regions of the country, and between urban and rural locations.[22] In this study, we found that many TSCI patients stayed in the hospital for less than 70 days (n=250, 53.6%). The duration of hospital stay depends not only clinical factor, but also social and economic factor. The HLoS differed in reports from various countries. The mean values were found 20-74 days in the USA,[23] 56-61 in Australia,[24] 91-143 in Italy,[25] 154-240 in the Netherlands,[26,27] and 267 in Japan.[28]

The present study has some limitations, such as: 1) limited number of risk factors examined in a single hospital and its retrospective nature; 2) the exclusion of patients with bed sores and no tracheostomy, and the limited number of quadriplegic patients admitted in the unit, which diminish the external validity of the study; and 3) the study included only patients who completed the rehabilitation program. In this context, it may not be possible to generalize the study results.

In conclusion, the study revealed that when compared to females the frequency of TSCI was higher in males, and the 16-30 age group sustained more TSCI. Road traffic accident was the most common cause of injury, and more than 50% of the TSCI patients stayed in the hospital less than 70 days. The cervical cord was the most common site of injury for the male population, and for females was the upper thoracic region. Further research is needed to address the limitations indicated in the study. Despite the limitations, the study provides valuable data related to Saudi population. Besides, this study has also brought out the need for extensive research in this area in KSA, which would facilitate planning and designing appropriate strategies and interventions.

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