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Original Research Article

A RETROSPECTIVE STUDY OF DEMOGRAPHIC PROFILE OF PATIENTS WITH SPINAL CORD INJURY ADMITTED IN A TERTIARY CARE HOSPITAL IN AHMADNAGAR, INDIA

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ABSTRACT

Background: Spinal cord injuries are greatly disabling and deadly injuries. At present, there is little information regarding the risk factors for complete injuries. This study aims to describe the demographics and the injury characteristics for traumatic and non-traumatic spinal cord injuries and to explore the risk factors for complete spinal cord injuries.

Methods: A retrospective study was performed by reviewing the medical records of 30 patients with spinal cord injuries who were admitted to the hospitals in Ahmednagar, India from 2016-2018. Variables included gender, age, marital status, etiology, occupation, level of injury, and severity of injury, associated complaints, complications and treatment.

Results: The proportion of patients increased from 30% to 36.66% from 2016 to 2018. The male-to female ratio was 5:1. The major cause of spinal cord injuries was traffic accidents (36.66%). Many of the injured were skilled workers (36.66%), semi-skilled (20%), and students (23.33%); these occupations accounted for 79.99% of the total sample. Cervical 13(33.33%) and lumbar 16(43.33%) spinal levels were the most affected. The most documented complications were pressure ulcers 11(36.66%) and urinary tract infection 02(6.66%).

Conclusion: The proportion of males was higher than the proportion of females. Skilled workers, semi-skilled workers and the students comprised the high-risk occupational categories. Male gender, having a spinal fracture, having a thoracic injury, and having complications were the major risk factors for a complete injury. We recommend that preventive measures should focus on high-risk populations, such as young males.

KEY WORDS: Spinal Cord Injury, Demographic Profile, Risk Factors.

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INTRODUCTION

A SCI is a highly disabling and deadly injury. Based on their etiology, SCIs can be divided into two different groups: traumatic spinal cord injuries (TSCI) and non-traumatic spinal cord injuries (NTSCI) [1]. As a devastating condition, traumatic spinal cord injury (TSCI) not only causes permanent serious dysfunction but alsoleads to disorders of several organ systems, including the respiratory, urinary and autonomic nervous system, as well as bone and joint[2]. Those affected are mostly young and middle-age adults, and recovery difficulties for these individuals are determined by the type and severity of lesion, the quality of rehabilitation

programs, and possibilities of performing everyday activities [2].

The incidence and prevalence of spinal injuries have been increasing, with the incidence rate estimated at 15 to 40 cases per million worldwide, although injury prevention initiatives have tried to reduce the occurrence of SCIs. With the modernization of society, SCI incidence increases year after year. The epidemiological characteristics of SCIs obviously vary in different countries, in regions with different economic levels or in different economic periods. The mean age of the SCI patient in developed countries is higher than in developing countries over the same time period; the reason may be related to the aging of the populations in developed countries and/or to the larger male-to-female ratio in developing countries in relation to developed countries [1].

The incidence of SCI varies widely from country to country according to cause, study methodology, and source of data. Furthermore, the occurrence of traumatic SCI (T/SCI) depends heavily on the local policies adopted to prevent trauma, as defined by systematic epidemiologic and economics studies. Non-traumatic lesions have received less attention, mainly because they call for a well-concerted multidisciplinary diagnosis [2]. It is generally known that TSCI exerts a severe burden on patients, their families and society because of the tremendous cost of health-care treatments, rehabilitation and lost productivity. As there is no effective treatment for the cure of TSCI, appropriate prevention is of paramount importance [3]. Trauma to the spinal cord may result from a road traffic accident (RTA), fall, assault and recreational or occupational accident. The World Health Organization informs that up to 90% of all spinal cord lesions are due to trauma and that the leading cause globally is RTA. According to the international standards set forth by the American Spinal Injury Association (ASIA), the severity of an injury is categorized as either complete or incomplete. A complete injury is defined as the absence of sensory and motor function in the lowest sacral segments [4]. SCI is often associated with fractures at other locales and brain injuries. Understanding the severity of these injuries has guided the treatment options for SCI patients. SCI patients are at high risk of medical complications that can prolong their hospitalization, affect their treatment and impair their recovery [1]. The complications for SCI patients include fever, pulmonary complications, spasms, pain, urinary tract infections, cardiovascular disease, osteoporosis and fractures, deep vein thromboses and bedsores. A group of investigators reported that the most common complication among SCI patients was urinary tract infection, bedsores and followed by pain and spasms. To date, there has been no obvious breakthrough in the clinical treatment of SCI; therefore, the emphasis has been on prevention [2]. As stated above, economic and social structures, politics and cultural traditions play important roles in the differences in the epidemiological characteristics of SCI patients in different regions. This retrospective study focuses on the demographics and epidemiological characteristics of SCI patients in Ahmednagar, India. The goals of the study were to explore effective prevention and control measures so that health related institutions can develop policies to make the best use of medical resources.

MATERIALS AND METHODS

Study design: This is a retrospective descriptive study, whereby demographic and clinical outcome information is collected from patient records for three consecutive years (2016–2018). The subjects were patients with spinal cord injuries who were admitted to the hospitals between 2016 and 2018. For this process, spinal cord injury was defined using the international definition as the occurrence of an acute lesion on the neural elements in the spinal canal (spinal cord and cauda equina), resulting in temporary or permanent sensory deficits, motor deficits, or bladder/bowel dysfunction.

Data sources, collection and analysis: Names, age, sex and addresses of all patients who acquired TSCI/NTSCI for the 3 years (2016–2018) were collected from the admission books in the physiotherapy department.

The detailed data regarding gender, age, marital status, occupation, etiology, and neurological level of injury, the severity of injury, the

length of hospital stay, clinical complications and treatment choice (conservative treatment or surgery) were collected and analyzed.

In the analysis process, the patients were divided into four age groups: ≤ 20, 21-40, 41–60, and ≥ 60 years. Marital status was categorized as married or unmarried. Occupations included Profession, Semi-profession, and Clerical, Shop-owner, skilled worker, Semi-skilled worker, unskilled worker, Unemployed and students. Etiologies covered road traffic accidents, falls (including low fall: from a height <1 m and high fall: from a height of 1 m or more), injuries caused by falling objects, crushing injury and non traumatic injury. For neurological level of injury, there were three rough categories: cervical, thoracic and lumbar. Types of injury causing neurological deficits were divided into complete and incomplete injuries. Associated injuries included head/brain injuries, fractures of ribs, limb or pelvic fractures and others complication such as bedsores, spasm, urinary tract infection and others etc.

Table 1: Demographic data of patients.

Variables		Percentage
Gender		
Male	25	83.33%
Female	5	16.66%
Age (Years)		
≤ 20	5	16.66%
21-40	17	56.66%
41-60	7	23.33%
≥ 60	1	3.33%
Occupation		
Profession	1	3.33%
Semi-profession	0	
Clerical, Shop-owner	1	3.33%
Skilled worker	11	36.66%
Semi-skilled worker	6	20%
Unskilled worker	2	6.66%
Unemployed	2	6.66%
Students	7	23.33%
Marital Status		
Married	21	70%
Unmarried	9	30%

RESULTS

Table 2: Distribution of SCI patients'characteristics by etiology.

Variables	Etiology					
	Traffic accidents Struck	Crushing injuries	Struck by falling objects	High falls	Low falls	Total
Period	(36.66%)	(3.33%)	(16.66%)	(30%)	(13.33%)	
2016	2	0	3	2	2	9
2017	6	1	1	2	0	10
2018	3	0	1	5	2	11
Gender						
Male	11(44%)	1 (4%)	2(8)	9(36%)	2 (8%)	25
Female	0	0	3(60)	0	2(40%)	5
Aged (Y)						
≤ 20	0	1	3	0	1	5
21-40	8	0	1	8	3	20
41-60	5	0	1	1	0	7
≥ 60	0	0	1	0	0	1
Occupation						
Profession	1(3.33%)	0	0	0	0	1(3.33%)
Semi-profession	0	0	0	0	0	0
Clerical, Shop-owner	1(3.33%)	0	0	0	0	1(3.33%)
Skilled worker	6(20%)	0	1(3.33%)	3(10%)	1(3.33%)	11(36.66%)
Semi-skilled worker	0	0	0	5(16.66%)	1(3.33%)	6(20%)
Unskilled worker	1(3.33%)	0	0	1(3.33%)	0	2(6.66%)
Unemployed	0	0	1(3.33%)	0	1(3.33%)	2(6.66%)
Students	2(6.66%)	1(3.33%)	3(10%)	0	1(3.33%)	7(23.33%)
There was no any etiology present for non traumatic conditions						

The study included the medical records of 30 patients with spinal cord injuries from January 2016 to December 2018. Because the study was not population-based, the results can only be presented as proportions and percentages and not as rates.

Table 3: Distribution of spine level injuries for SCI patients by the severity of injur

Level of injury	Severity of injury		
	Complete (86.66%)	Incomplete (20%)	Total percentage
Cervical	10 (33.33%)	3(10%)	43.33%
Thoracic	13(43.33%)	3(10%)	53.33%
Lumbar	3(10%)	0	10%

Table 4: Characteristics of associated injuries patients by the severity of injury.

Associated Injury	Severity Of Injury		
	Complete (76.66%)	Incomplete (13.33%)	Total percentage
Spinal Fracture	20(66.66%)	4(13.33%)	80%
Fracture Of Other Parts	1(3.33%)	0	3.33%
Brain Injury	1(3.33%)	0	3.33%
Others(Abrasions)	1(3.33%)	0	3.33%

Table 5: Complications experienced by SCI patients by the severity of injury.

Complication	Severity Of Injury		
	Complete (40%)	Incomplete (10%)	Total percentage
Urinary tract infection	2(6.66%)	0	6.66%
Bedsore	8(26.66%)	3(10%)	36.66%
Spasms	1(3.33%)	0	3.33%
Others	1(3.33%)	0	3.33%

Table 6: Treatment options for SCI patients by the severity of injury.

Treatment	Severity Of Injury		
	Complete (80%)	Incomplete (20%)	Total percentage
Surgery	19 (63.33%)	3(10%)	73.33%
Conservative treatment	5 (16.66%)	3 (10%)	26.66%

DISCUSSION

It is well known that SCI imposes a large burden on individuals, their families and society because of the cost of healthcare treatments, rehabilitation and lost efficiency. This study is a Retrospective study of the characteristics of the SCI patients being treated in tertiary care hospital in Ahmednagar, India, from January 2016 through December 2018. As a retrospective study, it was expected that some data might have been lost. The loss of data was minimized by investigative all the related medical records to obtain a data set that was as complete as possible. The number of SCIs has displayed an inclination of annual growth which was 09 patients in 2016, 10 patients in 2017 and 11 patients in the year 2018.

Male young adults aged between 21 and 40 years were the most affected and that the male-to female ratio of SCI patients was 5:1. This finding may effect from the fact that most women work as homemakers or are engaged in occupations with a low risk of injury. Men are more prone to work in unsafe occupations. This condition is especially true for young men, who carry out more dangerous outdoor work [1]. The results exposed that the proportion of married patients is larger than the proportion of patients with unmarried of marital status, which may be since the largest group of patients was middle-aged, when most Indian people have married. And the commonest co-morbidities were pressure ulcers and urinary tract infection complications [2].

In this analysis, the occupations of patients with TSCI included the Profession 3.33% , Clerical, Shop-owner 3.33%, Skilled worker 36.66%, Semi-skilled worker 20%, Unskilled worker 6.66%, unemployed 6.66% and Students 23.33%.In our results, the percentages of skilled worker and semi-skilled worker were 36.66% (11) and 20% (06), respectively [10]. This information was mainly because the educational background of these patients was comparatively low, thus preventive them to manual work and increased susceptibility to TSCI, which may give explanation of the increased burden of TSCI in this occupational group. The correspondence might be accredited to the fact that skilled and semi-skilled workers were more occupied in unsafe outdoor work [11].

Presently, most epidemiological research studies from countries worldwide have paying attention on traumatic SCIs, and the information about non-traumatic SCIs is limited. In this study, traumatic (road traffic accident, crushing injuries, struck by falling object, high fall and low fall) and non-traumatic were all incorporated to assess the epidemiological individuality and etiologies. This approach exposed that the main

etiologies in Ahmednagar were road traffic accidents (36.66%), high fall (30%), being struck by falling objects (16.66%), low fall (13.33%) and crushing injuries (3.33%). Thus, the five main causes of SCIs were all traumatic and there was no any patient referred to us with non traumatic conditions. The results showed that road traffic accidents were the foremost cause during the three years we examined. This result might be due to social transformation, particularly the developments in transportation, the increase in population density, and the lack of traffic safety awareness. These factors could lead to speedy increases in the road traffic accident rate, which has become the major cause of SCI. There have been many recent reports about gender differences in the causes of SCI. Work-related and fall-related injuries happen more often to males [12].

This study revealed that the main etiologies for a variety of occupations were different, which is a significant consideration for protective measures. Additionally, low fall SCIs occurred mainly in female group 45 years or older, and violence largely happened to patients about 40 years old. Correspondingly, there were high rates of road traffic accidents, high falls, and being struck by falling objects for the patients between 21 and 60 years old while low falls were the most common cause of SCI in this study for the female participants over 45 years old and above[4] . Therefore, the high-energy injuries, such as road traffic accidents, high fall and being struck by falling objects, were the major causes of SCI in young adults, while low-energy injuries such as low falls mostly occurred in the female and elderly. As we all know, people are more prone to injuries as they age and their alertness declines. Therefore, we should center on the elderly and high-risk groups to prevent spinal cord injuries. This study also discovered that road traffic accidents and high fall were the main causes of SCI for both married and unmarried patients, even though there were no significant differences in the division of marital status by etiology.

It was noted in our study that cervical and thoraco-lumbar injuries were the most frequent type of SCI, accounting for 33% to 45%. This result is attributable to the somewhat poor mechanical stability of the cervical and thoracic vertebrae, which makes the spine weaker to trauma than any other area of the vertebral column. The structures of the spinal column and mechanisms of fractures resolute the injury severity and level. In the examination, the percentages of complete and incomplete SCIs were 86.66% and 20 % respectively. The prevalence of complete injury was higher in the thoracic segments than in the lumbar and cervical segments. The level of the injury appears to have a cause on the extent of the neurological deficit. The results exposed that the greatest risk factors for a complete injury were male gender, having a spinal fracture, having a thoracic injury, and experiencing complications. A spinal fracture may have an effect on the stability of the spinal mechanics, so patients with spinal fractures are more prone to complications relating the spinal cord or the end of the cauda equine nerve. Hence, the patients with thoracic spinal fractures were more prone to complete injuries.

Our results confirmed that the differences in the allocation of treatment options (including surgery and conservative treatment) by the severity of injury revealed 63.33% with complete and 10% with incomplete injury for surgery and 16.66% with complete and 10% with incomplete for conservative treatment. This result reveals that there is a association between treatment options and the severity of SCI patients' injuries and that surgery is a common therapy for SCI patients, particularly for patients with complete injuries. Furthermore, this considerate has helped high-risk patients with complete injuries avoid additional injuries that might sever the spinal cord. Therefore, timely and suitable hospital treatment (and eventually conservative treatment) should be provided for the high-risk population with complete injuries. Although the proportion of patients who were under conservative treatment was 26.66 % who receive an intervention in our study. SCI is often linked with injuries to other body parts, fractures, and brain injuries. In this study, the percentage of clinical complications was 50%, and the four main complications were, urinary tract infections (6.66%), bedsores (36.66%), spasm (3.33%) and others (3.33%). Urinary tract infections and bedsores were common complications, and they

were mainly accredited to the poor nursing practices in hospitals. These results highlight that taking good care of patients is very essential for reduction the duration of hospitalization and for improving prognosis [4].

Currently epidemiology research about spinal cord injuries in Ahmednagar, India has been very rare. Still, this information is needed to apply preventive measures to control the extension of the SCI population [11]. First, data must be collected and analyzed to help describe the problem and to categorize possible risk factors in a variety of populations. Preventive strategies should be targeted at persons who are at the greatest risk for injury, such as young male adults who are engaged in hazardous outdoor work. Second, ecological modifications should be strengthened. Based on demographics and epidemiologic distinctiveness, different educational programs can be provided for various age/gender/occupational groups.

CONCLUSION

The mean age at the time of injury was young adults, and the proportion of males was higher. The main causes were traffic accidents and being struck by falling objects. Skilled and Semi-skilled workers were the high-risk occupational groups. The number of SCI patients has increased annually. The results revealed that being male, having a spinal fracture, having a thoracic injury, and having complications were the major risk factors for a complete SCI.

Conflicts of interest: **None**

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