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Special Issue: Nursing and Healthcare: Current Scenario and Future Development

ISSN No: 2319-5886

International Journal of Medical Research & Health Sciences, 2016, 5, 7S:447-451

A study on demographic pattern, causes and level of lesion in the spinal cord injured patients in Yazd City in 2009-2015

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ABSTRACT

Spinal cord injury (SCI) refers to any lesion that could cause neurological damage that may affect motor, sensory, visceral, genital and nutritional functions. This in turn causes incomplete or complete motor dysfunction of upper or lower limbs or physical relation. The aim of this study was to investigate the on demographic pattern, causes and level of lesion in the spinal cord injured patients in Yazd City in 2009-2015.This study was a cross-sectional study on all the patients with spinal cord injury whose records were registered in Yazd Rehabilitation Department from 2009 till 2015. First, the questionnaire was prepared which contained demographic characteristics of patients with spinal cord injury as well as the causes, level of injury, age at the injury occurred, year in which injury occurred, lesion type, lesion location, marital status before and after the lesion and its complications, Then all patients with SCI who had records with the Rehabilitation Department of Yazd in 2009-2015 were included in the study. It should be noted that the level of injury was diagnosed by a physician and incomplete records were completed using telephone and data was taken directly from patients. Age, gender and type of lesion in the study were considered as variable. The results showed that the most important cause of injury was motor vehicle accident (66.7 %) followed by fall from a height (15.5 %), other causes 16.7 % (2 cervical tumors, 2 after surgery and 4 due to MS) and sports (1.2 %). In the two groups of spinal cord injury due to car accidents and falls from a height, men (67.17 %) accounted for a higher percentage of injuries, compared with women (18.5 %).Finally, according to the data obtained in this study and comparing this information with similar studies conducted in other countries, it seems that preventive strategies must be focused on preventing road accidents.

Keywords: Spinal Cord, Lesion, Road Accidents, Pain, Demographic Pattern, Yazd.

INTRODUCTION

Spinal cord injury (SCI) refers to any lesion that could cause neurological damage that may affect motor, sensory, visceral, genital and nutritional functions. This in turn causes incomplete or complete motor dysfunction of upper or lower limbs or physical relation. Damage caused may result in defects such as limb weakness or paralysis of one limb or damage to upper motor neuron (UMN) or lower motor neuron (LMN), and for sensory actions, it may cause

loss of sensation, reduced sensation, hypersensitivity or abnormal senses such as burning or numbness. Patterns of spinal cord injuries take incomplete or complete forms [1-3].

Complete lesions result in the complete loss of sensory and motor functions below the level of damage. Complete lesion mostly occurs in connection with the longitudinal extension of spinal cord, vertical cut of spinal cord and severe vascular lesions or strong stress on the spinal cord. In complete lesion, due to disconnection of the spinal cord with the brain, sensory perception and motor control is disturbed and in these cases the prognosis of return of sensorimotor function is weak [4] [5].

Incomplete lesions refer to such lesions as anterior, posterior and central cord syndrome and Brown squared syndrome, in which part of the sensory or motor function below the level of the place of damage is maintained. If motor or sensory functions recover fast, the prognosis will be good in terms of neurological recovery [5] [6].

Various studies have reported factors such as vehicle accidents, falls, violence, sports, etc. as reasons that can cause injury of the spinal nerve roots or spinal cord or both and thus can cause disability, leading to many complications including urinary and fecal incontinence, bedsores and psychological problems. Two-wheel or four-wheel vehicle accident is the most common cause of injury in most regions of the world according to the studies [7] [8].

Spinal cord injury is divided to two categories of traumatic injury and non-injury according to cause of injury. Examples of the former, which accounts for most of spinal cord injuries include fractures and strain of spinal cord caused by motor vehicle accident, firearm injury, diving in shallow water, or falling from a high altitude point. Various studies have noted that this type of damage that are caused by accidents, extreme sports movement, stabbing, falling from a height produce effects such as fractures in the spine, acute injury of intervertebral discs, fractures with dislocation In the spine, spine dislocations and vascular injuries following trauma [8] [9].

It seems that non-traumatic injuries such as vascular problems, spinal stenosis, spinal disc herniation, spondylolisthesis, spinal tumors and spine disorders such as infection, spina bifida, amyotrophic lateral sclerosis, syringomyelia, transverse myelitis, multiple sclerosis, etc. accounted for 30% of causes of spinal cord injury. An epidemiologic study of the causes of spinal cord injuries in different countries is based on the results of these studies preventive strategies to reduce the occurrence of these events is considered to be [9-11].

Epidemiologic study of the causes of spinal cord injuries is conducted in different countries and based on the results of these studies, preventive strategies to reduce the occurrence of these events are considered[9-11]. Because the library sources suggested that no studies in the city of Yazd has been conducted to investigate demographic patterns, causes and level of injury in patients with spinal cord injury, we aimed to conduct the study between for 6 years [2009-2015] in the city on basis of which preventive strategies could be adopted.

MATERIALS AND METHODS

This study was a cross-sectional study on all the patients with spinal cord injury whose records were registered in Yazd Rehabilitation Department from 2009 till 2015. First, the questionnaire was prepared which contained demographic characteristics of patients with spinal cord injury as well as the causes, level of injury, age at the injury occurred, year in which injury occurred, lesion type, lesion location, marital status before and after the lesion and its complications, Then all patients with SCI who had records with the Rehabilitation Department of Yazd in 2009-2015 were included in the study. It should be noted that the level of injury was diagnosed by a physician and incomplete records were completed using telephone and data was taken directly from patients.

Patients were divided into three groups: cervical, thoracic and lumbar. In order to determine the level of spinal cord involvement, taking into account the results of sensory and motor examination, the most involved nerve root was revealed so that the level of the involvement of the spinal cord was one level higher than the level of involvement of nerve root, for example, if the most involved root is c5, then the level of spinal cord involvement is considered to be c4. In examination of key muscles, it was considered that a muscle may be innervated by several nerve roots. For example, a muscle that is innervated by L3 can be weakened following L4 lesion. Age, gender and type of lesion in the study were considered as variable.

RESULTS AND DISCUSSION

In this study, the records of all patients with SCI kept by Yazd Rehabilitation Department (including 84 patients, 65 (77.4 %) men and 19 (22.6%) females) were studied. Marital status was considered in this study. Of them, 53

caseswere married before the injury and after injury and 25 were single and remained single after the injury and5 were married, but divorced after injury and 1 person was single who married after the accident.

Causes of traumatic lesion in this study were divided into several groups, including motor vehicle accident (56 people including 6 patients due to motorcycle accidents and 32 due to the reversal of the car, 12 due to a crash of a car with another car), 13 fall from height and 1 due to sports (hitting the goal post).

Causes of non-traumatic injury happened to 14 people, which included patients with MS (6 persons), 2 patients following surgery, 2 cases of cervical tumor and 4 patients with idiopathic disease with likely cardiovascular disease. The patients were divided in 3 age groups: under 30 years, 30-45 year and more than 45 years to study therelation between injuries as well.

The results showed that the most important cause of injury was motor vehicle accident (66.7 %) followed by fall from a height (15.5 %), other causes 16.7 % (2 cervical tumors, 2 after surgery and 4 due to MS) and sports (1.2 %). In the two groups of spinal cord injury due to car accidents and falls from a height, men (67.17 %) accounted for a higher percentage of injuries, compared with women (18.5 %) (Table 1 and 2).

Table 1. Frequency distribution of cause of spinal cord injury in terms of age

Age Cause	≤30 Frequency (%)	31-45 Frequency (%)	≥46 Frequency (%)	Total Frequency (%)
Car accident	(%65.1)28	(%75)21	(%53.8)7	(%66.7)56
Fall	(%11.6)5	(%10.7)3	(%38.5)5	(%15.5)13
Other	(%20.9)9	(%14.3) 4	(%7.7) 1	(%16.7)14
Sports	(%3.3)1	(%0)0	(%0)0	(%1.2)1
total	(%100)43	(%100)28	(%100)13	(%100)84

Table 2. Frequency distribution of level of spinal cord injury in terms of age

Total **Frequency (%)**	**≥46** **Frequency (%)**	**31-45** **Frequency (%)**	**≤30** **Frequency (%)**	**Age** **Level of lesion**
(%29.8)25	**(%23.1)3**	**(%32.1)9**	**(%30.2)13**	Neck
(%42.9)36	**(%53.8)7**	**(%32.1)9**	**(%46.5)20**	Back
(%17.9)15	**(%15.4)2**	**(%21.4)6**	**(%16.3)7**	Reins
(%6.0)5	**(%7.7)1**	**(%3.6)1**	**(%7.0)3**	Thoracolumbar
(%3.6)3	**(%0)0**	**(%10.7)3**	**(%0)0**	Cervicothoracic
(%100)84	**(%100)13**	**(%100)28**	**(%100)43**	Total

In all age groups, the most common site of injury was the thoracic spine (42.9%) and the most affected areas were in the T10, T12 and at the simultaneous involvement of T9, T10. Then 29.8% were affected at the neck (cervical lesion). Largest level of cervical involvement were c5 (47%) and simultaneous involvement of C4 and c5 (33%). 17.9% of patients were affected with lumbar spine injury and the highest level of involvement was L3, followed bythoracolumbar area and cervicothoracic area with 6% and 3.6% respectively. In females, neck injury (47%) accounted for the largest cases of injuries while thoracic lesions in men (46.2%) accounted for the highest number of injuries (P= 0.008) (Table 3).

Table 3. Frequency distribution of level of spinal cord injury in terms of sex

Total Frequency (%)	Female Frequency (%)	Male Frequency (%)	Sex Level of lesion
(%29.8)25	(%47.4)9	(%24.6)16	Neck
(%42.9)36	(%31.6)6	(%46.2)30	Back
(%17.9)15	(%0)0	(%23.1)15	Reins
%6.0)5	(%10.5)2	(%4.6)3	Thoracolumbar
(%3.6)3	(%10.5)2	(%1.5)1	Cervicothoracic
(%100)84	(%100)19	(%100)65	Total

In all age groups, accident injury cases accounted for the most cases of injury (P = 0.001) and also in the age group under 30 years, spinal cord injuries due to sports and other causes were higher than other age groups . In people with spinal cord injury, there were 57 (68 %) complete spinal cord injuries and 27 (32 %) incomplete spinal cord injury. The most common complications of spinal cord injury in patients had prevalence of 85 % and 68 % respectively, all of all cases of bedsores, that is, 57 patients, occurred in patients with complete spinal cord injury, 51 patients (60 %) suffered from psychological (mental) problems who visited a psychiatrist and were taking psychiatric drugs.

DISCUSSION AND CONCLUSION

In a study in Switzerland in 2015 that was published by Chamberlain et al., the epidemiology of traumatic spinal cord injury in 2005 and 2012 in this country was studied. Comparing the rates of traumatic spinal cord injury compared to other European countries ranging from 8.3 in Denmark to 33.6 per million in Greece were 18 on average. The damaged male population accounted for a larger population for the ages of 16 to 30. Falling from height is more likely to cause injury to the elderly. With aging, fall-caused injury caused more SCI so that 80% of the elderly had experienced fall. Finally, the evidence suggests that in young people, damages are rather caused by sports injuries while in older people, damages are due to fall from a low height, which are the first priority of preventive strategy (12).

A study in 2012 by Chanbraet al. examined the demographic patterns of people with spinal cord injury in spinal cord injuries center in India. They examined 1138 people with spinal cord injury during the years from 2002 to 2010 in this study. Their results showed that most people were at an average age of 30 years. In most cases the causes of injury related to road accidents (45%) and fall from height (39.63%). In general, 66.67% of patients had partial paralysis of the body and 71.18% of them had complete spinal cord injury. Results of the study showed that in comparison with other studies in India, this study has a wider population. The study states that the demographic of SCI in India is different from that in developed countries because it had lower average age, more men and more married people and more spinal cord injury due to a fall or accident (13).

Our results are consistent with these studies that considered aging as linked to spinal cord injury due to falling from height. These events may increase with age and osteoporosis especially in women. Also, a recent study of married individuals comprised a large percentage of spinal cord injuries.

In a comprehensive study by Knútsdóttir S et al. published in 2012, scientists considered patients from 1975 to 2009. They found 207 patients with spinal cord injuries, of whom 72 percent were male and the rest female. The percentage of women affected during 2000 to 2004 increased to 37 percent. 42.5% were injured in accidents, and the majority of them were not wearing seat belts. Falling from a height accounted for about 30.9 percent of the injuries in the elderly, causing damage to the spine. Among causes of spinal cord injury are accident in horse riding, winter sports injury, especially in women. Damage was complete in 39% of cases, damage to the spine accounted for 57% of cases and thoracic and lumbar lesion accounted for 57% and 43%. The results of their study showed that between 2005 and 2009, SCI had growing trend, especially in sports injuries and accidents and that cervical trauma due to a fall in the elderly has also increased. They stated that preventive strategies in driving should focus on high-risk groups and belts [11]. In consistence with the present study, the results of our study showed that in patients less than 30 years, sport is the most important causes of spinal cord injury.

Aito S and colleagues in a study in 2014 examined the traumatic spinal cord injury in 30 years in a center. 1479 patients with this injury referred to this center during these years. Over these years, people injured due to road accidents with two-wheeled vehicles were increased while damage due to the cause of the fall and the sport has been declining. Injury due to an accident with a four-wheel vehicle was dropped. Like other studies, the most common cause of spinal cord injury in older people was falling from a height. Jumping has been considered as the leading cause of injury in sports. The results of this study showed that following the injury due to the two-wheeled vehicle accident, prevention strategy must be adopted by [14]. Other studies in recent years by Al shahri, Feng and Al Qurishi have been done that have led to similar results [15], [16] and [17]. In this study, the most common cause of injury have been reported as road accidents.

Finally, according to the data obtained in this study and comparing this information with similar studies conducted in other countries, it seems that preventive strategies must be focused on preventing road accidents.

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