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Orignal Article

Assessment of Functional Independence in Different Levels of Traumatic Spinal Cord Injury Patients of Pakistan population: A Cross-Sectional Survey

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ABSTRACT

Spinal Cord injury (SCI) is a serious public health problem as it not only causes serious functional impairment in the individual but also affects the family and social circle of the patient. **Objective:** of the study was to investigate the level of functional independence in different levels of SCI patients in Pakistani population. We hypothesized that different levels of SCI experience different levels of functional independence. **Methods:** An exploratory cross-sectional survey was designed, and data was collected from Lahore General Hospital, Ghurki Hospital, and Jinnah Hospital, Lahore, Pakistan. 52 patients suffering from acute spinal cord injury were enrolled in study by using convenient sampling technique. Overall health status of patients was measured using functional independence measure (FIM) tool. **Results:** Total 52 patients were assessed in this study. Out of which 50% injuries were reported at cervical level, 15% injuries were reported at thoracic level and 34% were reported at lumbar level. Percentage of males suffering from SCI (62%) was higher than female (38%). The lowest functional independence level was recorded for cervical injury (FIM score: 40), moderate for thoracic injury (FIM score: 84) and maximum for lumbar injury (FIM score: 102). **Conclusions:** Within the studied population, the percentage of cervical injuries was more than thoracic and lumbar. Gender proportion in traumatic spinal cord injury showed that men were more prone to injury as compared to female. However, functional independence was associated with level of SCI injury as cervical injuries patients were least independent while lumbar injury patients had high functional independence.

INTRODUCTION

Spinal Cord Injury (SCI) is one of the most devastating neurological injuries which causes loss of motor and sensory functions and patient suffers from massive functional impairment. SCI is highly prevalent affecting 195 people per million population and is reported to be even higher in urban countries. The anticipated prevalence of SCI in the United-States is 40 cases per million and approximately 2,38,000 to 3,32,000 people are currently living with this condition. SCI is four times more frequent in men than in women and average age of the patients suffering from SCI is ever-increasing as the population continues to age [1-3].The majority of common syndrome presentations comprise of incomplete tetraplegia (41%), incomplete paraplegia (19%), complete paraplegia (18%) and complete tetraplegia (12%) [4]. SCI is predominantly disturbing in communal level because it affects young, or healthy persons, with injury happening with the maximum rate of recurrence in individuals between 15-25 years of age. Traumatic SCI is a main cause of disability, healthcare expense and mislaid productivity [5,6]. SCI patient feels difficulty in performing the simplest routine activities (i.e., dressing, feeding, and bathing) and almost unable to do the complex tasks (i.e., going upstairs and downstairs). Quality of the life in such individuals is highly compromised as they need to overcome the succession of obstacles in everyday life. SCI affects not only the patient but also his family and closest social group. SCI patient is forced to adapt different lifestyle to overcome the functional impairment which not only affects bladder and bowel elimination, articular structure, skin and soft tissues, nutritional status as well as

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the professional and emotional life. Low quality of life in SCI patient is also found to be linked with onset of disease at younger age, stumpy functional ability, low communal support, low mobility, marital status, spasticity, and pain interference [7-12].Interpretation of patient outcome and validity of rehabilitation can be evaluated by documenting functional ability after SCI. Functional independence measure (FIM) is most frequently used instrument to assess the different routine activities of the patient (self-care, transfers, and cognition). Each activity is measured in a score range from 1-7 (total dependence-complete independence) resulting in a total score from 18 to 126 [13,14]. Responsiveness of FIM in SCI have been studied previously and it represented low responsiveness in cognition domain. Level of injury affects the motor score and provide considerable information about functional independence [15-17]. To the best of our knowledge no study reported the functional independence of SCI patients of different injury levels in Pakistani population. Therefore, present study was designed to find the level of functional independence by FIM score and to compare the effect of gender in different levels of spinal cord injuries in patients suffering from SCI in Pakistani population.

METHODS

This exploratory cross-sectional survey recruited 52 patients (both male and female) with different levels of SCI (cervical, thoracic, and lumbar) and admitted at Lahore General Hospital, Jinnah Hospital, and Ghurki Hospital, Lahore, Pakistan for rehabilitation. Data was collected by convenient sampling method. Any patient with injury at C4 or above, congenital anomaly of spine, Spondylolisthesis, Spondylosis, Scoliosis, any metabolic disease of spine, Tb of spine, Brown squed syndrome were excluded from the study. Study was approved from research ethics committee of Riphah International University, Lahore and involved no conflict of interest. Written informed consent was obtained from all enrolled subjects. Data was divided in three groups according to level of SCI as cervical injury, thoracic injury, and lumbar injury and based on gender as male and female group. All groups were subjected to statistical analysis using SPSS version 21. Normality of the dataset was checked by Shapiro-wilk test and parametric/non-parametric set of tests were selected accordingly. Association of gender (male/female) with different levels of SCI was done by chi-square test. ANOVA/Kruskal Wallis test was performed for multiple group comparison. A p value <0.05 was considered significant.

RESULTS

A total of 52 records were analyzed which includes 26 cases (50%) of cervical injury, 18 cases (34%) of lumbar injury and 8 cases (15%) of thoracic injury. All three groups contained almost equal age distribution of participants. Overall, 32 (62%) males and 20 (38%) females participated in the study. Majority of the enrolled subjects belonged to the age group of 20-35 years with 30 cases (57%) followed by 36-50 years group with 15 cases (28%) whereas >50 years age group was least affected with 7 cases (13%). Distribution of SCI in study population was according to the reported literature as SCI affects mostly young people up to 35 years of age. Clinical and demographic characteristics of study population are shown in the Table. 1. Distribution of patients by gender (male/female) and level of SCI (cervical, thoracic, and lumbar) are shown in Figure 1A,B.

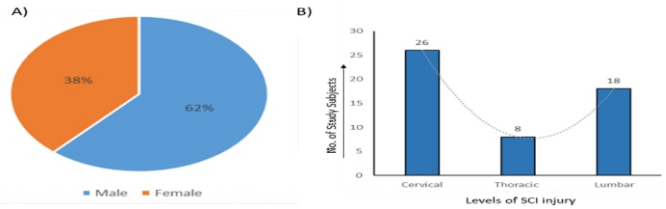

Figure 1A: Distribution of study population in gender groups (male/female) B) Distribution of study population by three levels of SCI

Characteristics	Number (%age)
No. of Patients	52
Age in Years	
20-35	30 (57%)
36-50	15 (28%)
>50	07 (13%)
Gender Groups	
Male	32 (62%)
Female	20 (38)
Levels of SCI	
Cervical Injury	26 (50%)
Thoracic Injury	08 (15%)
Lumbar Injury	18 (34%)

Table1: Clinical and demographic characteristics of enrolled subjects

Shapiro wilk test revealed data is non-normally distributed and hence non-parametric tests were applied. Chi-square test revealed there is no significant association between gender and different SCI levels ($p>0.05$). Mosaic plot (Figure 2A) shows different association between gender and SCI levels. Functional independence was measured in enrolled patients by FIM score. Figure 2B shows mean FIM score in three study groups and found least value of FIM score (mean FIM: 40.15) in cervical injury patients as they need maximum assistance for common activities. Mean FIM score was raised to 58.23 in thoracic injury patients as they showed moderate functional independence. Highest value of FIM score was recorded for lumbar injury patients (mean FIM: 102.86) but they were not still completely independent.

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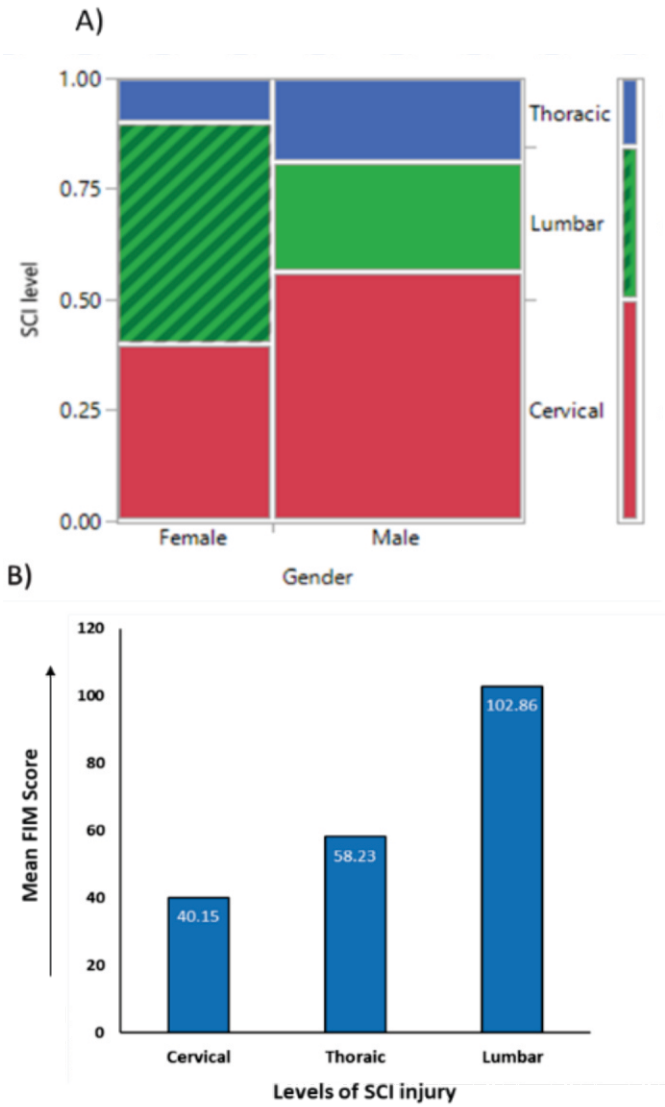

Figure 2A: Association between gender and SCI levels B) Mean FIM score of three study groups: cervical, thoracic, and lumbar

Details of mean FIM score obtained for each category are summarized in Table 2. It can be interpreted from the Table 2 that FIM score is poor in cervical injury patients as compared to thoracic and lumbar injury. These patients require maximum assistance in self-care (15.55), transfers (7.02) and cognitive domain (17.58). Thoracic injury patients showed improved FIM score as compared to cervical injury (self-care: 26.64, transfers:13.90, and cognitive: 17.69). Lumbar injury patients exhibited maximum independence towards self-care (44.06), transfers (24.04) and cognitive domain (34.77). Kruskal Wallis Test for three group comparison proved significant difference between three SCI levels for self-care ($p<0.0001$), transfers ($p<0.0001$), cognitive domain ($p<0.0001$), and total FIM score ($p<0.0001$). All comparisons were statistically significant which indicates that three levels of SCI have different levels of functional independence and cervical injury patients were highly dependent whereas lumbar injury patients were highly independent.

Domain	Individual Variables	Mean FIM Score			Minimum	Maximum
		Cervical	Thoracic	Lumbar		
Self-Care	Eating	3.10	3.75	6.79	1.00	7.00
	Grooming	2.55	2.94	6.56	1.00	7.00
	Bathing	1.41	3.10	5.21	1.00	7.00
	Dressing upper body	2.32	3.25	6.76	1.00	7.00
	Dressing lower body	1.33	3.04	5.35	1.00	7.00
	Toileting	1.49	2.90	4.99	1.00	7.00
	Bladder Management	1.88	3.81	4.22	1.00	7.00
	Bowel Management	1.48	3.85	4.17	1.00	7.00
	Total Self-Care	**15.55**	**26.64**	**44.06**	**8.00**	**56.00**
Transfers	Bed, Chair	1.67	3.40	5.44	1.00	7.00
	Toilet	1.31	2.77	4.98	1.00	7.00
	Walk/wheelchair	1.67	3.08	5.77	1.00	7.00
	Stairs	1.05	2.38	3.08	1.00	7.00
	Tub, Shower	1.32	2.27	4.78	1.00	7.00
	Total Transfers	**7.02**	**13.90**	**24.04**	**5.00**	**35.00**
Cognitive	Comprehension	3.32	3.48	7.00	1.00	7.00
	Expression	3.50	3.52	7.00	1.00	7.00
	Social Interaction	3.56	3.58	6.90	1.00	7.00
	Problem Solving	4.07	3.38	6.99	1.00	7.00
	Memory	3.13	3.73	6.88	1.00	7.00
	Total Cognitive	**17.58**	**17.69**	**34.77**	**5.00**	**35.00**
	Total FIM Score	**40.15**	**58.24**	**102.86**	**18.00**	**126.00**

Table 2: Mean FIM Score of each category in three study groups

DISCUSSION

World-wide incidence of traumatic SCI reported that men are usually more affected from traumatic SCI than female [18]. Our study also reported that men were more affected to traumatic SCI than females and our findings were consistent to the previous studies conducted in Pakistan and United States [3,15,19,20]. Our study reported a high frequency of cervical injury and lowest level of injuries were reported at thoracic level and similar findings were reported by the study conducted in Europe. We measure the overall status of independence level of patients suffering from traumatic SCI by functional independence measure and findings of our study reported that patient having lumbar level of injury scored good and patient having cervical level of injury scored poor and similar findings were reported in previous studies [13]. We found that cognitive domain of the FIM was poor predictor for measurement of overall independence status of patients with traumatic SCI. However, we suggest that cognitive domain of FIM can be used as mild screening tool for cognition.

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