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Research

Spinal cord Injury Pattern Study

Pattern Of Traumatic And Non-Traumatic Spinal Cord Injuries - A Hospital Based Study In Haryana

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Abstract: The demographic characteristics and rehabilitation outcomes of patients with traumatic spinal cord injury (T-SCI) have been extensively studied across the globe, whereas there has been limited research done on patients with non- traumatic spinal cord injury (NT-SCI). Studies observing the patterns and statistics of both T-SCI and NT-SCI are insufficient in developing countries, especially in India. Thereby, a retrospective cross-sectional study was conducted to evaluate the factors involved to improve the management of SCI. The aim of this study was to analyze the demographic profile and injury pattern of persons admitted with T-SCI and NT-SCI in a paraplegic rehabilitation center from August, 2015 to May, 2019. The injury pattern of 663 patients was observed in the present study, with ratio of T-SCI: NT-SCI of 4.30:1. Highest incidence of T-SCI and NT-SCI was found in the rural male population in the age group of 20-29 years and 30-39 years. Fracture and Pott's spine disease with an incidence of 72.1% and 17.49% of SCI were primary etiologies for T-SCI and NT-SCI respectively, with maximum occurrence in the thoracolumbar region. On comparing T-SCI with NT-SCI based on the level of spinal injury, the ratio of TSCI: NT-SCI in cervical spine was 58.33:1; 1.89:1 in thoracic spine and 8.6:1 in lumbar spine. Lower percentage of cervical injuries and prevalence of thoracolumbar injuries in T-SCI category and prevalence of Pott's disease in NT-SCI category, predict that demographic profile of both T-SCI as well as NT-SCI in India is different from developed countries. There is a need for upgradation of the first-aid services and rural health care facilities for effective management of injuries of cervical spine. Eradication of tuberculosis through definitive measures is the need of hour for prevention and effective management of NT-SCI.

Keywords: Incidence of SCI; Level of SCI, Non-traumatic SCI, Traumatic- SCI.

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1. INTRODUCTION

Spinal cord injury (SCI) is a traumatic event that carries a high risk of morbidity and mortality with an annual incidence of 3.6 - 195.4 patients per million in the world and average annual incidence of SCI in India is 15,000 new cases per year with a prevalence of 0.15 million.[1,2] Spinal cord injury can result from both traumatic and non-traumatic etiologies and both are associated with lifelong devastating consequences for the individual and require high economic cost for specialized rehabilitation. Multiple etiologies of NT-SCI include vertebral spondylosis (spinal stenosis), spinal tumors, Pott's spine, vascular ischemia, congenital disease, degenerative diseases of the spinal column followed by vascular and autoimmune disorders.The T-SCI is an injury caused as a result of motor vehicle accidents, gunshot wounds, assault, falls and diving activities. [3,4,5] Despite the fact that more than 80% of the world's population lives in more than 100 developing countries[6], there ~~is~~ are insufficient studies providing data of SCI patients in developing countries like India. There is need of such data as it is helpful in identification of risk factors.. In addition, it helps in the planning of prevention strategies which may modify or eliminate the risk factors of this incapacitating injury.[5,6,7,8,9]The prevention of SCI is paramount because there is no curative treatment for SCI and investigating the epidemiology pattern of SCI is the first step required for formulating preventive strategies for SCI. Previous studies conducted by Singh R et al[8] and Chhabra HS et al[9], analyzed the demographic profile of patients with T-SCI only and did not observe injury pattern associated with NT-SCI. Study by Agarwal P et al[7] observed patients with both T-SCI and NT-SCI. This study had pitfalls owing to small sample size and had included population of only one area. The study advocated inclusion of patients from other designated SCI centers so that a national database could be established. Also, none of the above-mentioned studies [7,8,9] had screened individual levels of SCI namely cervical, thoracic and lumbar vertebral levels for various causes of T-SCI AND NT-SCI.

Thereby, a retrospective cross-sectional study was conducted to evaluate factors which could lead to a better management of SCI. The aim of the study was to analyze demographic profile and injury pattern at various vertebral levels alongwith etiologies of persons admitted with T-SCI and NT-SCI in a paraplegic rehabilitation center from August, 2015 to May, 2019. To the best of our knowledge, it is the first study in the country where incidence of both T-SCI and NT- SCI has been evaluated and objectives that were assessed are age, gender, rural- urban distribution, type of SCI and level of SCI (cervical, thoracic, lumbar and sacral).[2,6,7,8,9]

2. MATERIAL AND METHODS

A retrospective cross-sectional study was conducted to analyze various factors that were associated with incidence of T-SCI and NT-SCI. The study was approved in the Institutional Ethics Committee of Pt. B. D. Sharma, UHS, Rohtak vide No. IEC/17/388 dated 25/03/2017. The demographic profile and injury pattern of 663 patients admitted with T-SCI and NT-SCI from August, 2015 – May, 2019, in Paraplegia ward, Department of Paraplegia and Rehabilitation, Pt. B. D. Sharma, PGIMS, Rohtak was collected. The objectives that were assessed are age, gender, rural- urban distribution, type of SCI and level of SCI.Patient evaluation for SCI was done with a pre structured proforma and demographic parameters such as age, gender and rural–urban distribution were noted. All patients who were diagnosed with traumatic and non traumatic spinal cord injury were included in the study. Patients who incurred ailment due to any other disease state other than than T-SCI and NT-SCI were excluded from the study. Further, in the epidemiological variables, etiology of injury was categorized into two broad groups namely T-SCI and NT-SCI. Incidence of T-SCI due to fracture, subluxation and dislocation and the incidence of NT-SCI due to Pott's spine or caries spine disease, metastasis, and spinal deformities was recorded at vertebral levels including cervical, thoracic, lumbar and sacral.

3. STATISTICAL ANALYSIS

Data was expressed in terms of number (percentage) and ratio using MS- EXCEL.

4. RESULTS

A sum total of 663 cases were enrolled in the present study. There were five hundred and thirty-eight patients of T-SCI (81.14%) (Figure 1) and the most prevalent age group was 20-29 with an incidence of 123 patients (22.86%), closely followed by age group 30-39 (118 patients; 21.93%) and 40-49 (111 patients; 20.63%). There were 405 patients (75.28%) of rural background and 133 patients (24.72%) were of urban background. There were 393 male patients (73.05%) and 145 female patients (26.95%).The rural: urban ratio was approximately 3.05:1 and male: female ratio was 2.71:1.

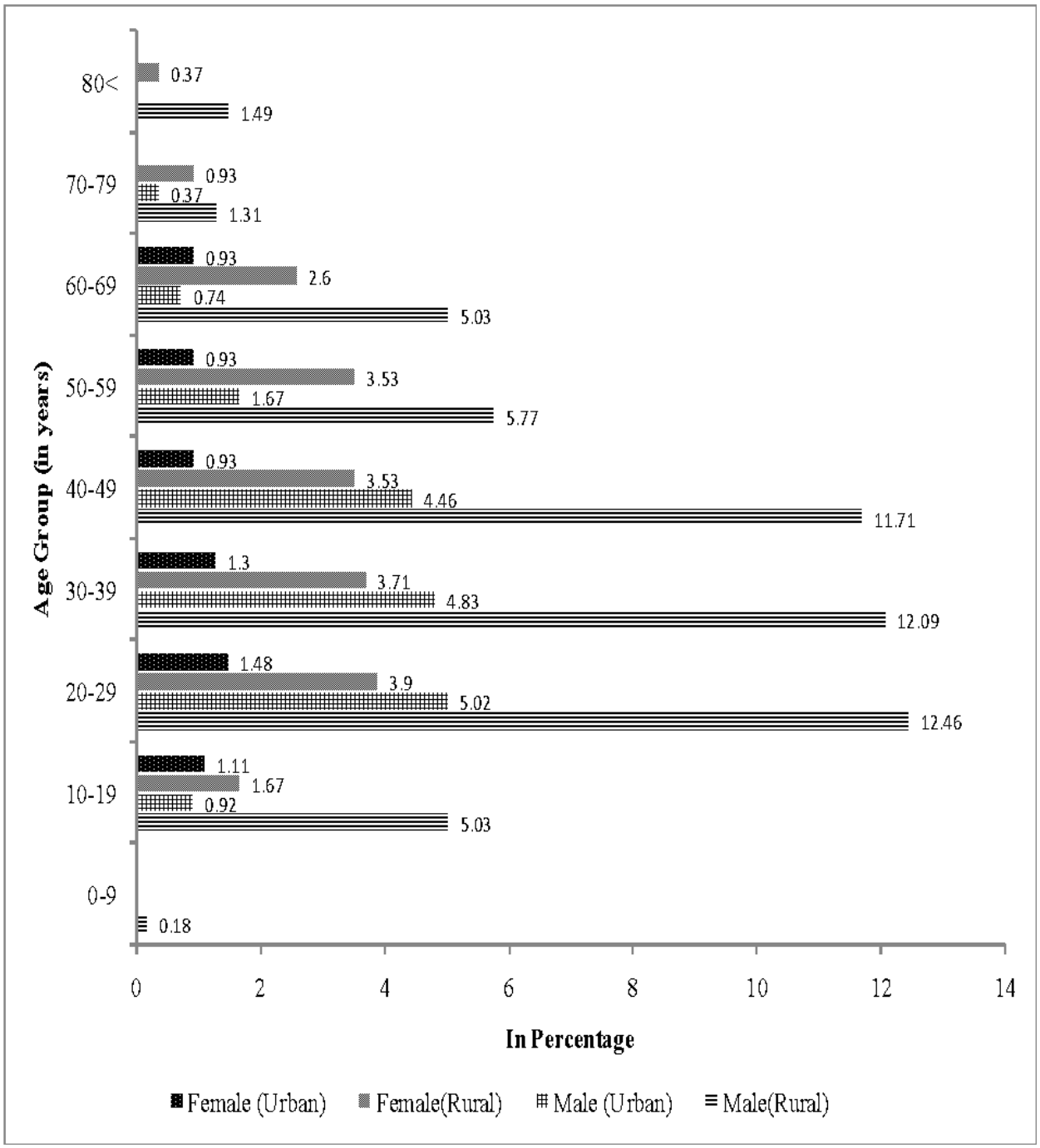
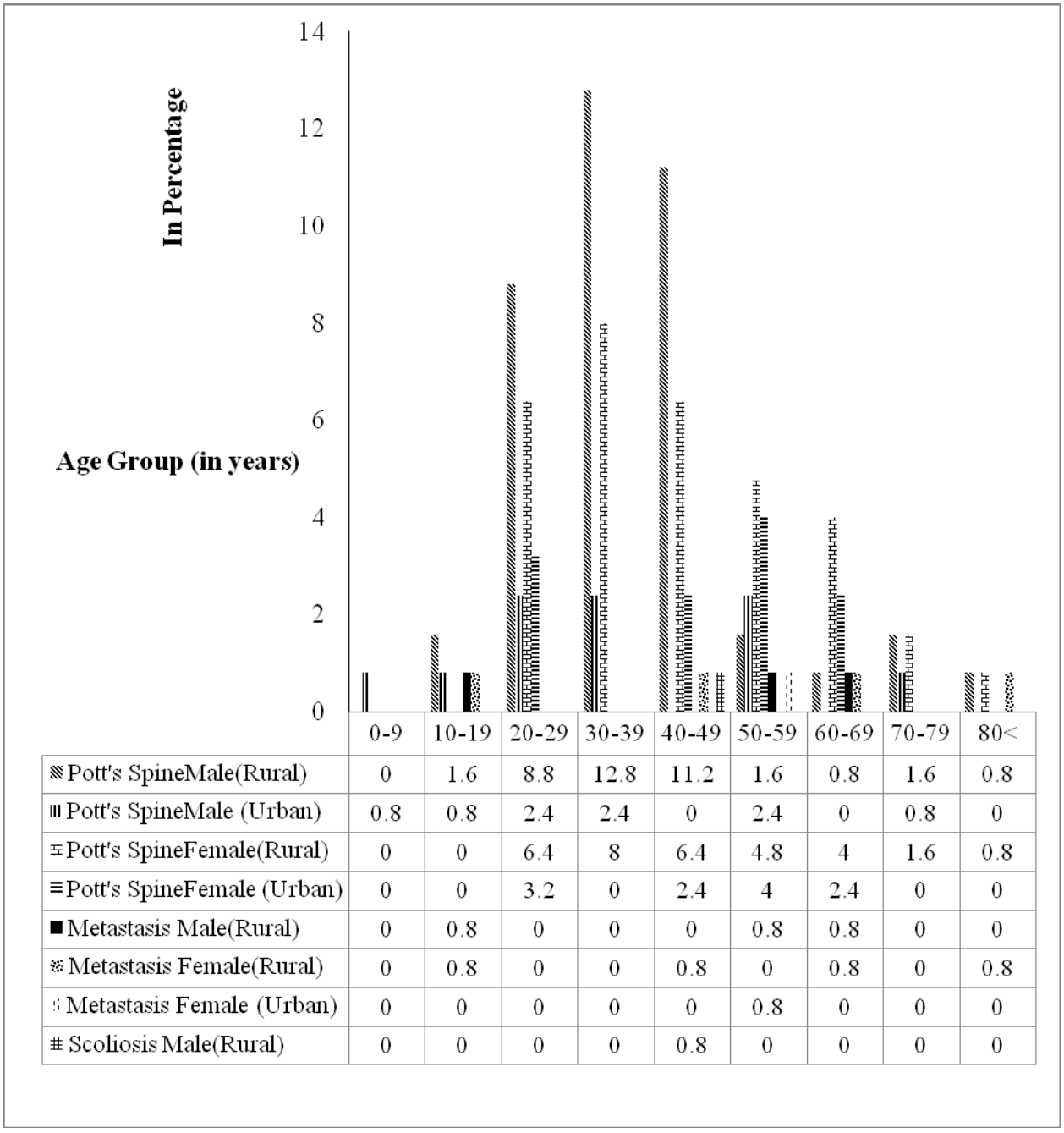


Fig 1: Comparison between Age Group (in years) and Gender (expressed in percentage) in Patients with Traumatic Spinal Cord Injury

There were one hundred and twenty-five patients of NT-SCI (Figure 2). Pott's / Caries spine disease had the highest incidence and was most prevalent in the age group of 30-39 years (29 patients; 23.2%), closely followed by age group 20-29 and 40-49 with incidence of 24 patients (19.2%) and 25 patients (20%). There were 96 patients (76.8%) of rural background and 28 patients (22.4%) were of urban background, with rural versus urban ratio to be approximately 3.42:1. There were 65 male patients (52%) and 60 female patients (48%) with male: female ratio of 1.08:1.



	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80<
Pott's SpineMale(Rural)	0	1.6	8.8	12.8	11.2	1.6	0.8	1.6	0.8
Pott's SpineMale (Urban)	0.8	0.8	2.4	2.4	0	2.4	0	0.8	0
Pott's SpineFemale(Rural)	0	0	6.4	8	6.4	4.8	4	1.6	0.8
Pott's SpineFemale (Urban)	0	0	3.2	0	2.4	4	2.4	0	0
Metastasis Male(Rural)	0	0.8	0	0	0	0.8	0.8	0	0
Metastasis Female(Rural)	0	0.8	0	0	0.8	0	0.8	0	0.8
Metastasis Female (Urban)	0	0	0	0	0	0.8	0	0	0
Scoliosis Male(Rural)	0	0	0	0	0.8	0	0	0	0

Fig 2: Comparison between Age Group (in years) and Gender (expressed in percentage) in Patients with Non- Traumatic Spinal Cord Injury

In the patients with T-SCI (Figure 3), there was a uniform distribution of injuries at cervical, thoracic, thoracolumbar and lumbar vertebral levels. In the patients with T-SCI (Figure 3), 175 patients (26.39%) had sustained injury at the cervical level, 81 patients (12.22%) at the thoracic level, 110 patients (16.59%) at the thoraco-lumbar level, and 172 patients (25.94%) at the lumbar level. Fracture was the sole cause of injury at thoracic, thoraco-lumbar and lumbar vertebral levels of injury (Figure 3). However, in patients with cervical spine injury, out of the 175 patients, 115 (17.35%) had history of fracture, 49 patients (7.39%) had history of subluxation, and 11 patients (1.66%) had sustained injury due to dislocation of the cervical spine. In patients with NT-SCI (Figure 3), the cervical level had the least number of patients in comparison to thoracic/ lumbar vertebral levels. In this category, 77 patients (11.61%) had sustained injury at the thoracic level, 24 patients (3.62%) at thoraco-lumbar level, followed by 21 patients (3.16%) at lumbar level and 03 patients (0.45%) at cervical level. Major cause of NT-SCI was found to be Pott's / Caries spine disease with 116 patients (17.49%) (Figure3). Ninety-eight patients (14.78%) presented with Pott's disease at the thoracic and thoraco-lumbar level, followed by 15 patients (2.26%) at the lumbar level and only 03 (0.45%) patients at the cervical level. Metastasis was the secondary cause of NT-SCI with an incidence of 08 (1.2%) patients and was observed only at lumbar, thoraco-lumbar and thoracic vertebral levels with an incidence of 05 patients (0.75%), 02 patients (0.3%) and 01 patient (0.15%) (Figure3). There was only one patient (0.15%), who had spinal deformity due to scoliosis.

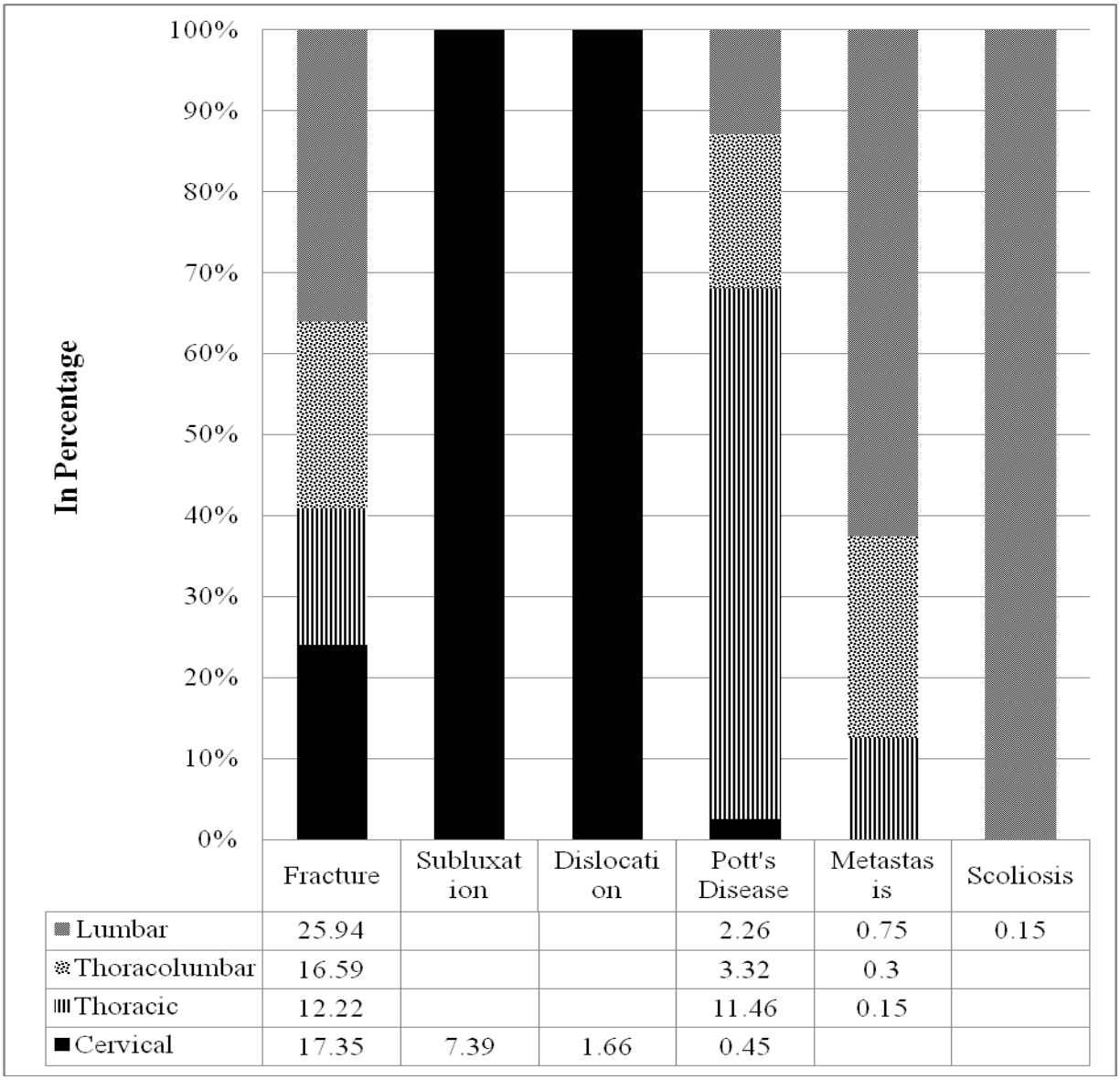


Fig 3: Distribution of patients (expressed in percentage) with traumatic and non-traumatic spinal cord injury due to various etiologies.

C5-C6 level had the highest incidence of spinal cord injuries (66 patients, 37.07%) as compared to other vertebral levels. In the T-SCI category, the maximum numbers of traumatic injuries at C5-C6 level were caused by fracture (36 patients, 31.30%) and subluxation (28 patients, 57.14%). (Table1). However, in the NT-SCI category only three patients were seen with pott's disease in the cervical spine at C5-C6 and C7 levels. (Table 1).

Table 1: Level and Mechanism of injury in patients with Cervical Spinal Cord Injury

Level Of Injury	Traumatic (n=175)			Non-traumatic (n=03)	Total (n=178) No. (%)
	Fracture (#) (n=115) No. (%)	Subluxation (n=49) No. (%)	Dislocation (n=11) No. (%)	Pott's/Caries spine (n=03) No. (%)	
C1-C2	3(2.61)	-	-	-	3 (1.69)
C2-C3	5(4.35)	3(6.12)	-	-	8 (4.49)
C3-C4	12(10.43)	2(4.08)	1 (9.09)	-	15 (8.42)
C4-C5	28(24.35)	7(14.29)	2 (18.18)	-	37(20.79)
C5-C6	36(31.30)	28(57.14)	-	2(66.66)	66 (37.07)
C6-C7	23(20)	6(12.24)	8(72.72)	-	37 (20.79)
C7	8 (6.96)	3(6.12)	-	1(3.33)	12 (6.74)
Ratio Traumatic: Non-Traumatic				175:03 = 58.33:1	

Most common fractured vertebra in the thoracic spine was T12 vertebra (96 patients, 50.26%). Maximum incidence for pott's disease was observed at thoraco-lumbar junction with T12 being the commonest vertebra, followed by T5-T11 vertebral levels. Metastasis was seen only at T9-T10 vertebral levels (Table 2).

Table 2: Level and Mechanism of injury in patients with Thoracic Spinal Cord Injury

Level Of Injury	Traumatic (n=191) No. (%)	Non-traumatic (n=101) No. (%)		Total (n=292) No. (%)
	Fracture (#) (n=191) No. (%)	Metastasis (n=03) No. (%)	Pott's /Caries spine (n=98) No. (%)	
T1-T2	3(1.57)	-----	-----	3(1.02)
T2-T3	5(2.61)	-----	2(2.04)	7(2.39)
T3-T4	2(1.04)	-----	4(4.08)	6(2.05)
T4-T5	8(4.12)	-----	8 (8.16)	16(5.47)
T5-T6	9(4.71)	-----	11(11.22)	20(6.84)
T6-T7	13(6.81)	-----	10(10.2)	24(8.21)
T7-T8	11(5.76)	-----	12(12.24)	23(7.87)
T8-T9	9(4.71)	-----	13(13.26)	22(7.53)
T9-T10	13(6.81)	1 (33.33)	7(7.14)	21(7.19)
T10-T11	8(4.18)	-----	9(9.18)	17(5.82)
T11-T12	14(7.33)	-----	8(8.16)	22(7.53)
T12	96(50.26)	2 (66.66)	14(14.28)	111 (38.35)
Ratio Traumatic: Non-Traumatic			191:101 = 1.89:1	

Most common fractured vertebra in the lumbar spine was L1 vertebra (87 patients, 50.58%). Maximum incidence for pott's disease was observed at L1-L3 vertebral levels. Metastasis was seen at L3-L4 and L5 vertebral levels (Table 3).

Table 3: Level and Mechanism of injury in patients with Lumbar Spinal Cord Injury

Level Of Injury	Traumatic (n=172) No. (%)	Non-traumatic (n=20) No. (%)		Total (n=192) No. (%)
	Fracture (n=172) No. (%)	Metastasis (n=05) No. (%)	Pott's /Caries spine (n=15) No. (%)	
L1-L2	87(50.58)	-	6 (40)	93 (48.43)
L2-L3	46(26.74)	-	5(33.33)	51 (26.56)
L3-L4	14(8.13)	2(40)	-	16(8.33)
L4-L5	20(11.62)	-	1(6.66)	21 (10.93)
L5	4(2.33)	3(60)	3(20)	10(5.21)
Sacral	1(0.58)	-	-	1(0.52)
Ratio Traumatic: Non-Traumatic			172:20=8.6:1	

5. DISCUSSION

Spinal cord injury has a profound social and economic burden on individuals, their families and the society. Spinal cord injury persons themselves as well as their families have to face multifaceted difficulties post injury as sometimes the injured person is the only income producer for the family and the whole family has to suffer through the expenses of hospitalization of the patient and his ongoing care. Precise information about the incidence and epidemiology of SCI helps not only in planning of resources but also in proper treatment and management.[6-8] Thereby, it is necessary to understand the epidemiology of spinal cord injury to determine the modifiable risk factors for disseminating information to masses, training paramedical staffs in rural areas about handling and transportation of patients and for the rehabilitation of these patients. The present study incorporates the incidence of both T-SCI and NT-SCI at various vertebral levels of injury. It may not be a true representation of epidemiology of all spinal injuries in society, as it is restricted to only one institute but it can best be taken as the trend, as the Paraplegia ward, PGIMS Rohtak, is the single tertiary care government rehabilitation unit being set up for SCI treatment at Pt.B.D.S., University of Health Sciences, Rohtak, which is the only government healthcare university of Haryana.

5.1 Age, Rural –Urban Distribution, Male: Female Ratio In Patients With T-SCI

Amongst the five hundred and thirty-eight patients of T-SCI, the most prevalent age group was 20-29, closely followed by age group 30-39 and 40-49 and this could be explained on basis of higher incidence of T-SCI in the young, active and productive population of the society. The age distribution of patients observed in the present study is comparable with other studies from India[5,7,8,9]and developing nations[6]. The mean age of incident cases of SCI patients in the geriatric population has comparatively increased in developed countries, possibly due to better healthcare facilities, increased life expectancies and a higher mean age of population.The young adults constitute the prime earning

population of society and they are the one who are at utmost risk on account of their occupation. The prime earning age in which the individuals are rendered completely disabled, strongly encourages the formulation and implementation of rehabilitation strategies for the forerunners of the society, as they are the ones who are at utmost risk on account of their occupation. [6,9] The rural-urban ratio of T-SCI was 3.05:1, in the present study is in accordance with the ratio of 1.3:1, quoted by another study[9] on Indian population. This center receives patients from both rural as well as urban populations. The ratio of 1.3:1 as observed in another Indian study[9] could be due to the reason that in this study there is larger coverage of urban population rather than rural one. Previous studies conducted in Indiaand other developing countries[6-9], have reported that the percentage of men affected due to T-SCI was more than that of women. Comparable results were found in the present study with a male: female ratio of 2.71:1 in the T-SCI group. The male: female ratio is higher in developing countries compared to the developed ones. This could be due to the fact that in developing countries male members of the family are more exposed to risk factors being the sole breadwinner of the family and females in developing countries are mostly engaged in household work[6,8,9] .Previous study carried out in the same institution 16 years ago[8] on patients with T-SCI, observed male: female ratio as 2.96:1 and suggested that gender distribution in traumatic SCI reflects changing face of social and cultural norms of the society, where females are also actively participating in outgoing activities. This is clearly evident from the decrease in the male: female ratio in the present study to 2.71:1.

5.2 Age, Rural –Urban Distribution, Male: Female Ratio In Patients With NT-SCI

The main cause of NT-SCI in our study was Pott's disease followed by metastasis. The most prevalent age group for NT-SCI caused by Pott's disease was 30-39, closely followed by the age group 20-29 and 40-49. There was no specific gender predilection in patients classified with pott's disease, with male:female male: Female ratio to be 1.11:1. Results of the present study are supported by the study of Hoque et al[11] , who also stated pott's disease to be the primary cause of NT-SCI followed by metastasis, both prevalent in the age group of 10-40 years. Previous studies on Indian population by Razdanet al[3] and Gupta et al[4], have also quoted Pott's disease as a common condition leading to NT-SCI. Findings by Rauf F et al[10]are also in accordance with results of our study, who stated that no specific gender predilection was seen for pott's disease and about 90% of patients were below the age of 40 years with young males belonging to the age group 20–29 years being the most affected. The possible reason for higher prevalence of NT-SCI in young adults in our study due to Pott's disease may be because in developing countries such as India which are endemic to tuberculosis, spinal tuberculosis is the most common form of skeletal tuberculosis. It is one of the main pathologies seen in spinal and general orthopedic units with higher prevalence in children and young adults.[12]

5.3 Distribution Of T-SCI and NT-SCI

The higher incidence of T-SCI as compared to NT-SCI as seen in our study has also been observed in previous studies from India [7], Australia[4] and Bangladesh.[11] In our study, injuries were more evenly distributed among cervical (26.84%), thoracic (27.30%), thoraco-lumbar (16.74%) and lumbar (29.10%) vertebral levels against injuries at the cervical spine (36.2%), thoracic spine (34.3%) and at lumbar spine (29.5%), in a previous study conducted on Indian[7] and Bangladesh[11] population. The possible reason for differences seen in injury patterns could be attributed to the fact that the present study had included more than three times the number of patients as compared to the previous studies. The incidence of T-SCI, observed at various vertebral levels including cervical (26.39%), thoracic (12.22%), thoraco-lumbar (16.59%) and lumbar (25.94%) was in accordance with results of previous studies conducted on Indian population[9] and in other developing countries including Afghanistan, Bangladesh, Brazil, Iran, Jordan, South Africa and Turkey[6]. These studies have also reported higher incidence of thoracic and lumbar/sacral injuries than cervical injuries. Also, the present study has uniformly described all the vertebral levels including cervical, thoracic, thoraco-lumbar and lumbar. The possible reason for higher percentage of injuries at thoracic and lumbar vertebral levels than cervical level in the present study could be due to lower mean age of T-SCI (percentage of persons with tetraplegia increases rapidly after the age of 46 years) [9] and higher percentage of rural than urban population in our study (the rural areas in India are not well equipped with comprehensive trauma care and patients face difficulties to get timely medical aid and hospitalization.[13]Fall from height has been rated highest amongst the etiological factors leading to T-SCI in a previous study from the same institution by Singh et al[8] and in all other Indian series.[8,9] Preferential thoraco-lumbar and lumbar injuries are sustained in fall from height because of anatomical reasons. The dorsal spine is fixed and less mobile due to its attachment with the rib cage, whereas the lumbar spine is a very mobile portion of spine. The sudden transition during fall, from fixed to mobile portion makes the dorsolumbar area a precarious site for injury. Fracture was the sole cause of injury at thoracic, thoraco-lumbar and lumbar vertebral levels of injury. However, in patients with cervical spine injury, in addition to fracture, patients also sustained injuries due to subluxation. The possible reason for this could be that the cervical spine is the most mobile portion of the spinal column and a cervical vertebra can be placed in an extreme position of hyperflexion or hyperextension during buckling, even though the head and neck complex is not yet experiencing observable motion.[14] Pott's / Caries spine disease was the primary cause of NT-SCI with maximum involvement at the thoracic and thoraco-lumbar levels, followed by lumbar and cervical spine levels. Rauf et al[10] also stated similar findings that the most common site of involvement was dorsal spine (45%), followed by lumbo-sacral spine (33%), cervical spine (10%) and at multiple levels (12%) . Metastasis was the second most common cause of NT-SCI and was observed only at lumbar, thoracic and thoraco-lumbar vertebral levels [4,11]

~~5.4~~ Vertebral Level In T-SCI

Amongst the total 538 patients with T-SCI, the most common vertebral levels of injury in the present study were T12 (96 patients, 17.84); closely followed by L1 (87 patients, 16.17%) and C5 level (64 patients, 11.89%). The results were in accordance with the findings of previous study from the same institution by Singh et al[8], which also quoted dorsolumbar spine injury to be the most prevalent with L1

and T12 as the most common fractured vertebra followed by cervical spine injury at C5-C6 level. Findings from studies by Chhabra et al [9] and Hoque et al [11] also support results of our study and have quoted T12/L1 and C5 as the most common vertebral levels in T-SCI. Fractures are more common in the cervical spine at C4-C7 segment because the anatomy and flexibility of this segment make it susceptible to trauma and also predispose this site to whiplash type injuries and thereby explain higher occurrence of not only fractures but also subluxation and dislocation in cervical spine, in comparison to thoracic/ lumbar segments where there is higher frequency of fractures and same results have been observed in present study.[14]

Fractures of the thoracolumbar junction (T10-L2) are the most common injuries of the vertebral column because it is uniquely positioned in between the rigid thoracic spine and the mobile lumbar spine. This transition from the less mobile thoracic spine with its associated ribs and sternum to the more dynamic lumbar spine, subjects the thoracolumbar region to significant biomechanical stress and a precarious site for injury.[8]

5.5 Vertebral Level In NT-SCI

Pott's/Caries spine disease was the primary cause of NT-SCI with maximum involvement at thoracic and thoraco-lumbar levels followed by lumbar and cervical spine levels, which is in corroboration to findings of previous studies.[15] Most commonly involved vertebra in the present study in thoracic spine was T12 followed by lower thoracic segment T5-T11 and upper lumbar segment L1-L3. HoqueM et al[10] also quoted that Pott's disease was responsible for lesions between T7 ± T12 and there were no cases of cervical tuberculosis disease. Rauf et al[10] also stated similar findings that the most common site of involvement was dorsal spine (45%), followed by lumbo-sacral spine (33%), cervical spine (10%) and at multiple levels (12%). Metastasis was second most common cause of NT-SCI in our study and was observed only at lumbar, thoracic and thoraco-lumbar vertebral levels, in corroboration to findings of other studies.[4, 11]

6. CONCLUSION

To the best of our knowledge this is the first study from India, the country that has analyzed in-depth the spinal cord injury patterns associated with traumatic and non-traumatic SCI. The demographics of spinal cord injuries of both traumatic and non-traumatic variety in India differ significantly from that in other developed countries. In T-SCI, the prevalence rate is high in young adults, there is a higher percentage of males and injury predominates in rural distribution. The lower percentage of cervical injuries and preponderance of thoracolumbar injuries probably reflects the need to establish comprehensive rural healthcare facilities, proper services for first aid and prehospital care and initiatives for establishing rehabilitation units for persons with cervical spine injury. In NT-SCI, the primary cause is pott's disease with higher prevalence in young adults as compared to the developed nations where NT-SCI is seen in older age groups and tumors are the main etiology. These findings suggest that there is an urgent need to take definitive measures to completely eradicate tuberculosis.

7. AUTHOR CONTRIBUTION STATMENT

Ms. GitanjaliSikka conceptualized and gathered the data with regard to this work. Dr. JoginderYadav, Dr. Roop Singh and Dr. Sonia Pawaria have contributed to the study conception, design and necessary inputs were given towards the designing of the manuscript. All authors discussed the methodology and results and contributed to the final manuscript. All authors read and approved the final manuscript.

8. CONFLICT OF INTEREST

Conflict of interest declared none.

9. REFERENCES

1. Amanat M, Vaccaro AR, Salehi M, Rahimi-Movaghar V. Neurological conditions associated with spinal cord injury. Informatics in Medicine Unlocked 2019; Volume 16,100245. https://doi.org/10.1016/j.imu.2019.100245.
2. Rehabilitation Council of India. Spinal Cord Injury.Available from: http://www.rehabcouncil.nic.in/writereaddata/spinal.pdf(last accessed on 20th February, 2020)
3. New P, Farry A, Baxter D, Noonan VK. Prevalence of non-traumatic spinal cord injury in Victoria, Australia. Spinal Cord 2013; 51:99–102. https://doi.org/10.1038/sc.2012.61.
4. Gupta A, Taly AB, Srivastava A, Murali T. Non-traumatic spinal cord lesions: epidemiology, complications, neurological and functional outcome of rehabilitation. Spinal Cord2009; 47:307–311.https://doi.org/10.1038/sc.2008.123
5. Mathur N, Jain S, Kumar N, Srivastava A, Purohit N, Patni A. Spinal Cord Injury: Scenario in an Indian State. Spinal Cord 2015; 53:349-352. https://doi.org/10.1038/sc.2014.153
6. Rahimi-Movaghar V, Sayyah MK, Akbari H, Khorramirouz R, Rasouli MR &Moradi-Lakeh M et al. Epidemiology of Traumatic Spinal Cord Injury in Developing Countries: A Systematic Review. Neuroepidemiology 2013; 41(2):65-85. https://www.karger.com/?DOI=10.1159/000350710.
7. Agarwal P, UpadhyayP,Raja K. A demographic profile of traumatic and non-traumatic spinal injury cases: a hospital-based study from India. Spinal Cord2007;45:597–602. https://doi.org/10.1038/sj.sc.3102005.
8. Singh R, Sharma SC, Mittal R, Sharma A. Traumatic spinal cord injuries in Haryana: An Epidemiological study. Indian J Community Med2003; 28(4):184–6.
9. Chhabra HS, Arora M. Demographic profile of traumatic spinal cord injuries admitted at Indian Spinal Injuries Centre with special emphasis on mode of injury: a retrospective study. Spinal Cord 2012;50:745–754. https://doi.org/10.1038/sc.2012.45.
10. Rauf F, Chaudhry UR, Atif M, urRahaman M. Spinal tuberculosis: Our experience and a review of imaging

methods. Neuroradiol J 2015 Oct;28(5):498-503. https://doi.org/10.1177/1971400915609874.
11. Hoque MF, Grangeon C, Reed K. Spinal cord lesions in Bangladesh: an epidemiological study 1994-1995. Spinal Cord 1999;37:858-861. https://doi.org/10.1038/sj.sc.3100938.
12. Garg RK, Somvanshi DS. Spinal tuberculosis: a review. J Spinal Cord Med 2011;34(5):440-54. https://doi.org/10.1179/2045772311Y.0000000023.
13. Sharma DC.India still struggles with rural doctor shortages. Lancet 2015 Dec12; 386(10011):2381-2. https://doi.org/10.1016/S0140-6736(15)01231-3.
14. Swartz EE, Floyd RT, Cendoma M. Cervical spine functional anatomy and the biomechanics of injury due to compressive loading. J Athl Train 2005 Jul-Sep;40(3):155-61.
15. Rajasekaran S, Soundararajan DCR, Shetty AP, Kanna RM. Spinal Tuberculosis: Current Concepts. Global Spine J 2018 Dec;8(4Suppl):96S-108S. https://doi.org/10.1177/2192568218769053.