

## Spectrum of Different Spinal Disorders Presenting to Neurosurgical Department of Public Sector Tertiary Care Hospitals of Peshawar

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### ABSTRACT

**Objectives:** To assess the spectrum of different spinal disorders presenting to the Neurosurgical department of public sector tertiary care hospitals of Peshawar.

**Materials and Methods:** This was a retrospective study carried out in the Neurosurgery departments of two public sector tertiary care hospitals in district Peshawar from January 2012 to December 2018. Our inclusion criteria comprised of all those patients who were having spinal abnormalities irrespective of age and gender, admitted either via emergency or OPD. We excluded those patients who were dead on arrival or whose data was lacking including those who did not do their follow up and those who were not given consent for the study.

**Results:** Out of total 5,579 patients, male to female ratio was 1:1.7. The age range was from 6 days to 78 years. Elective cases were 63.61% (n = 3,549) and emergency were 36.37% (n = 2,030). TSCI were 35.01% (n = 1,953) and NTSCI were 3,626 (n = 64.99%). Out of all patients, 91.03% (n = 5,079) were treated surgically. About 79% (n = 4,406) had a good outcome.

**Conclusion:** We collected data and made a survey of the spectrum of different spinal abnormalities resulting from various etiologies focused over the last 6 years. We found a variety of cases presenting to our departments of neurosurgery. Non traumatic spinal injuries are more frequent as compared to traumatic ones.

**Keywords:** Traumatic spinal injuries, Non traumatic spinal injuries, epidemiology, WHO spinal injury database.

### INTRODUCTION

Spinal cord abnormalities are devastating conditions that results in functional, psychological and social problems. Its incidence is different between different countries across the globe and is estimated at 15-40 cases per million population.<sup>1</sup> It is documented that damage to neural elements in the spinal canal (spinal cord and cauda equina) results in temporary or permanent neurological deficit that arises from different causes including trauma. Spinal cord lesions can result from different causes that is broadly grouped into two categories, (a) traumatic spinal cord

injury (TSCI) and (b) Non traumatic spinal cord injury (NTSCI). TSCI is the commonest type and accounts for the largest proportion of the population.<sup>2</sup> TSCI occurs when an external physical impact occurs, that damages the spinal cord acutely. The major causes of TSCI in developing countries are motor vehicle accidents, falls and assaults, with motor vehicle accidents being on top (41.4%). Complete spinal injuries (56.5%) are more frequent than incomplete spinal injuries (43.5%).<sup>2-4</sup> Non traumatic spinal cord injury (NTSCI) is defined as any spinal cord damage that has not been caused by any external trauma and

results from an acute or chronic disease process. Another term used for NTSCI is spinal cord damage or spinal cord myelopathy. According to the literature major causes of NTSCI include degenerative spine diseases, neoplasms (benign or malignant), infections, congenital and developmental, vascular and autoimmune disorders.<sup>4-8</sup> These NTSCI occurs at any age and its incidence is more than that of TSCI.<sup>9</sup> It may be the case in the developed countries but it is proposed that incidence of NTSCI will increase in coming years due to aging population.<sup>10,11</sup>

Spinal cord injuries have serious physical, social and vocational effects for patients and their families and results in loss of independence and permanent high lifelong mortality rates. Secondly, costs for care of patients with spinal cord damage in much more which highlights the importance of prevention that we can deliver. The development of effective treatment modalities is critically important for those patients in whom we can't prevent spinal cord injuries.<sup>9</sup> Thereby it is important to have an idea about the extent of problem in terms of demographics, etiology and outcome, in order to implement appropriate preventive and treatment strategies.<sup>12</sup>

## MATERIALS AND METHODS

### Study Design

It was a retrospective study conducted at neurosurgery departments of public sector tertiary care hospitals of district Peshawar, KPK province of Pakistan from January 2012 to December 2018. Approval for the study was taken from ethical committee Lady Reading hospital, Peshawar.

### Inclusion Criteria

Our inclusion criteria comprised of all those patients who were having spinal abnormalities irrespective of age and gender, admitted either via. emergency or OPD (including referral cases from other centers/units). Both conservatively and surgically treated patients were included.

### Exclusion Criteria

We excluded those patients who were dead soon after arrival. We also excluded those patients whose data was lacking including those who did not do their follow up and those who did not give consent for the

study.

### Data Collection

The data was collected from hospital database, ward/O.T and emergency registers, patient record files and follow up details. Data was entered in a designed Proforma comprising of patient demographics, type of disease, level of disease, cause of spinal cord injury, treatment modality and outcome of treatment. Three months post treatment outcome was assessed in terms of relief of symptoms, complications and mortality. It was measured as good, satisfactory and poor.

The outcome was measured as "Good", if no complications occurred and the patient became totally free of disease with return of normal routine daily activities. "Satisfactory" outcome was labelled if little relief of symptoms with no complications and routine daily activities of the patient were disturbed. Whereas "Poor" outcome meant if no relief of symptoms or little relief of symptoms occurred along with complications.

### Data Analysis

The data was analyzed using SPSS version 20.

## RESULTS

### Age Incidence

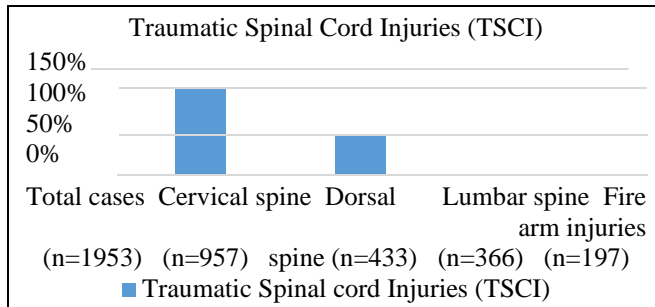
Total number of patients were 5,914. Out of which 335 patient's data was lacking so 5,579 patients were included in the study as per inclusion criteria. The age range was from 6 days to 78 years.

### Gender Distribution

Male patients were 58.82% (n = 3,282) and female were 41.17% (n = 2,297). Male to female ratio was 1.7:1.

### Clinical Presentation

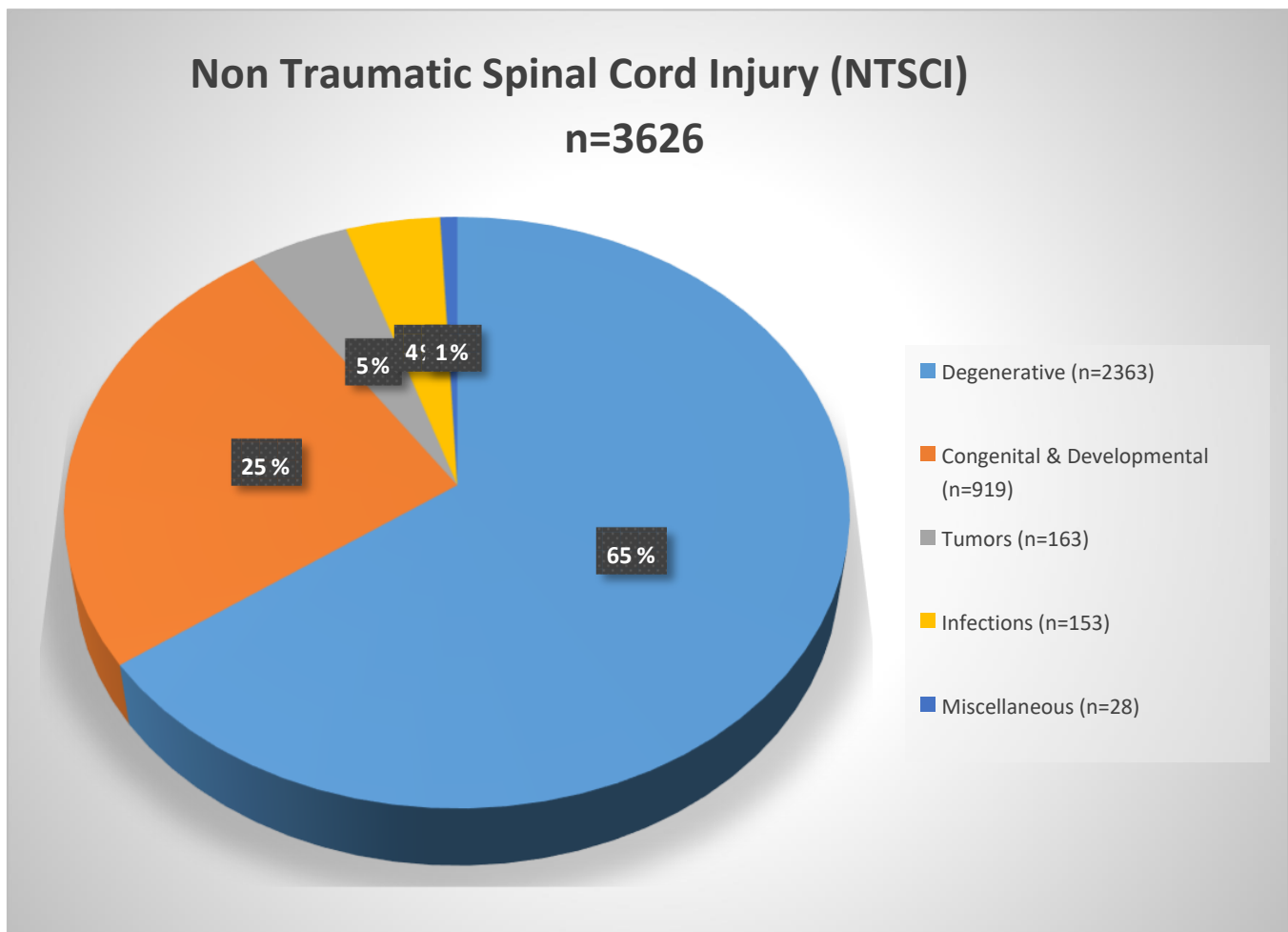
Elective cases were 63.61% (n = 3,549) and emergency were 36.37% (n = 2,030). TSCI were 35.01% (n = 1,953) and NTSCI were 3,626 (n = 64.99%). The proportion of each disease in TSCI group and NTSCI group is shown in graph 1 and graph 2 respectively. The distribution of each disease in each group is shown in tables 1-5. Out of all patients 91.03% (n = 5,079) were treated surgically and 8.96% (n = 500) were treated conservatively.



**Graph 1:** Traumatic Spinal Cord Injuries.

### Outcome

Regarding the outcome, 78.97% (n = 4,406) had a good outcome, 15.27% (n = 852) had satisfactory outcome and 3.06% (n = 171) had poor outcome, while 2.68% (n = 150) died during this study.



**Graph 2:** Non-traumatic Spinal Cord Injury.

**Table 1:** Distribution of Disease.

Total	Cervical Spine		Dorsal Spine		Lumber Spine		
	PIVD	Stenosis/Myelopathy	PIVD	Stenosis/Myelopathy	PIVD	Stenosis	Spondylolisthesis
	357	431	04	07	915	566	83
<b>2363</b>	<b>788</b>		<b>11</b>		<b>1564</b>		

**Table 2:** *Type of Disease.*

Type of Disease	Number Cases of	Total
Meningocele/Myelomeningocele	689	1045
Tethered Cord Syndrome	208	
Arnold Chiari malformation	97	
CVJ bony Anomalies	51	

**Table 3:** *Type of Tumor.*

Type of Tumor	Number of Cases	Percentage
Extradural	48	25.80
Intradural extramedullary	71	38.17
Intramedullary	67	36.02
Total	186	100

**Table 4:** *Cases of Carries Spine and Hydatid Cyst.*

Carries Spine			Hydatid Cyst	Total
Cervical Spine 14	Dorsal Spine 111	Lumbar Spine 47	03	175

**Table 5:** *Complications.*

Type	Number of Cases	Total
Implant Removal	07	32
Displaced Implant/ Implant Repositioning	12	
CSF Leak	13	

**Table 6:** *Outcome.*

Total	Outcome			
	Good	Satisfactory	Poor	Mortality
5,579	78.97% (n=4,406)	15.27% (852)	3.06% (n=171)	2.68% (n=150)

## DISCUSSION

It is important to understand the factors responsible for spinal cord injuries (SCI). These factors are paramount in injury prevention.<sup>13</sup> Literature shows that trauma is responsible for the majority of cases of spinal injuries, but our study shows that non traumatic causes are much more frequent as compared to traumatic ones. Those studies describe the demographic data, causes, neurological deficit, clinical outcomes and disabilities related to traumatic etiologies. The major causes of TSCI are road traffic accidents (RTA) followed by a history of falls and assaults. In a study done in Africa RTAs are responsible for 70% of cases, whereas in Denmark transport related injuries are responsible for 59.6% cases.<sup>13,14</sup> In a study done in Mexico, 41.3% cases were due to road traffic accidents while 30.9% were due to history of falls. In South Asia falls are responsible for 40% of traumatic spinal injuries.<sup>15</sup> A study done by Mathur et al in India found that 53% patients had a history of fall.<sup>16</sup> Assaults, including firearm injuries are the third most common cause responsible for TSCI. A study done in South America showed 16.8% cases of firearm injuries, whereas a Brazilian study showed 42% cases, while it was 25% in a study from Turkey and 21% from Africa.<sup>17,18,13</sup> Other studies from developed countries showed an incidence of 11.7%, 4% and 2% from USA, Europe and Canada respectively.<sup>18-20</sup> According to data from USA National Spinal Cord Injury Statistical Database, NTSCI prevalence is 25-60%.<sup>14,18,19-21</sup> In recent studies the more accurate result is 23%.<sup>22</sup> Male to female ratio is 55% vs. 45% in one study. A study found the average age of 31 years in patients with TSCI. The average age of the patients with NTSCI is more than 30 years in different studies.<sup>22,23</sup> A study in Mexico has shown 45.2 years as the average age of patients with NTSCI. We found the average age of 39.6 years. The male gender is most frequently affected group. Its incidence is 82.17% reported in one study.<sup>15</sup> Such results were shown in other studies as well in which TSCI was higher in males as compared to females. This male to female ratio is a bit more balanced in NTSCI group.<sup>24</sup> A study found NTSCI in the thoracic region (71.3%) more frequently and they attributed this to fact that spinal tumors that compress the cord are mostly found in dorsal spine. As we are concerned only with the spinal diseases, so we found lumber region to be more affected because of higher prevalence of lumber degenerative spinal diseases. We also found more tumor incidence in the dorsal

spine region. Other studies have shown the same results.<sup>21,23-25</sup> Other studies have found more incidence of TSCI as compared to TSCI. A study by Cosar et al found this incidence as 23% vs. 77%.<sup>26</sup> Our results are the same if we exclude the degenerative spinal diseases and congenital spinal diseases below L2 level. Battie et al in his study found that the prevalence of degenerative spine disease ranges from 20-83%.<sup>22</sup> Matsumoto and colleagues found that degenerative spine disease is more frequent in cervical spine (86% in men and 89% in women above the age of 60 years).<sup>27</sup> Hanagai et al and Kanayma et al, found highest prevalence of degenerative spine disease in the lumbar region, 67% and 49.5% respectively.<sup>28, 29</sup> Our findings are consistent with these results. Older age was associated with degenerative spine disease in each region and is more common in the male gender.

A study found 67% spinal cord abnormalities with complicated bony malformations whereas 37% cases had simple abnormalities.<sup>30</sup> 55% of children with congenital bony pathology had associated spinal neural axis abnormality.<sup>31-34</sup> Basu in his study found that incidence of spinal cord abnormalities is highest in cervical and thoracic regions, however they only included patients with hemivertebrae in cervical, thoracic and lumbar region.<sup>30</sup> Another study found 70%, 61% and 54% incidence of congenital spinal abnormality in cervical, lumbar and thoracic regions respectively.<sup>35</sup>

Duong et al in 2012 concluded that incidence rates of benign primary spinal tumors (0.76/100,000) were higher than malignant tumors (0.22/100,000). In children, the incidence of malignant tumors is more as compared to those of adults.<sup>36</sup> In a study done in Croatia, Materljan et al., found the incidence of benign spinal tumors as 1.60/100,000.<sup>37</sup> The hospital based incidence was found to be 0.24/100,000 persons per year in a study in India. Primary malignant spinal cord tumors and vertebral tumors comprised of 32.58%, benign tumors were 67.42%. Mets were present in 16.38% cases.<sup>38</sup>

Spinal tuberculosis is apparently the primary cause of non-traumatic spinal cord lesions in Africa and, together with neoplasms, represents almost half of the causes. Lee found 85% of spinal infections as tuberculous spine infections, whereas in his another study, he reported 70.1% cases of tuberculous spine infections.<sup>39,40</sup> Kim et al found that pyogenic spondylodiscitis is more as compared to Tuberculous spondylodiscitis (62.7% vs. 37.3%).<sup>41</sup> In another study, the pyogenic infection was 78.3% as compared

to tuberculous spine infection (21.7%). The in hospital mortality in studies published on TSCI groups is different in different regions. It is 10.8-34.6% in Africa, 3.1-12.6% in USA, 1.4-3.4% in the Western Pacific (only China) and 1.115.9% in Europe.<sup>42</sup> In adult group the mortality was 23.1%. In another study of two adult NTSCI population, the in hospital deaths varied from 9.6% to 11.4% cases.<sup>43, 44</sup> In our study, the mortality was 2.68%.

## **LIMITATIONS/RECOMMENDATIONS**

The limitation of this study was that data was collected from only two tertiary care hospitals of district Peshawar. So these results are not a true representative of entire province or country. Epidemiological data for spinal injuries are required to increase the allocation of health care related resources in the form of budgeting and establishing separate research units aiming at preventing, treating & rehabilitating and innovative research work for treating these abnormalities. Further research will demonstrate a significant rise in the incidence of SCIs in the coming years. This knowledge can help in healthcare planning in our country.

## **CONCLUSION**

We collected data and made a survey of spectrum of different spinal abnormalities resulting from various etiologies focused over the last 6 years. Scarcity of data, incomplete information and lack of proper standardized classification are obvious hurdles for definite conclusion. Standard registration of spinal cord injuries (SCI) is needed for prevention, treatment and further research work. We found a variety of spinal abnormalities in our study and a lot of burden on public sector tertiary care hospitals. Non traumatic spinal injuries are more frequent as compared to traumatic ones.

## **REFERENCES**

1. Sekhon LH, Fehlings MG. Epidemiology demographics, and pathophysiology of acute spinal cord injury. *Spine*, 2001; 26: S2–12.
2. McKinley WO, Seel RT, Gadi RK, Tewksbury MA. Nontraumatic vs. traumatic spinal cord injury: a rehabilitation outcome comparison. *Am J Phys Med Rehabil*. 2001; 80: 693–699.
3. Majdan M, Brazinova A, Mauritz W. Epidemiology of traumatic spinal cord injuries in Austria 2002-2012. *Eur Spine J*. 2015; 25: 62–73.

4. Löfvenmark I, Norrbrink C, Nilsson-Wikmar L, Hultling C, Chakamdinakira S, Hasselberg M. Traumatic spinal cord injury in Botswana: characteristics, aetiology and mortality. *Spinal Cord*, 2015; 53: 150–154.
5. Wyndaele M, Wyndaele J-J. Incidence, prevalence and epidemiology of spinal cord injury: what learns a worldwide literature survey? *Spinal Cord*, 2006; 44: 523–529.
6. New PW, Cripps RA, Bonne Lee B. Global maps of non-traumatic spinal cord injury epidemiology: towards a living data repository. *Spinal Cord*, 2014; 52: 97–109.
7. New PW, Sundararajan V. Incidence of non-traumatic spinal cord injury in Victoria, Australia: a population based study and literature review. *Spinal Cord*, 2008; 46: 406–411.
8. McKinley MO, Tewksbury MA, Goodbout CJ. Comparison of medical complications following non-traumatic and traumatic spinal cord injury. *J Spinal Cord Med*. 2002; 25: 88–93.
9. Center, N.S.C.I.S. Spinal Cord Injury Facts and Figures at a Glance. *The Journal of Spinal Cord Medicine*, 2014; 37: 117–118. Doi:10.1179/1079026813z.000000000249.
10. Singh, A., Tetreault, L., Kalsi-Ryan, S., Nouri, A. & Fehlings, M. G. Global prevalence and incidence of traumatic spinal cord injury. *Clin Epidemiol*. 2014; 6: 309–331. Doi:10.2147/CLEP.S68889.
11. Chen Y, He Y, De Vivo M. J. Changing Demographics and Injury Profile of New Traumatic Spinal Cord Injuries in the United States, 1972–2014. *Arch Phys Med Rehabil*. 2016; 97: 1610–1619. Doi:10.1016/j.apmr
12. Ibrahim A, Lee KY, Kanoo LL, Tan CH, Hamid MA, Hamedon NM et al. Epidemiology of spinal cord injury in hospital Kuala Lumpur. *Spine*, 2013; 38: 419–424.
13. Fielingsdorf K, Dunn RN. Cervical spine injury outcome—a review of 101 cases treated in a tertiary referral unit. *S Afr Med J*. 2007; 97: 203–207.
14. Bjornshave Noe B, Mikkelsen EM, Hansen RM, Thygesen M, Hagen EM. Incidence of traumatic spinal cord injury in Denmark 1990–2012: a hospital-based study. *Spinal Cord*, 2015; 53: 436–440.
15. Alshahari SS, Cripps RA, Lee BB, Al-Jadid MS. Traumatic spinal cord injury in Saudi Arabia: an epidemiological estimate from Riyadh. *Spinal Cord*, 2012; 50: 882–884.
16. 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.
17. Costacurta ML, Taricco LD, Kobaiyashi ET, Cristante AR. Epidemiological profile of a pediatric population with acquired spinal cord injury from AACD: Sao Paulo/Brazil. *Spinal Cord*, 2010; 48: 118–121.
18. Ones K, Yilmaz E, Beydogan A, Gultekin O, Caglar N. Comparison of functional results in non-traumatic and traumatic spinal cord injury. *Disabil Rehabil*. 2007; 29: 1185–1191.
19. DeVivo MJ, Chen Y. Trends in new injuries prevalent cases, and aging with spinal cord injury. *Arch Phys Med Rehabil*. 2011; 92: 332–338.
20. Scivioletto G, Farchi S, Laurenza L, Molinari M. Traumatic and non-traumatic spinal cord lesions: an Italian comparison of neurological and functional outcomes. *Spinal Cord*, 2011; 49: 391–396.
21. O'Connor P. Incidence and patterns of spinal cord injury in Australia. *Accid Anal Prev*. 2002; 34: 405–415.
22. Battié MC, Videman T, Parent E. Lumbar disc degeneration. Epidemiology and genetic influences. *Spine*, 2004; 29: 2679e90.
23. Celani MG, Spizzichino L, Ricci S, Zampolini M, Franceschini M. Spinal cord injury in Italy: a multicenter retrospective study. *Arch Phys Med Rehabil*. 2001; 82: 589–596.
24. Zárate-Kalfópulos B, Jiménez-González A, Reyes-Sánchez A, Robles-Ortiz R, CabreraAldana E. LM Rosales-Olivarez L. M. Demographic and clinical characteristics of patients with spinal cord injury: a single hospital-based study. *Spinal Cord*, 2016; 54: 1016–1019.
25. Vervoordeldonk JJ, Post MW, New P. Rehabilitation of patients with traumatic spinal cord injury in the Netherlands: etiology, length of stay and functional outcome. *Top Spinal Cord Inj Rehabil*. 2013; 19: 195–201.
26. Cosar SN, Yemisci OU, Oztop P, Cetin N, Sarifakioglu B, Yalbuздag SA et al. Demographic characteristics after traumatic and non-traumatic spinal cord injury: a retrospective comparison study. *Spinal Cord*, 2010; 48: 862–866.
27. Matsumoto M, Fujiwara Y, Suzuki N, Nishi Y, Nakayama M, Yabe Y, et al. MRI of cervical intervertebral discs in asymptomatic subjects. *J Bone Joint Surg Br*. 1998; Vol. 80: 19e24.
28. Hanagai M, Kaneoke K, Kuno S, Hinotsu S, Sakane M, Mamizuka N, et al. Factors associated with lumbar intervertebral disc degeneration in the elderly. *Spine J*. 2008; 8: 732e40.
29. Kanayama M, Togawa D, Takahashi C, Terai T, Hashimoto T. Cross-sectional magnetic resonance imaging study of lumbar disc degeneration in 200 healthy individuals. *J Neurosurg Spine*, 2009; 11: 501e7.
30. Basu P, Elsebaie H, Noordeen M. Congenital spinal deformity: a comprehensive assessment at presentation. *Spine*, 2002; 27 (20): 2255–2259. Doi:10.1097/00007632200210150-00014
31. Nagata K, Yoshimura N, Muraki S, Hashizume H, Ishimoto Y, Yamada H, et al. Prevalence of cervical cord compression and its association with physical performance in a population based cohort in Japan: the Wakayama Spine Study. *Spine*, 2012; 37: 1892e8.

32. Ibrahim A, Lee KY, Kanoo LL, Tan CH, Hamid MA, Hamedon NM et al. Epidemiology of spinal cord injury in hospital Kuala Lumpur. *Spine*, 2013; 38: 419–424.
33. Bjornshave Noe B, Mikkelsen EM, Hansen RM, Thygesen M, Hagen EM. Incidence of traumatic spinal cord injury in Denmark 1990-2012: a hospital-based study. *Spinal Cord*, 2015; 53: 436–440.
34. Fielingsdorf K, Dunn RN. Cervical spine injury outcome—a review of 101 cases treated in a tertiary referral unit. *S Afr Med J*. 2007; 97: 203–207.
35. Trenga A.P, Singla A, Feger M. A, Abel M. F. Patterns of congenital bony spinal deformity and associated neural anomalies on X-ray and magnetic resonance imaging. *J Child Orthop*. 2016; 10: 343–352. Doi:10.1007/s11832-016-0752-6
36. Duong LM, McCarthy BJ, McLendon RE, Dolecek TA, Kruchko C, Douglas LL, et al. Descriptive epidemiology of malignant and nonmalignant primary spinal cord, spinal meninges, and cauda equina tumors, United States, 2004-2007. *Cancer*, 2012; 118: 4220–7.
37. Materljan E, Materljan B, Sepcic J, Tuskan-Mohar L, Zamolo G, Erman-Baldini I. Epidemiology of central nervous system tumors in Labin area, Croatia, 1974-2001. *Croat Med J*. 2004; 45: 206–12.
38. Bhat A. R, Kirmani A. R, Wani M. A, Bhat M. H. Incidence, histopathology, and surgical outcome of tumors of spinal cord, nerve roots, meninges, and vertebral column – Data based on single institutional (Sher-i-Kashmir Institute of Medical Sciences) experience. *J Neurosci Rural Pract*. 2016; 7 (3): 381–391. Doi:10.4103/0976-3147.181489.
39. Lee KS, Doh JW, Bae HG, Yun IG. Primary infections disorders of the spine: report of 40 cases. *J Korean Neurosurg Soc*. 1996; 25: 1655–1660.
40. Lee KY, Sohn SK, Hwang KS. Comparison of pyogenic and tuberculous spondylitis. *J Korean Soc Spine Surg*. 1999; 6: 443–450.
41. Kim HW, Jeong S, Choi S, Youm J, Ha H.G, Yi J. S, Microbiology and Epidemiology of Infectious Spinal Disease. *J Korean Neurosurg Soc*. 2014; 56 (1): 21–27.
42. Chamberlain J. D, Meier S, Mader L, von Groote P, Martin W.G, Brinkhof M. W.G. Mortality and Longevity after a Spinal Cord Injury: Systematic Review and Meta-Analysis. *Neuroepidemiology*, 2015; 44: 182–198. Doi:10.1159/000382079
43. Mak KS, Lee LK, Mak RH, Wang S, Pile-Spellman J, Abraham JL, Prigerson HG, Balboni TA: Incidence and treatment patterns in hospitalizations for malignant spinal cord compression in the United States, 1998–2006. *Int J Radiat Oncol Biol Phys*. 2011; 80: 824–831.
44. New PW, Epi MC: Influence of age and gender on rehabilitation outcomes in non-traumatic spinal cord injury. *J Spinal Cord Med*. 2007; 30: 225–237.

### **Additional Information**

**Disclosures:** Authors report no conflict of interest.

**Ethical Review Board Approval:** The study was conformed to the ethical review board requirements.

**Human Subjects:** Consent was obtained by all patients/participants in this study.

### **Conflicts of Interest:**

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

**Financial Relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

**Other Relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

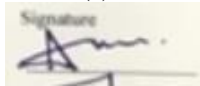
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Sr.#	Author's Full Name	Intellectual/Contribution to Paper in Terms of:	Signature by the author(s) 
1.	<b>Adnan Ahmed</b> (Main/Principal Author).	1. Proposed topics and Basic Study Design, methodology.	
2.	<b>Mohammad Ishaq</b> (2nd Author)	2. Data collection and calculations	
3.	<b>Mumtaz Ali</b> (3rd Author)	3. Analysis of data.	
4.	<b>Musawer Khan</b> (4th Author)	4. Literature review and manuscript writing	
5.	<b>Sohail Ahmad</b> (5th Author)	5. Paper writing	
6.	<b>Syed Nasir Shah</b> (6th Author)	6. Study Design and methodology	
7.	<b>Sajjad Ahmad</b> (7th Author)	7. Interpretation of results	
8.	<b>Mansoor Ahmad</b> (8 <sup>th</sup> Author)	8. Referencing	
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