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ORIGINAL ARTICLE

# The Incidence of traumatic spinal cord injury in Khyber Pukhtunkhwa, Pakistan from 2008 to 2012

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## ABSTRACT

**Background:** Incidence studies of SCI play an important role in planning health care policies. This study gives the incidence of SCI in Khyber Pukhtunkhwa province of Pakistan.

**Objective:** To determine the incidence of Traumatic spinal cord injury in Khyber Pukhtunkhwa, Pakistan from 2008 to 2012

**Methodology:** This study is retrospective descriptive study. The data was collected from three SCI rehabilitation centers of Khyber Pukhtunkhwa. SCI cases were collected from the records of the rehab centers which occurred in KPK between 2008 and 2012. All data was entered in SPSS and was analyzed for finding the incidence rate of SCI, male and female ratio, most common cause, and most frequently injured level, age of patients, complete and incomplete injuries and district wise distribution.

**Results:** Total 1,136 SCI patients were included in the study. The mean incidence on the five years was 10.23 per million people per year. Males were 920 patients (81 %) while females were 216 patients (19 %). Most patients (31.4 %) were at age between 20 to 29 years. Falls from height (35.3 %) was the most common cause of SCI which was followed by RTA (21.5 %) and FAI (21.3 %) respectively. Thoracic (58.2 %) was most common level injured. Complete injuries were 903 (79.5 %) and incomplete were 233 (20.5 %). Most patients were from Peshawar District (15.2 %).

**Conclusion:** Incidence of SCI in KPK was 10.23 per million people per year.

**Keywords:** Traumatic Spinal Cord Injury, Incidence, Khyber Pakhtunkhwa.

## INTRODUCTION

A spinal cord injury (SCI) refers to injury to the spinal cord that is caused by trauma. SCI may be caused by non-traumatic conditions such as tumor, spinal TB etc. [1] These traumas may be because of several causes such road traffic accident (RCT), falls from height, sports related injuries etc. [2, 3]. If the injury is above the 1st thoracic vertebra (T1) it consequences in quadriplegia and all the four limbs paralyze. When the injury is below the 1st thoracic vertebra it consequences in paraplegia and the patient situation can differ from the impairment of lower limb movement, to complete paralysis of the lower limbs. Complete SCI refer to complete loss of function below the injury. Incomplete injury some feeling or movement is still apparent below the level of injury. As division of CNS the function of spinal cord is to transmit inputs from the other CNS division i.e. brain to the other parts of the body. Vertebra surrounds the spinal cord. There are different vertebras which are named on the basis of their location. There are five different types. They are cervical, thoracic, lumbar, sacral and coccyx. The cervical vertebras are located in the neck. The thoracic vertebras are located in the upper back. The lumbar vertebras are present in the lower back. The sacral vertebras are located from pelvis to the last part of the vertebra.[3]

Spinal cord injury (SCI) is a major hardship. The epidemiology of these injuries differs from continent to continent in the world.[4-5] Their incidence is abruptly increasing in developing countries. [6] Over 80% of the SCI reported to a national database in Russia occurred in males.[7] In the United States there are approximately 250,000 persons living with SCI.[8,9] In the USA, the estimated incidence of SCI is about 40 per 1 million people per year.[9,10]

Karamchmetoglu et al reported in their study that the rate of incidence in Istanbul turkey is 21 per million per annum. [11] In 2013 the incidence rate of SCI in developing countries was reported 25.5/million/year. [12]. The incidence rate in Japan in 2011 and 2012 was reported by Katohet al to be

121.4 and 117.1, respectively per million per annum. [13] The incidence of SCI in Russia according to Silberstein during the period of 1989 to 1993 was 29.7 per million population/ year. Maharaj did an observational study for incidence of SCI in period between 1985 and 1994 in Fiji islands. He reported the incidence rate of 18.7. [7] Lenehan et al reported in 2012 that the mean incidence of Traumatic SCI in British Columbia in previous ten years was 35.7 per million per annum.[8] S Knútsdóttir et al reported in 2012 that in Iceland during the period of 2005 to 2009 the incidence was 33.5 per million per annum. [9]. In 2014 B B Lee et al reported that in 2007 the worldwide incidence rate of Traumatic SCI was 23 cases per million.[10]. Martinus et al showed in their study that incidence of SCI in Coimbra Portugal in period between 1989 and 1992 was 25.4 / million population / year.[15]. In 2014 the highest incidence rate was reported 49.1 per million in New Zealand, and the lowest incidence rate was in Spain (8.0 per million) and in Fiji (10.0 per million).[16]. Karaka et al reported that incidence rate in turkey during 1994 was 12.7. [17]. In a systematic review in 2015 it was reported that the incidence of Traumatic SCI lies between 3.6 to 195.4 patients per million around the globe. [18]. Burke et al reported the SCI incidence rate of 27.1 in Kentucky, Indiana State, United States of America. [19] O, commor et al reported in their study that the incidence of SCI in Australia during 1998 and 1999 was 14.5 / million population / year. [20] Noonan V.K et al reported in their study that the incidence rate in Canada in 2010 was 41 per million per million population per year. [21] In a systemic review including articles from 1950 to 2012 The worldwide incidence rate of SCI ranges from 8.0 to 246.0 cases per million per year.[22]

More than 80 % of SCI occurred in males.[23] In Pakistan about 600-700 new classes occurred because of the 2005 earthquake.[24, 25] This is a highest figure which is ever reported in any natural disaster on this earth. The literature on incidence of Traumatic SCI is scarce in Pakistan and only few studies are available.[26,27]

## METHODOLOGY

This study is a retrospective descriptive study. It is an epidemiological study. Researcher collected data from the registers and records of below mentioned rehab center's patients which injured their SC from 2008 to 2012. Researcher collected data of registered SCI patients 2008 to 2012 from the medical records of the Paraplegic Center Hayatabad Peshawar, Rafsan Paraplegic Center, Gulbarg, Sadder Peshawar and Helping Hand Rehabilitation Center (HHRC) Mansehra. Ethical approval for the study was taken from the head of each mentioned SCI rehabilitation cener. Initially the researcher collected data from Rafsan paraplegic center then collected data from Paraplegic Center Hayatabad Peshawar then the researcher visited the HHRC Data Morh, Mansehra. Convenient sampling was used. Persons who do not meet our inclusion criteria were not included in our sample. Total patient were 1,136. All these patients were admitted to the three rehabilitation centers in KPK in duration from 2008 to 2012.

Only those patients are included in the study who injured in period between 2008 and 2012 or who remained alive till admission in the above mention three rehabilitation centers or whose paralysis is only due to traumatic cause. The Cases which resulted in Death were excluded from study because they were not registered with the rehabilitation centers as the researcher collected the data from the medical records of the SCI rehabilitation centers.

Those patients are not included who injured after 2012 or before 2008 or injured outside the Khyber Pukhtunkhwa even he/she belong to KPK or had paralysis due to reasons other than traumatic conditions such as tumor, stroke, spina bifida, cerebral palsy, etc. Similarly those patients are also not included in my study who has acquired paralysis from MS or GBS.

The data was analyzed using SPSS software of version 16.0. All the data was analyzed for mean value and percentage.

## RESULTS

82 patients were admitted to Rafsan Paraplegic center. The most developed and one of the well structured & big SCI rehab center of the country

"Paraplegic Center Hayatabad Peshawar" received the highest number of patients. Out of 1,136 patients of SCI 1021 were registered with Paraplegic center. 33 SCI patients were admitted to HHRC.

Total population KPK in 2012 was 22,000,000. The incidence rate in 2008 was 11per million people per year (242 *1,000,000 / 22,000,000). The rate of incidence of SCI in 2009 was 9.45 per million people per year (208 *1,000,000 / 22,000,000). The rate of incidence of SCI in 2010 was 10.63 per million people per year (234 *1,000,000 / 22,000,000).

**Table1: Incidence of Spinal Cord Injury from 2008 to 2012**

| Year | Incidence (per million people per year) | Frequency | Percentage |
|---|---|---|---|
| 2008 | 11 | 242 | 21.3 % |
| 2009 | 9.45 | 208 | 18.3 % |
| 2010 | 10.63 | 234 | 20.6 % |
| 2011 | 10.36 | 228 | 20.1 % |
| 2012 | 10.18 | 224 | 19.7 % |

The rate of incidence of SCI in 2011 was 10.36 per million people per year (228 *1,000,000 / 22,000,000). The rate of incidence of SCI in 2012 was 10.18 per million people per year (224 *1,000,000 / 22,000,000). The average incidence rate for the five years from 2008 to 2012 was 10.23 per million people per year.

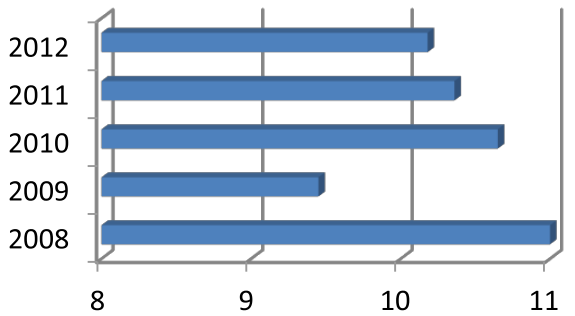


**Figure 1: Year Distribution**

Most patients were at age range from 20 to 29. 357 patients (31.4 %) were at age from 20 to 29. It was followed by age range from 30 to 39 which were 264 patients (23.2 %). Among total 1136 SCI patients from 2008 to 2012 males were more than females. Males were 920 (81.0 %) while females were 216 (19.0 %). The ratio between males/females was 4.25/1. Among the five years from 2008 to 2012 the year 2008 has more new cases of SCI. In 2008 total 242 (21.3 %) new cases occurred. The year in which less new cases occurred was 2009. In 2009 total new cases occurred were 208 (21.3 %).

**Table 2: Gender, Type of injury and Level of Injury**

| Gender | | Type of injury | | Level of injury | | |
|---|---|---|---|---|---|---|
| Male | Female | Complete | Incomplete | Cervical | Thoracic | Lumbar |
| 920 | 216 | 903 | 233 | 254 | 661 | 221 |
| Total = 1136 | | Total = 1136 | | Total = 1136 | | |

**Table 3: Causes of Spinal Cord Injury In KPK from 20018 to 2012**

| Cause | Frequency |
|---|---|
| Fall from height | 401 |
| Road traffic accident | 244 |
| Fire arm injury | 240 |
| Weight fallen over | 137 |
| Natural disaster | 28 |
| Dive in shallow water | 25 |
| Stab wound | 5 |
| others | 56 |
| Total | 1136 |

Thoracic level was the most common level. More than half cases were reported at thoracic level. 661 (58.2 %) cases had injury at thoracic level. Cervical was the second most common level reported i.e. 254 cases (22.4 %). Injury at lumber level was 221 (19.4 %). Cervical level was most commonly reported in patients whose cause of injury was road traffic accidents. Thoracic level was most commonly reported in patients whose cause of injury was fall from height. Falls was mostly reported in patients from hilly areas such as upper dir, lower dir, chitral, swat etc.

## DISCUSSION

In this study the average incidence rate in KPK, Pakistan is 10.23 per million population / year. Karamchmetoglu et al (11) reported the incidence rate in Turkey as 21 per million people / year. In Fiji islands incidence rate of 18.7 is reported. (8) In Jordan it was reported as 18. (10) In Taiwan 18.8 is reported. (9) In Portugal it was reported as 25.4. (15) In Netherlands 10.4 is reported which is about same to that of KPK, Pakistan. (16) The most common cause of SCI in my study is fall from height. Fall as most common cause is also reported by a number of researchers such as M Asad Qureshi et al. (27). Falls was mostly seen in patients from hilly areas such as upper dir, lower dir, chitral, swat etc. Picket et al (28) in Ontario province Canada, Karamehmetoglu et al (11) in Istanbul Turkey and Jagdish C Maharaj (8) in Fiji islands reported falls as the most common cause of the SCI "Road Traffic Accident (RTA)" was the second most common cause of SCI. The same story about RTA as cause of SCI is described by others researchers as well. For example Jagdish C Maharaj (8) in Fiji islands. Dryden et al (29) reported that in Alberta, Canada RTA is the most common cause of SCI. similarly Knotsdottir et al (30) in Iceland reported that RTA was the most common cause and Falls were the second most cause of the SCI.

## CONCLUSION

The unique thing in the researcher study is "fire Arm Injury (FAI) " as the cause of SCI. FAI was the third most common (240 cases, 21.1%) cause of Traumatic SCI following Fall from height and RTA. In almost all the studies which are mentioned and described above, there is no even description of FAI as one of the cause of Traumatic SCI. The main reason of this is the weaponization in tribesmen.

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