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**AN EPIDEMIOLOGICAL STUDY IN SPINAL CORD LESIONS IN  
BANGLADESH**

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## Table of Contents

	<b>Page No</b>
List of Tables	i
List of Figures	ii
List of Abbreviations	iii
Abstract	iv
<b>CHAPTER-I: INTRODUCTION</b>	<b>1-11</b>
1.1 Background	1-7
1.2 Justification of the study	8
1.3 Research Question	9
1.4 Objectives	9
1.5 List of variables	10
1.6 Operational definition	11
<b>CHAPTER-II: LITERATURE REVIEW</b>	<b>12- 29</b>
<b>CHAPTER III: METHODOLOGY</b>	<b>30- 33</b>
3.1 Study design	30
3.2 Study site	30
3.3. Study area	30
3.4. Criteria for selection	30
3.5. Sample size	31
3.6. Data collection method and tools	31
3.7. Ethical Consideration	31-32

	<b>Page No</b>
3.8. Inform Consent	32
3.9. Limitation of the Study	33
<b>CHAPTER -IV: RESULTS</b>	<b>34- 48</b>
<b>CHAPTER- V: DISCUSSION</b>	<b>49- 51</b>
<b>CHAPTER -VII: RECOMENDATION ANDCONCLUSION</b>	<b>52-53</b>
<b>References</b>	<b>54- 65</b>
<b>Questionnaire</b>	<b>66-72</b>
<b>Appendixes</b>	<b>v-xiv</b>
Appendix – A: Institutional Review Board (IRB) Letter	v
Appendix – B: CRP EC Permission Letter	vi-vii
Appendix - C: Questionnaire	viii-xiv

<b>List of Tables</b>
-----------------------

<b>Table No</b>	<b>Description</b>	<b>Page No</b>
Table 1	Association between Age and Gender	34
Table 2	Association between Different Diagnosis and Gender of the Participants	37
Table 3	Association between outcome and Gender of the Participants	41
Table 4	Association between pressure ulcer and Gender of the Participants	48
Table 5	Association between pressure ulcer and type of injury of the Participants	48

## List of Figures

<b>Figure No</b>	<b>Description</b>	<b>Page No</b>
Figure 1	Geographical distribution of the participants in division wise	35
Figure 2	Traumatic and Non – Traumatic Participants	36
Figure 3	Traumatic and Non – Traumatic Participants	37
Figure 4	Causes of Non – Traumatic Participants	38
Figure 5	Causes of Traumatic Spinal Cord Injury	39
Figure 6	Outcome of the Spinal Cord Lesion	40
Figure 7	Skeletal Level of Spinal Cord Lesion in level wise	42
Figure 8	Skeletal Level of Spinal Cord Lesion in individual level	43
Figure 9	AIS Impairment Scale during Discharge	44
Figure 10	Neurological Level of Spinal Cord Lesion in level wise	45
Figure 11	Neurological Level of Spinal Cord Lesion in individual level	46
Figure 12	Pressure Ulcer during admission	47



## List of Abbreviations

ASIA	American Spinal Injury Association
AIS	American Spinal Injury Association Impairment Scale (AIS)
BHPI	Bangladesh Health Professions Institute
BMRC	Bangladesh Medical & Research Council
CRP	Centre for the Rehabilitation of the Paralysed
CRPEC	Centre for the Rehabilitation of the Paralysed Ethics Committee
DOR	Discharge On Request
DORB	Discharge On Request Bond
IRB	Institutional Review Board
JMSOP	Japanese Medical Society of Paraplegia
SCI	Spinal Cord Injury
SCL	Spinal Cord Lesion
SPSS	Statistical Package for Social Sciences
SwiSCI	Swiss Spinal Cord Injury
TSCI	Traumatic Spinal Cord Injury
NTSCI	Non-Traumatic Spinal Cord Injuries
USD	United States Dollars

## Abstract

**Purpose:** To find out the cause and characteristics of spinal cord lesions and thus to allow prevention and control programs to be developed. **Objectives:** The aims of this study were to find out the socio-demography information, traumatic and non-traumatic causes of spinal cord and possible preventive measure for the SCI patients. **Methodology:** The study design was cross sectional. The sample size was 394 and data were collected from the hospital record of Centre for the Rehabilitation of the Paralyzed (CRP) in Bangladesh which is the largest spinal cord injury rehabilitation centre in South Asia. Data was collected by a standard questionnaire and it was analyzed by SPSS software version 16.0. **Results:** Among 394 spinal cord lesion patients, most of the patients were young. The mean age of the participants was 34.4 ( $\pm 14.7$ ) year. Male and female ration was 8:1. . About 97 % (n=386) was traumatic while rest of the participants 3% (n=8) was non – traumatic spinal cord lesion. Around 51% (n=196) of the participants causes were fall from height and road traffic accident was the second most common cause of injury about 27% (n=103) . Time gap between date of injury and date of admission was from first day to 6 years. The mean of hospital stay was 138 ( $\pm 71.7$ ) days which indicate that for doing successful rehabilitation in a specialized rehabilitation centre it takes 5 months to hospital stay. The maximum days are 542 which indicate upto 1 year and 6 months. Most of the participants did not have pressure ulcer during their admission at the Centre for the Rehabilitation of the Paralyzed (CRP) that was about 69% (n=273) which rest of the participants had pressure ulcer that is 31% (n=123). **Conclusion:** From the study it can be concluded that most of the participants were young age group at their productive life. So they cannot take part to the livelihood of their family rather than they become burden of the society. The study may help to provide awareness among the people of Bangladesh. And also express the vulnerable cause, occupation which is responsible for the spinal cord injury. So SCI can be reduced through taking preventative measure.

### 1.1 Background

Prevention is better than cure which is more applicable for the spinal cord lesion as the loss of spinal cord functions following spinal cord lesion there was still a very long way to go to restore the functional activities. Spinal trauma which could have been prevented, this is the result of spinal cord injuries. The Japanese Medical Society of Paraplegia (JMSOP) which is the prevention Committee conducted the first nationwide epidemiological survey in Japan in order to obtain basic data to organize a prevention campaign for SCI and spinal injuries (Shingu et al., 1994). Ning et al., (2012) suggested that Traumatic spinal cord injury (TSCI) is one of the most devastating types of injury, and it results in varying degrees of paralysis, sensory loss, and bladder/bowel dysfunction. The effects of TSCI are not limited to an individual's health; it also creates an enormous financial burden for families and society at large. As there is no cure for TSCI, prevention is critical. A thorough epidemiological understanding is vital for implementing preventative measures and planning clinical services. Yang et al., (2014) shows that the epidemiological characteristics of SCIs obviously vary in different countries, in regions with different economic levels or in different economic periods. The mean age of the SCI patient in developed countries is higher than in developing countries over the same time period; the reason may be related to the aging of the populations in developed countries and/or to the larger male-to-female ratio in developing countries in relation to developed countries In a spinal cord injury (SCI), the structures and functions of the spinal cord are damaged by trauma, inflammation, tumors or other causes, resulting

in dysfunction of motion, feeling, sphincters and autonomic nerves below the damaged plane. A SCI is a highly disabling and deadly injury. Based on their etiology, SCIs can be divided into two different groups: traumatic spinal cord injuries (TSCI) and non-traumatic spinal cord injuries (NTSCI).

Sharif-Alhoseini and Rahimi-Movaghar (2014) in their recent research paper found that traumatic spinal cord injury (TSCI) can lead to varying degrees of motor, sensory, and/or autonomic deficits. TSCI causes high mortality, severe disability, expensive cure, extensive rehabilitation, and a high economic burden. Since there has been no definite treatment for TSCI, prevention efforts are important. Therefore, it is necessary to determine the epidemiological features, causes and circumstances that result in injury for developing preventive strategies. Chhabra and Arora (2012) suggest that the importance of epidemiological studies in planning prevention strategies as well as clinical and community services for persons with spinal cord injury (SCI) is well established. Epidemiology of a particular ailment is linked to social, environmental, cultural and biological issues and thus varies from region to region.

Yilmaz and Kaptano lu (2015) shows that the incidence of acute SCI has been reported as 15 to 40 in a million in the world. The common causes of SCI are motor vehicle accidents, sport injuries, work-related accidents, assaults and falls. It is more common in young men. Thompson et al., (2015) in their recent research paper found that the worldwide estimated incidence of T-SCI varies from 10.4 to 83 cases per million, variability being due to regional differences in motor vehicle use and legislation,

developing vs. developed countries. T-SCI typically affects young males and can have a devastating physical and psychological impact. T-SCI leads to decreased quality of life, social participation, and productivity as well as significant financial burden. Costs of T-SCI to society were estimated in 2006 at 9.7 billion United States Dollars (USD) per year in the USA. Epidemiological characteristics of TSCI in Asia in order to increase prevention awareness. In addition, we gave recommendations for future epidemiological studies to improve comparisons with other countries and enriched worldwide epidemiological data regarding this important subject. Traumatic spinal cord injuries (TSCIs) are a rare, albeit oftentimes life-altering condition with long-term physical, psychological, social and financial implications. TSCIs can result in lasting neurologic impairments of all organ systems and body functions below the neurologic lesion level, thereby causing the loss of function, decreased mobility, increased morbidity and reduced life expectancy and quality-of-life. Related to the financial implications of TSCI, one study estimated the lifetime costs for a person injured at 25 years to be 4.6 million US\$ for high tetraplegia, and 2.3 million for paraplegia.

Chamberlain et al. (2015) shows that previous research has also demonstrated the importance of age and sex on incidence and etiology of TSCI, for example the increase in risk for falls with increasing age. To inform targeted public health interventions, policies, and resource management efforts aimed at prevention and improvement in the lives of individuals with TSCI, valid and reliable data on the basic epidemiological characteristics of TSCI (i.e., demographic characteristics, incidence and prevalence) are imperative. Magu et al (2015) found that Spinal trauma occurs with an annual incidence of approx-

imately 15 to 40 cases per million. It commonly results from motor vehicle accident, fall from height, community violence and workplace related injury. The incidence in South Asia is around 21 per million. Trauma to the spine and spinal cord is a potentially devastating injury. The incidence of spinal cord injury (SCI) is more common in young male patients, occurring most frequently in persons between 16 and 40 years of age. Imaging studies are essential to confirm the exact location of the injury, to assess the stability of the spine, and to define the repercussion of the trauma on the diameters of the spinal canal and neural foramina. Kamravan et al (2014) shows that Traumatic spine injuries are the major cause of morbidity and mortality in many countries. In Canada, the average incidence of spinal column injuries (SCI) is about 52.5 cases per million persons per year, whereas in United States this estimation is about 40 cases per million individuals. Traumatic spine injuries can be either spinal column injury (SCI) or spinal cord injury (SI) or both, that result in disability, mortality and imposing heavy financial cost on health care system. Cervical spinal column injury is of greater importance due to concomitant head injury, difficult intubation and the complications such as quadriplegia and paraplegia. An important preventive measure for decreasing this national health problem is to obtain epidemiological data which enables us to identify causes and risk factors associated with SCI and to improve laws and safety guidelines and educate target groups.

Alibai et al., (2015) found that Traumatic spinal cord injury (SCI) is a catastrophic sudden and devastating event associated with high mortality and morbidity and high social and economic burden. In developing countries the age range of traumatic SCI is

18-32 years while in developed countries the age is over 65 years because of aging population. A global-incident rate (2007) is estimated at 23 SCI cases per million (179 312 cases per annum). Regional data are available from North America (40 per million), Western Europe (16 per million) and Australia (15 per million). Extrapolated regional data are available for Asia- Central (25 per million), Asia-South (21 per million), Caribbean (19 per million), Latin America, Andean (19 per million), Latin America, Central (24 per million), Latin America-Southern (25 per million), Sub-Saharan Africa-Central (29 per million), Sub- Saharan Africa-East (21 per million). About 80.7% of all spinal cord injuries are reported in men, but elder women with osteoporosis have a propensity for vertebral fractures from falls with associated SCI.

Groce (1999) shows that the prevalence of SCI at 650–900 per million American epidemiological data approximately rates of adolescents with disabilities range from 108 per 100,000 in Myanmar to 6,726 per 100,000 in Canada. Ning et al, (2011) found that it is one of the most serious injuries that a person can survive. It is probably the most devastating of all the illness that can befall man. Internationally incidence rate for SCI range from 10.4 to 83 case per million of population, with significant difference between different country or region. Paraplegia (2011) found that most spinal cord injuries occur as the result of direct or indirect trauma to the vertebral column. Approximately 10% of these spinal cord injuries occur with no detectable vertebral injury. In 3% to 5% of cases of vertebral injury, however spinal column sustain damage at two or more level that are separated by undamaged vertebrae. The secondary level of injury is often located at the rostral or caudal part of the spine. Multiple, noncontagious vertebral injuries are

associated with severe trauma. They occur most commonly associated with injuries of the upper and middle thoracic spine.

Spinal cord, (2011) found that Spinal column injuries are rarely caused by direct trauma to the vertebrae, most result from that create violent motion of the head or trunk. In Iran according to Chabok, et al (2010) the most common cases of spinal injuries are motor vehicle accidents (52%) and fall (43%) the remainder was caused by falling heavy object on spine (2.4%) and other mechanism (2.4%). According to Divanoglou and Levi, 2009, in Greece, leading cause of spinal cord injury was transportation accident (51%), fall were 37%, iatrogenic 4%, assault 2%, sports related injury include diving in (4%) and other in (2%). Divanoglou and Levi, (2009) shows in Sweden the leading cause o injury was fall occurred in (47%). Transportation accident occurred in (23%), sports injury including diving (17%), iatrogenic in (4%), assault in (4%) and other cause in 3%. According to McCammon and Ethans (2011) Spinal cord injuries (SCI) have diverse non-traumatic and traumatic etiologies with varying degrees of resultant neurological damage. Regardless of the cause and the severity, SCI often results in devastating effects on the injured persons' medical, functional, psychosocial, and financial well-being. Epidemiological SCI studies conducted in Canada and internationally to date have focused on traumatic SCI (TSCI), leaving out non-traumatic causes such as spinal stenosis or neoplasm.

Yilmaz and Kaptano lu (2015) shows that the incidence of traumatic SCI was reported as 12.7in a million in a study conducted in Turkey in 1992. The most common causes of



these injuries are motor vehicle accidents (48.8%), falls (36.5%), cutting injuries (3.3%), gunshot wounds (1.9%) and jumping into the water (1.2%). Male/female ratio has been reported as 2.5:1. The most common causes of non-traumatic SCIs are spinal vascular diseases (25%), tumors (25%), inflammatory diseases (20%) and spinal stenosis (19%).

Thompson et al., (2015) shows that the Canadian age-adjusted incidence of T-SCI is higher for individuals older than 64 years (51.4 cases per million) than for individuals aged between 15 and 64 years (42.4 cases per million), and is variable regionally (24.0–50.9 cases per million in Ontario, 52.5 cases per million in Alberta and 35.7 cases per million in British Columbia). Thompson et al., (2015) shows that The aging of the T-SCI population also impacts the type of neurological injury. Central cord syndrome (CCS) is an incomplete neurological injury that occurs following hyperextension of the cervical spine with a small spinal canal, secondary to other conditions such as spondylosis and cervical stenosis. Affected individuals are typically older and have no overt spinal instability but present a spectrum of neurological injury ranging from mild hand numbness to tetraplegia. The upper limbs are more affected than the lower limbs and hand function impairment is a significant long-term disability.

## **1.2 Justification of the Study**

Injuries and diseases affecting spinal cord are an important health problem in Bangladesh due to high morbidity and mortality rate (Hoque et al. 1999). It is one of the significant causes of physical disability in our country. The number of affecting with spinal cord injury is increasing day by day due lack of awareness and preventative strategies. It affects a large number of individual that create devastating affect on their individual family and the society as well as in whole country. It is a serious condition which can result in significant morbidity and mortality, therefore prevention is paramount importance. For planning of preventive clinical and community service appropriate data are essential. There in only one epidemiological study in Bangladesh that was done by (Hoque et al. 1999). This study will help the researcher to know the recent causes which are responsible for spinal cord injury in Bangladesh and that may facilitate find out possible measure to prevent this injury.

### **1.3 Research question**

What are the characteristics and causes of spinal cord lesion in Bangladesh?

### **1.4 Objectives**

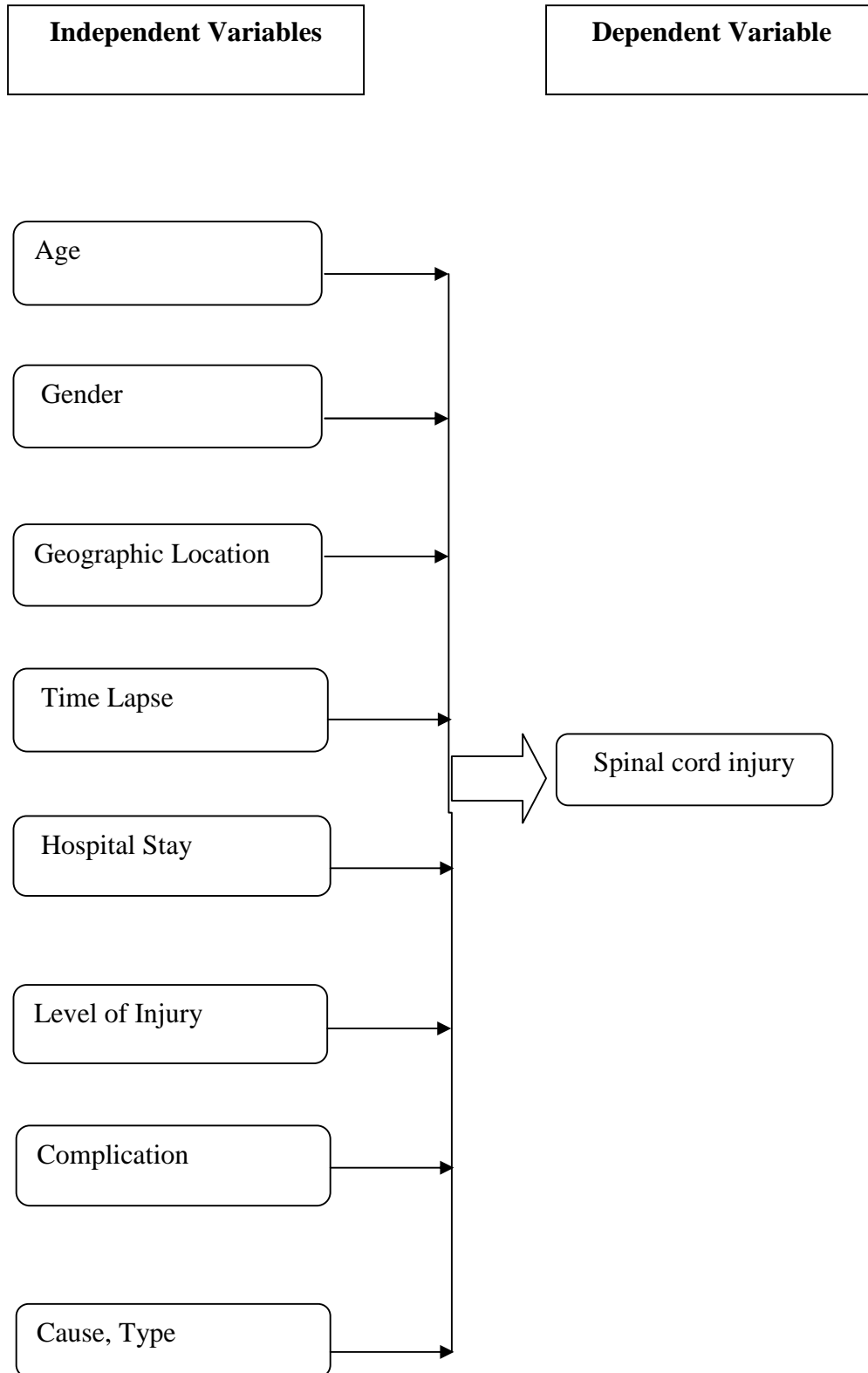
#### **1.4.1 General objective**

- To find out the characteristics, causes, types of spinal cord lesion in Bangladesh.

#### **1.4.2 Specific objective**

- To explore socio-demography information of patient with spinal cord lesion.
- To identify traumatic causes associated with spinal cord lesion.
- To find out non-traumatic causes of spinal cord lesion in Bangladesh.
- To identify the time lapse and length of hospital stay of spinal cord lesion in Bangladesh.
- To find out possible preventive measure for the spinal cord lesion in Bangladesh.

### 1.5 List of Variables



## **1.6 Operational definitions**

### **Epidemiology**

Epidemiology is the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems.

### **Spinal Cord**

Cylindrical mass of nervous tissue running through spinal column.

### **Spinal Cord Lesion**

It is damage to the spinal cord. It may result from direct injury to the cord itself or indirectly from damage to surrounding bones, tissues, or blood vessels.

### **Neurological level**

The most caudal level at which both motor and sensory modalities is intact.

### **Tetraplegia**

Paralysis of the arms, legs, and trunk of the body below the level of an associated injury to the spinal cord.

### **Paraplegia**

Paraplegia describes complete or incomplete paralysis affecting the legs and possibly also the trunk, but not the arms.

### **Complete injury**

Absence of sensory and motor function in the lowest sacral segment.

### **Incomplete injury**

Preservation of motor or sensory function bellows the neurological level of injury that included the lowest sacral segment.

Spinal Cord Injury (SCI) is a major disabling condition often affecting young and healthy individuals around the world (Ackery, et al., 2004). DeVivo, (1997) suggests that each year approximately 10000 persons in the United states incur a spinal cord injury (SCI) requiring hospitalization. Kafadar, et al. (2002) shows that In the United Kingdom annually 10 per 1000000 of the population sustain fractures of the spine which damage the spinal cord and result in either partial or total permanent paralysis . Bromley, I. (1991) suggests that a study in Taiwan found that between July 1992 and June 1996, the observed average annual incidence of spinal cord injury was 18.8 per million populations. Sabre et al., (2013) found that Traumatic spinal cord injury (TSCI) may cause physiological dysfunctions and a range of complications in different body systems. After incurring spinal cord injury (SCI), the individuals' longevity declines significantly. Waters et al., (1991) shows that on the neurological examination by the completeness of the injury the severity of spinal cord trauma is clinically determined. In prognosis associated with recovery the classification of injury which completely assists to the clinician. Those with incomplete injuries have a less favorable recovery potential than patients with complete injuries persisting after the initial acute injury phase. Common two definitions of complete spinal cord injury (SCI) are used in more common. Coppla & Marlin, (2013) found that the leading causes of spinal cord injuries are the auto and motorcycle accidents. In USA a study showed that more than 40 percent spinal cord injuries occur in each year. According to the National Institute of Neurological Disorders and Stroke 1.5 percent of spinal cord injuries resulting from violent encounters, gunshot

and knife wounds. Caused by fall is most common among the old age about 65. One-quarter of spinal cord injuries occurs by falls. About 8 percent of spinal cord injuries occur by the athletic activities, such as impact sports and diving in shallow water. About 1 out of every 4 spinal cord injuries occurs by using of alcohol. Spinal cord injuries also caused by cancer, arthritis, osteoporosis and inflammation of the spinal cord may cause.

Spinal Cord Injury, (2008) found that spinal Cord Injury (SCI) is damage or trauma to the spinal cord that results in a loss or impaired function causing reduced mobility or feeling. Singh, et al. (2003) shows that in India approximately 20 000 new cases of spinal cord injury are added every year. Sabre et al., (2013) found that medical care improves survival, TSCI remains a disease with high mortality rates. The risk of death is the highest during the first two years after the injury. Mortality rate has been approximately three times higher among patients with TSCI than in able-bodied individuals. The death rate has been found to be higher among the elderly, with more counts of comorbidities. Also, the predictors of survival are the neurological level and extent of injury. Country-specific, as well as cross-country studies are desirable to inform relevant health policy for improved primary and secondary prevention and care. The incidence of TSCI in Estonia is one of the highest in Europe with a high number of deaths resulting from injury in general. Therefore, it is crucial to investigate causes of increased mortality after TSCI in order to implement suitable prevention strategies promptly.

Hofstetter (2005) found that worldwide 90 million people suffer from spinal cord injury of varying severity per year. The prevalence of spinal cord injury is not well known in

many countries. The annual incidence of spinal cord injury is 3-5 per 100000 in the USA and 1.5-2 per 100000 in Sweden. Rathore et al., (2007) shows that the epidemiological study in Japan showed that no survivors with complete tetraplegia, mostly paraplegics (89%), a significant pediatric population (17%), predominant female victims (ratio of 1:1.3). Spinal Hub, (2010) found that A person with traumatic or non-traumatic SCI the potential changes are similar regarding their ability to feel, move, control their bladder and bowel and other possible problems. Traumatic SCI are at higher risk than those with non-traumatic SCI. Non-traumatic SCI patients have a better recovery in affected areas and stay for shorter periods in hospital compared with those with a traumatic SCI who have worse prognosis and long durations. A specialized team of health care professionals it is best to have periodic reviews for anyone with SCI. Prevent and treat SCI complications help to achieve the best possible outcomes for health and well-being. Medtronic, (2013) found that 80% of spinal cord injuries occurred in men, 16 to 30— more than half of spinal cord injuries occur in young adults, they are the high risk of Spinal cord injury. Diving into shallow water or playing sports without proper safety gear or precautions, they are in risky. Arthritis, osteoporosis or any other joint disorder are also caused of Spinal cord injury.

Frankel et al., (1998) shows that the literature of an excellent review of and comprehensive study of SCI describes the changes over the past 20 years in survival and causes of death where using data from the US Spinal Cord Injury Model Systems. A population based sample of SCI survivors in Great Britain to examine long-term survival which is the aims of that study, explore trends in cause of death identify and risk factors



contributing to deaths. 50 years of spinal cord injury experience, the investigation which is covering, and the longest follow-up SCI survival study to date. Any results of SCI mortality data were compared with from the United States. Spinal Hub, (2010) shows that acute hospital care is needed after immediately following a SCI where all medical and surgical treatment is completed. After complete acute care, they should be considered for rehabilitation. Rehabilitation care is the most effective for traumatic or non-traumatic events. A research showed that specialist spinal rehabilitation unit has great outcomes for people with a SCI. Specialist rehabilitation unit are better than a general rehabilitation unit. Rabchevsky & Kitzman, (2011) shows that there is no effective pharmacological treatment for acute or chronic SCI manifested in uncontrolled muscle spasms or autonomic dysreflexia. The current drug treatments which aim to be degrade of spasticity and autonomic dysfunction in the chronic SCI population. Usually anti-spastic medications include baclofen, tizanidine, clonidine, benzodiazepine, dantrolene, and cannabis are used to improve autonomic dysreflexia include anti-hypertensive nitrates, nifedipine, and adrenergic blockers. The drugs are used to prevent the secondary complication. The quality of life is degraded of SCI patients who suffer from secondary complications. Onifer et al., (2011) shows that earlier re-training sessions with more repetitions and critical neural circuitry may be necessary to engender a rehabilitation effect. Task-specific rehabilitative training can be employed clinically for the frequent contusive spinal cord injury contusive thoracic SCI requires frequent re-training and initiating the re-training for spontaneous recovery. Furlan et al., (2011) found that the common principal end-point of the trial on treatment of traumatic spinal cord injury (SCI) is the degree of impairment. Motor function and pin-prick and light-touch sensory

function are widely used which is allowed by The American Spinal Injury Association (ASIA).

Islam et al., (2011) shows that Patients who have been suffering from spinal cord injury often face life threatening complications so they need appropriate management and specialized rehabilitation. The patients of SCI are going into the different hospital for the treatment but they do not have enough facilities for their treatment. In Bangladesh there is only one non-government organization is Centre for the Rehabilitation of the Paralyzed, which has conducting a rehabilitation program for the last 32 years through which the patients can improve their life style. New & Sundararajan, (2008) found that in Australia a study showed that most devastating medical conditions are Spinal cord injury (SCI) or damage. In all facets of human functioning and existence it causes life changing consequences. The incidence of Traumatic SCI a recent review reported that worldwide varied between 10-4 and 83 per million per year. About 15–17 cases per million per year over the past decade the age-adjusted incidence rate of TSCI in adults aged 15 years has remained at and older surviving to reach hospital. In currently 11.9 cases per million adults per year is the incidence in Victoria in Australia. Momin (2003) suggest that spinal cord is divided into four sections of cervical (neck), thoracic (trunk), lumbar and sacral. Depending on the level of injury in the spinal cord, a person may become paraplegia or tetraplegia. Paraplegia refers to damage to the spinal cord at the thoracic or lumbar level and the lower part of the body (i.e. two limbs) is paralysed. Ditunno (1992) suggest that with paraplegia, arm functioning is speared but depending on the level of injury the trunk,

legs and pelvic organs may be involved. Momin (2003) suggest that tetraplegia refers to damage to the cervical level such that both the upper and lower parts of the body (i.e. four limbs) are paralysed. Ditunno (1992) shows that tetraplegia results in impairment of function in the arms as well as in the trunk, legs and pelvic organs. Beninato et al.,(2004) shows that the level and severity of injury determine the type and degree of impairments and functional ability. Ditunno (1992) found that if partial preservation of sensory and/ or motor functions is found below the neurological level and includes the lowest sacral segment, the injury is defined as incomplete. Sacral sensation includes sensation at the anal muscocutaneous junction as well as deep anal sensation. The test of motor function is the presence of voluntary contraction of the external anal sphincter upon digital examination. Complete injury is used when there is an absence of sensory and motor function in the lowest sacral segment.

Ahoniemi, et al, (2008) found that In Finland the mean annual incidence for entire population was 13.8/1000 000, person for men 23.8/1000 000 and for women 4.6/1000 000. The external cause of injury was fall 41.2%, traffic in 39.5%, violence in 2.7% and other in 10%. Ning et al, (2011) shows that In china, average incidence rate was 23.7/1000 000 in year from 2004 to 2008. Leading cause of injury was fall (56.9%) which include high and low fall. Next common cause was motor vehicle accident (34.1%). Other cause include 6.3% of being struck by an object, 1.4% of assault 0.8% of work accident and 0.2% was sports related injury. Chen et al., (2013) shows that the cause of spinal cord injury may traumatic or non-traumatic. Auto crash, including jeep, truck and bus, fall: including jumping and being pushed accidentally (not as an act of violence),

gunshot wound motorcycle crash: 2-wheeled, diving, medical/surgical complications: impairment of spinal cord function resulting from adverse effects of medical, surgical or diagnostic procedures and treatment, bicycle, tricycles, Pedestrian, including falling/jumping into the path of a vehicle, auto racing, glider kite, slide, swimming, bungee jumping, scuba diving, lightning, kicked by an animal, machinery accidents, tractor, bulldozer, go-cart, steamroller, train, road grader, forklift, sledding, snow tubing, tobogganing, playing ice hockey, snowboarding. Personal contact, including being hit with a blunt object, falls as a result of being pushed. Football and other penetrating wounds: stabbing, impalement, boat and parachuting, para-sailing, etc gymnastic activities other than trampoline baseball/softball, water skiing, basketball/volleyball, high jump, bomb, grenade, dynamite and gasoline. These are traumatic cause. The non-traumatic cause is spinal tumor, TB spine, transverse myelitis, physical assault, physical weakness etc.

Shin et al., (2013) shows that there are many foreign studies regarding the epidemiology of patients with spinal cord injury (SCI). In the United States, the annual incidence of SCI is approximately 40 cases per million people in the general population. Thus, based on the United States population in 2010, approximately 12,400 new patients experienced SCI each year. Considering the population growth, this number will grow to 13,600 by 2020, and 17,560 by 2050. Singh et al (2003) shows that In united states the number of people in the who are alive in 2009 who have SCI has been estimated to be approximately 262,000 persons, with a range of 231,000 to 311,000 persons where vehicular 41.3%, falls 27.3%, violence 15%, sports 7.9%, other/unknown cause 8.5%

(Spinal Cord Injury Facts and Figures at a Glance 2010). In India the most common cause of injury was fall from height including roof, trees, and electricity pole (44.5%) followed by motor vehicle accidents (34.7%). Falls were more prominent in second and third decades. Roadside accidents were common in third and fourth decade. Hubli & Dietz, (2013) shows that a spinal cord injury (SCI) is a devastating event that, depend on the level and severity. The affected area mark for rehabilitative interventions is the regaining of independence and thus a good quality of life. It is now widely accepted that the central nervous system is able to recover following incomplete SCI with functional training.

Spinal cord injury, Australia, (2006) shows that Cause of spinal cord injury varies from country to country. According to spinal cord injury statistics (2003) annual incidence of spinal cord injury (SCI), not including those who die at the scene of the accident, is approximately 40 cases per million population in the U. S. or approximately 12,000 new cases each year. Here the cause of SCI is RTA 36.8%, falls 41.7%, sharp trauma 2.7%, sports 11.6%, collision/lifting 4.2%, nonspecific trauma 3.3%. In Australia transport related injuries (52%) and falls (29%) accounted for over three-quarters of the 271 cases of traumatic SCI. Cases also occurred during sport and working for income, including travel to and from work. Falling was the most common type of event leading to traumatic SCI at older ages. Farry & Hansen (2010) found that In Canada there are currently 85,556 persons living with spinal cord injury in Canada. Of this total, 51 Percent (43,974 people) were the result of traumatic, and 49 percent from non-traumatic causes. 4,259 new cases per year of SCI in Canada today. Of this total, an estimated 42 percent (1,785 cases) are

the result of traumatic spinal cord injury and 58 percent are from non-traumatic causes. Connor and Murray (2006) found that In Ireland most prominent cause of spinal cord injury was motor vehicle collision (50%). Fall (37%) was the second most causes of injury. 9% was injured during sports or recreational activity. Rowley et al. (1998) shows that Spinal cord injury continues to be major causes of disability throughout Asia. The Disability Services Act 2006 is based on an expanded declaration of the rights of people with a disability. The Act retains the existing rights of people with a disability from the previous legislation, stating: “All people with a disability have the same human rights as other members of society and should be empowered to exercise their rights”. Hoque et al (1999) shows that causes of spinal cord injuries include motor vehicle accidents (44%), acts of violence (24%), falls (22%), sports (two-thirds of these are from diving accidents) (8%), and other (2%). Momin, (2005) found that After spinal injury many people are not immediately treated and a person acquiring a spinal cord injury stays at home and wants to a traditional treatment. So, many people face medical complications such as urine infections and bedsores. In other hand, the other hospital refers the patient to a specialized hospital or medical college hospital or to CRP for further treatment although there are no specialized government hospitals for the treatment and rehabilitation of people with SCL. Most of the patients come from the rural area and their career is also illiterate as a result they cannot know about the lesion of spinal cord. So they think the patient will be recovering by day to day. The patient believes that he will come back his normal life and provide support to his/her family. CRP has enhanced a full and average system to provide services for people with SCL. CRP is all-time ready to play a vital contribution to the rehabilitation of paralyzed people. A social worker or a Community

Based Rehabilitation (CBR) worker visits the patient's home, because after rehabilitation they need some necessary things which they supplied. CRP wants to give the fully support to people with SC, so the people can lead a normal, happy and peaceful life. Spinal Cord Injury (SCI): Fact Sheet, (2006) shows that secondary conditions are a major health issue for people living with spinal cord injury (SCI). Secondary conditions are negative health outcomes that occur as a direct result of a spinal cord injury-related disability. The most common secondary conditions are pressure sores, respiratory complications, urinary tract infections, spasticity, and scoliosis.

Saulino (2009) shows that pressure sores are a major complication associated with spinal cord injury. They occur as a result of excessive pressure, primarily over the bones of the buttock (particularly the ischial tuberosities and the trochanters at the hip). Morbidity during the acute rehabilitation phase (which follows the initial acute hospitalization) includes pressure ulceration, which occurs in about 25% of patients treated in Model Systems centers in the United States. Dawodu (2008), described spinal cord injury (SCI) as an insult to the spinal cord resulting in a change, either temporary or permanent, in its normal motor, sensory, or autonomic function. There are mainly two types of spinal cord injury, complete and incomplete. Complete spinal cord injury is defined as absence of sensory and motor functions in the lowest sacral segments. An over view of complete spinal injury provided by complete spinal cord injury (2011) is that a complete spinal cord lesion is the term used to describe damage to the spinal cord that is absolute. It causes complete and permanent loss of ability to send sensory and motor nerve impulses and, therefore, complete and usually permanent loss of function below the level of the

injury. This will result in complete paraplegia or tetraplegia. According to disability in Bangladesh (2002) the total figure of disability is increasing with population growth and aging. With such a large number of disabled people it is quite possible to achieve national development. But it is a real phenomenon of our society that disabled people are very often deprived of their social opportunity and their rights. National Institute of Neurological Disorders and Stroke, (2010) shows that Most spinal cord injuries affect bladder and bowel functions because the nerves that control the involved organs originate in the segments near the lower termination of the spinal cord and are cut off from brain input. Without coordination from the brain, the muscles of the bladder and urethra can't work together effectively, and urination becomes abnormal.

Groce, (1999) found that Social isolation and discrimination in society is the major and common problem. For the non-disabled majority must be undertaken and legal guarantees time honors and compulsory to improve the lives of those with disabilities, education. People with disabilities with some cultures are more tolerant than others. Believe to be the cause of disability (for example, bad blood, divine displeasure or punishment for actions in a previous life) by the people of a society's attitude towards disability is created in nature. Always such beliefs are not negative. For example, God often gives children with a disability to couples who are able to show them special compassion and care influences the way the surrounding community responds to these children in northern Mexico that the belief. The manner in which families and communities, how people expect individuals with disabilities to contribute to society also shapes respond to children and youth with disabilities. National Institute of Neurological Disorders and



Stroke, (2010) found that More than 80 percent of spinal cord injury patients are men and 55 percent of spinal cord injury victims are between 16 and 30 years old. In this duration of life men are normally engage on the employment as well as contribute the national development of the country. As spinal cord injury needs long period of time for rehabilitation so it may create burden in the community, society as well as the country. Saulino (2009) found that traumatic Spinal cord injury (SCI) is perhaps the most devastating orthopedic injury possible. With prolonged survival being the rule, rehabilitation of these injuries has an increasingly important role. The primary goals of rehabilitation are prevention of secondary complications, maximization of physical functioning, and reintegration into the community. Maharaj, (1996) shows that Long-term disability or death is the cause of Spinal cord injury (SCI). Leading to permanent paralysis by modern man, it is one of the most catastrophic lesions. The Spinal cord injury patients, the victims who are usually young and in their most productive stage of life multiple medical, social and vocational complications affect to them. Spinal cord injury causes burden and suffering not only of the victim but also to their families, to the health care system and to the community. Shingu et al., (1995) found that In Japan from January 1990 to December 1992 a survey of traumatic spinal cord injuries was carried out by a statistical method of the nationwide epidemiological study showed that the incidence was 40.2 per million in the annual report of spinal cord injury. More caudal SCI was 3:1 is the ratio of cervical cord injuries. Spinal Cord Injury Network, (2010) found that treatment begins with the emergency medical personnel who make an initial evaluation and immobilize the patient for transport.

Spinal Cord Injury, (2008) shows that medical rehabilitation needs accurate methods of measuring human function in a reasonable period of time. Saulino, MF. (2009) suggested that Rehabilitation following SCI is most effectively undertaken with a multidisciplinary, team-based approach. Momin (2003) found that According to WHO (1996) “Rehabilitation involves the combined and coordinated use of medical, social, educational and vocational measures for training or retraining the individual to the highest possible level of functional activity”. Brown et al., (2006) showed that It is estimated that in the United States each year there are about 11,000 new cases of spinal cord injury (SCI) and that there are currently about 250,000 persons alive with SCI. Because of improvements in medical care and survival, the prevalence of people living with SCI has increased, and it is predicted that there will be greater and greater numbers of older patients with SCI. Currently the average age at injury is 37.6 years, and about 80% of those affected are male. The racial distribution appears to be changing. Between 1973 and 1979, 76.9% were white and 14.2% were African American. Since 2000, 62.9% of those injured have been white and 22% have been African American. The cause of this apparent trend is unclear, but it may be due to actual race-specific incidence rates rather than changing location of centers collecting data or changing referral patterns to those centers.

According to Robert and Zamzami (2013) Traumatic Spinal Cord Injury (TSCI) is a devastating neurological injury, causing paralysis, sensory loss and sphincter disorder in different degrees and indirectly imposes a significant burden on the health care system. Based upon the location and degree of injury, and irrespective of the advanced medical

management, the probability of death during the pre-hospital as well as the acute phase is still present. In the developed countries, TSCI has been studied in great detail, and several research papers have been published over the last few decades. However, most of the research published considers only a limited section of the world's population. Although research reveals that more than 80% of the world's population is spread across more than 100 developing countries, information regarding TSCI from these countries is still meager. Besides, an established national spinal trauma or Spinal Cord Injury (SCI) registry is lacking among the developing countries. Also, detailed records of population-based data on TSCI are also limited from most of the developing countries. Further complications arise as the majority of the hospitals do not maintain meticulous medical records. Further, most of the data published are surveys from single center hospitals representing fewer than 15 developing countries. The World health Organization (WHO) states that, ten percent of total populations are disabled in Bangladesh, and most of those are physically disabled. With such a large number of disabled people, achieving national development is difficult. But it's the real phenomenon of our society that disabled people are very often deprived of social opportunities and their rights. Disability is contentious issue throughout the world. The twentieth century saw a remarkable change in the understanding of disability, from charity and welfare to right based approach (Momin, 20003). Spinal cord injury is a devastating condition often affecting young and healthy individuals around the world. This debilitating condition not only creates enormous physical and emotional cost to individuals but also is a significant financial burden to society at large (Ackeryet al. 2004). During the First World War, those with spinal cord injuries seldom survived because medical technology was not available to provide

medical treatment. However after the Second World War many people with spinal cord injury in the high resource countries lived longer due to the development of medical technology (Momin 2003).

The incidence of SCI in Ireland is 13.1 per million populations (O'Connor & Murray, 2001). Spinal cord injury are a major public health problem in Bangladesh, The incidence of people with SCI in Bangladesh Six person per million. The high incidence of SCI as a result from falls from a height, and from falling when carrying a heavy weight on the head, can be explained by the mainly agricultural based economy of Bangladesh. The most common age group (10-40 years) of patient reflects the socio-economic conditions of Bangladesh. The male: female ratio (7.5: 1.0) of patients with a spinal cord injury is due to the socio-economic status and to the traditional culture of the society.

The causes of death following SCI have changed. In the past, urinary tract disease and renal failure were leading causes of mortality. At present, renal failure in those with SCI is unusual. The leading cause of death at present is pneumonia, and the risk for a person with SCI far exceeds that for the general population. Non-ischemic heart disease ranks second, and sepsis is third. Michael et al. 2009 conducted a study of persons with chronic SCI monitored in England for many years revealed an annual incidence of 23% for pressure ulceration and 20% for urinary tract infection. Pressure ulcers also were noted to be the most common morbidity in a study of patients monitored in US Model Systems, occurring in 15% of patients during the first year post injury and increasing in subsequent years. Spinal Cord injury necessities a specialized and comprehensive rehabilitation

service. For Prolonged rehabilitation stay, the risk of severe complication, increased burden of care during discharge and loss of productivity of these patients. Therefore, Special effort should be made to improve rehabilitation outcome (Scivoletto G et al. 2003).

Ullah, et al., (2015) shows that spinal cord Injury (SCI) is a public health problem in Bangladesh. A study reviewing 20 manuscripts from 17 countries around the world that focused on the global perspective of SCI epidemiology, found six major categories of causes of SCI: motor vehicles collisions, violence, sports related & aquatic/driving injuries, self-inflicted injuries/suicide attempts and others/ unrecognized etiologies. This study also showed that victims of SCI are predominately young in age and male in gender. The cause of spinal injuries between high income and low income countries are different. However, a recent study on spinal on spinal cord lesions in Bangladesh has shown that 93% of spinal cord lesions are related to trauma related to carrying heavy load on head or fall from height. The major cause of SCI in Bangladesh is related to falls: Falls from a height and falls while carrying heavy load on head. Patients with SCI in Bangladesh are predominately male (more than 80% of all patients), 62%-70% were in the 20-40 years age group, and the mean monthly income of a person with SCI before his/her accident is about US \$60. Other demographic about people who report SCI in Bangladesh include that 84% are from a nuclear family, 65% are married, 54% are illiterate, 50% from agricultural and related labor jobs and 98% from rural area. Chamberlain et al (2015) shows that The Swiss Spinal Cord Injury (SwiSCI) Cohort Study serves as an ideal platform for estimating the burden of TSCI and identifying areas

for prevention purposes, with results generalizable to other epidemiologically similar regions as data coverage is representative of the entire population, and is available by demographic and characteristics specific to spinal cord injuries (SCIs). This investigation aimed to describe etiology, demographic and SCI characteristics of patients receiving first rehabilitation in Switzerland and to calculate annual age- and sex-specific incidence rates of TSCI in Switzerland by demographic and injury characteristics using contemporary data collected in the SwiSCI study.

National Database is overall cumulative survival rate of the entire population is 10 years. The statistical the database of the patients, probability of dying was determined declining somewhat thereafter to be greatest during the first post-injury year (Stover & Fine, 1987). Shin JC et al., (2013) shows that A study in Norway reported that the annual incidence rate of SCI had grown from 6.2 per million in the period between 1952 and 1956 to 26.3 per million in the period between 1997 and 2001. The main reasons reported for the increase were car accidents and falls . Other annual incidence rates of SCI that have been reported include 40.2 per million in Japan from 1990 to 1992, 18.0 per million in Jordan from 1988 to 1993, and 18.8 per million in Taiwan from 1992 to 1996. In the United States, the National Spinal Cord Injury Statistical Center (NSCISC) was established in the 1970s to continuously investigate the epidemiologic changes in SCI. It has reported changes, such as an increase in SCI prevalence among older people and females, and an increase in the percentage of patients with incomplete tetraplegia. Thompson et al., (2015) shows that cost estimates have not addressed CCS specifically, incomplete cervical SCI has been shown to be the most costly of all types of T-SCI (4.78 million USD for incomplete cervical SCI (most) vs. 0.16 million USD for complete lumbar SCI (least)). Due to the aging population and the relatively low-velocity injuries that lead to

CCS, we believe that CCS is an important and increasing subset of T-SCI. In addition, the prognosis of CCS is generally good and differs from that of incomplete T-SCI overall (when adjusted for age). CCS is therefore presented and analyzed separately from T-SCI overall in this study.

**3.1 Study design**

Retrospective cross sectional survey was chosen to meet the study aim as an effective way to collect data. Data were collected from patient record who admitted in hospital in 2014 July to 2015 June.

**3.2 Study site**

Spinal Cord Injury patients discharge from the Center for the rehabilitation of the paralyzed was chosen for the study.

**3.3 Study area**

Spinal cord injury department of the Center for the rehabilitation of the paralyzed.

**3.4 Inclusion and exclusion criteria****3.4.1 Inclusion criteria**

- Patient with spinal cord lesion who were admitted in CRP during July 2014 to June 2015.

**3.4.2 Exclusion criteria**

- Patient with spinal cord lesion who were re-admitted are excluded



### **3.5 Sample size**

In the July 2014 to June 2015 there were 411 spinal cord lesion patients admitted in the Centre for the Rehabilitation of the Paralysed (CRP). Out of 411, 17 patients were re-admitted which are excluded from the study. As the study purpose to find out the epidemiology of spinal cord lesion so finally 394 patients were included in the study as samples size.

### **3.6 Data collection methods and tools**

A structure questionnaire was developed for collecting the data from the hospital record and verify with the patient or his/her next to keen family members if any inaccuracy found in the hospital record.

### **3.7 Ethical Consideration**

The study proposal was initially submitted to the Institutional Review Board (IRB) of the Bangladesh Health Professions Institute (BHPI) for getting permission from the institution. BHPI issued an approval letter for conducting the study. An application was then submitted to the Ethics Committee of the Centre for the Rehabilitation of the Paralysed (CRP) for the ethical permission. After getting permission from the Ethical Committee the study was preceded for further. For this study, the researcher was not interfered with their clients and clinical practice. It was informed that study was conducted for the thesis purposes and it may not be harmful for the participants information. Confidentiality of information was maintained and client code was used to make clients identity invisible. In future new generation of physiotherapy department

maybe benefited from this study. And the Data collection was started and completed within the allocate duration. All information was kept in secure. World Health Organization (WHO) and Bangladesh Medical and Research Council (BMRC) rules were followed to conduct the study.

### **3.8 Inform consent**

Researcher has taken permission from Institutional Review Board (IRB) from the Bangladesh Health Professions Institute (BHPI). After getting the approval from the institute it was submitted to the Centre for the Rehabilitation of the Paralyzed (CRP) Ethic Committee (CRPEC) to get permission. CRPEC review the proposal and approve the study to conduct data collection from the Centre for the Rehabilitation of the Paralyzed (CRP). After completing all the formalities, research start collect data from the hospital record of the CRP SCI nursing unit. Once all the data were collected from the SCI nursing unit it was tabulated to the questionnaire and if there is any confusion then participant's was called to do the validation of the information. The study information only discusses with supervisor but this would not share with any other person. These materials were disposed off after completion of the research project. Participants right and dignity were maintained very strictly.

### **3.9 Limitation of the study –**

- The first limitation of this study was sample representation. The data was taken only in one tertiary level centre.
- As the study conducted only centre so multi-centre data will not accessible in the study.
- Divisional representation was not authentic so that Dhaka divisions population get priority to participate in the study where it is not clear about the population of the rest of the districts especially the peripheral districts.
- As the study was conducted at Centre for the Rehabilitation of the paralyzed (CRP) which may not represent the whole country.

## 4.1 Demographic Information of the Participants

### 4.1.1 Age and Gender

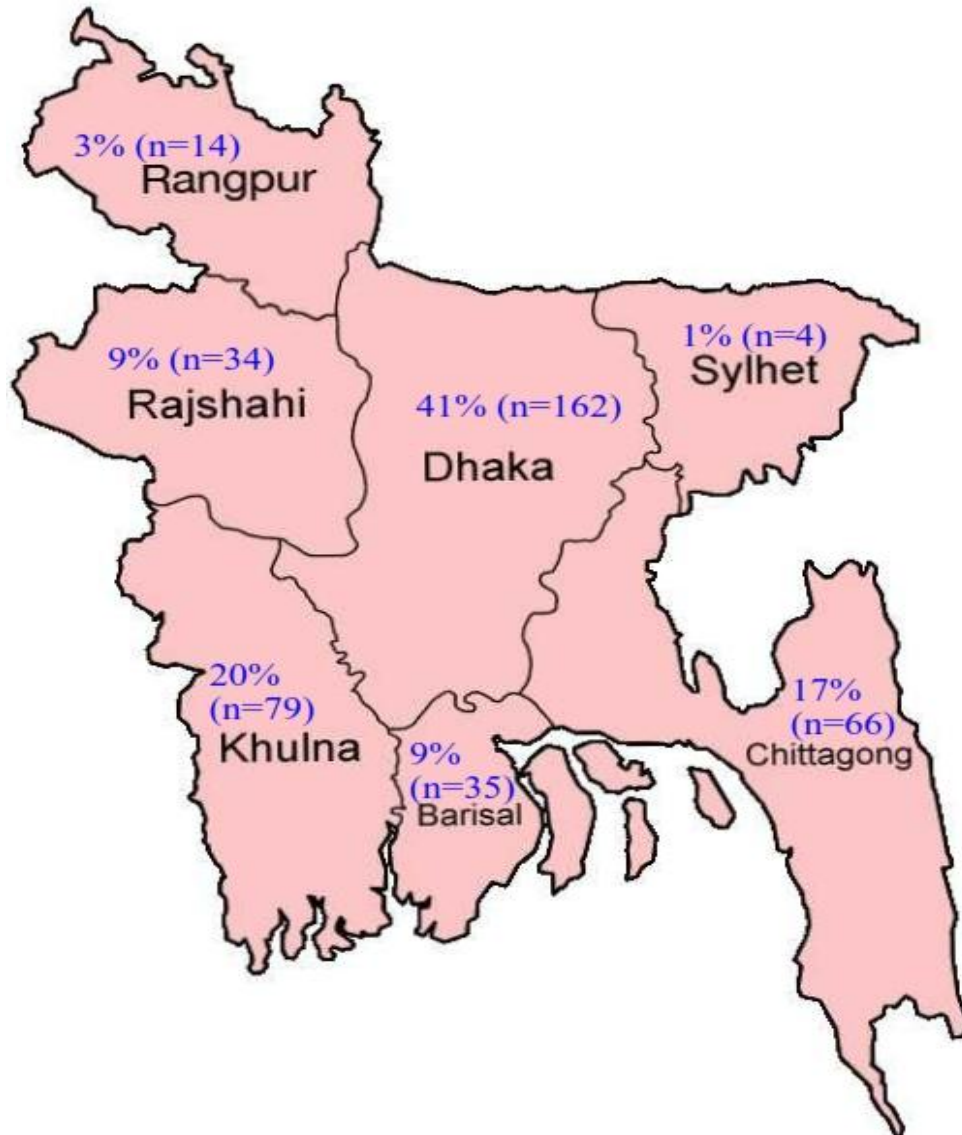
Out of 394 participants, the mean age of the participants was 34.4 ( $\pm 14.7$ ) years, mode and median were 35 years and 35 years respectively. Among all the participants, majority 88% (n=348) were male while rest of the female 12% (n=46). A cross tabulation between age and sex describe in the Table – 1. Male and female ration was 8:1.

	Sex		Total
	Female	Male	
Age	N (%)	N (%)	
40 years	43 (93.5)	240 (69)	283 (71.8)
41 years	3 (6.5)	108 (31)	111 (28.2)
<b>Total</b>	<b>46 (100)</b>	<b>348 (100)</b>	<b>394 (100)</b>

**Table – 1:** Association between Age and Gender

#### 4.1.2 Geographical Distribution of the Participants

Out of 394 participants, majority of the participants 41% (n=162) belongs to the Dhaka division while 20% (n=79) were from the Khulna division. Rest of the participants 17% (n=66), 9% (n=35), 9% (n=34), 3% (n=14) and 1% (n=4) from Chittagong, Barisal, Rajshahi, Rangpur and Sylhet respectively (Figure - 1).

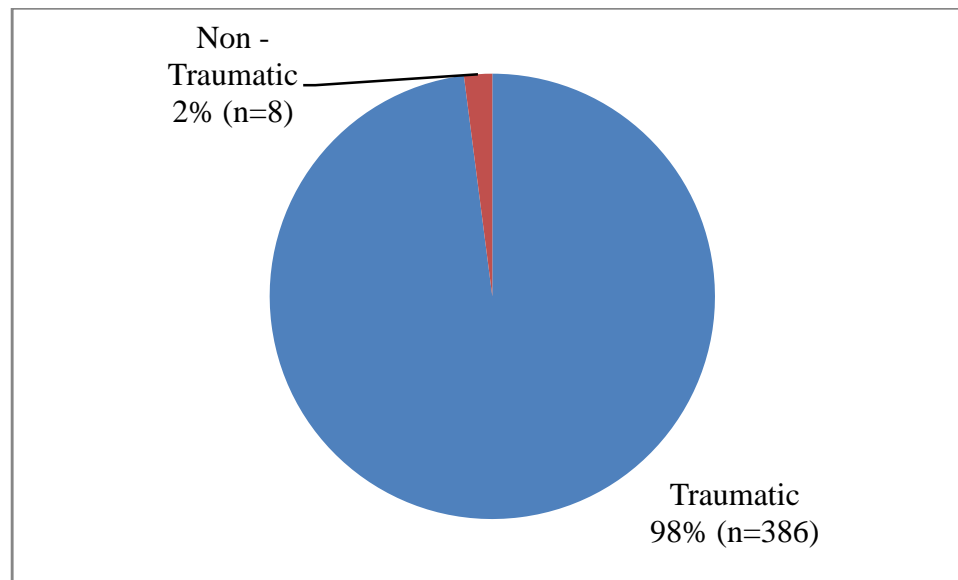


**Figure – 1:** Geographical distribution of the participants in division wise

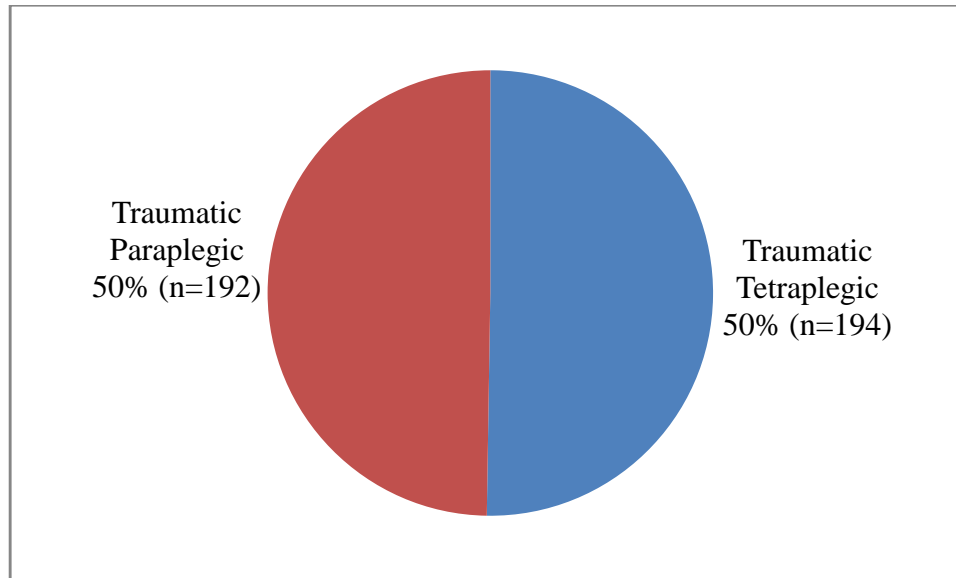
## 4.2 Disease Condition Related Information of the Participants

### 4.2.1. Diagnosis of the Participants

Out of 394 participants, majority of the participants 97 % (n=386) was traumatic while rest of the participants 3% (n=8) was non – traumatic (Figure – 2). For traumatic participants 386, Traumatic Tetraplegic and Traumatic Paraplegic were the almost similar and half of the participants were diagnose with these type (Figure – 3). For all the participants 394, the cross tabulation gender with the diagnosis was reported in the Table – 2.



**Figure – 2:** Traumatic and Non – Traumatic Participants



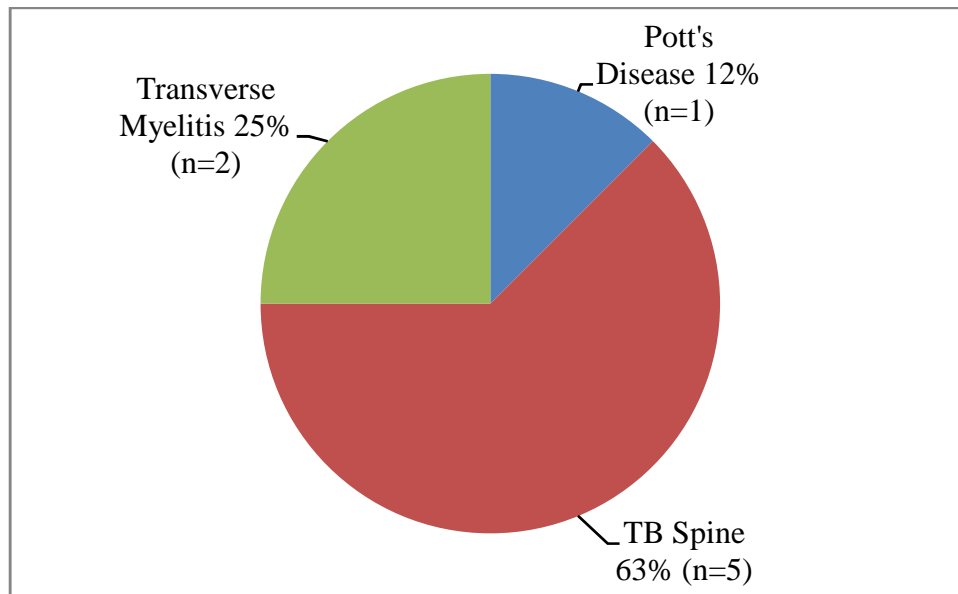
**Figure – 3:** Traumatic and Non – Traumatic Participants

<b>Gender</b>			
	<b>Female</b>	<b>Male</b>	<b>Total</b>
<b>Type of Injury</b>	N (%)	N (%)	N (%)
Traumatic Tetraplegic	22 (47.8% )	172 (49.4%)	194 (49.2%)
Traumatic Paraplegic	20 (43.5%)	172 (49.4%)	192 (48.7%)
Non-Traumatic Tetraplegic	-	2 (0.6%)	2 (0.5%)
Non-Traumatic Paraplegic	4 (8.7%)	2 (0.6%)	6 (1.5%)
<b>Total</b>	<b>46 (100%)</b>	<b>348 (100%)</b>	<b>394 (100%)</b>

**Table – 2:** Association between Different Diagnosis and Gender of the Participants

#### 4.2.2. Causes of Non – Traumatic Spinal Cord Lesion

Out of 8 non-traumatic participants, about 63% (n=5) of the participants causes were TB – Spine while second most common cause was Transverse Myelitis that is 25% (n=2). Only 12% (n=1) was Pott’s Disease (Figure – 4).

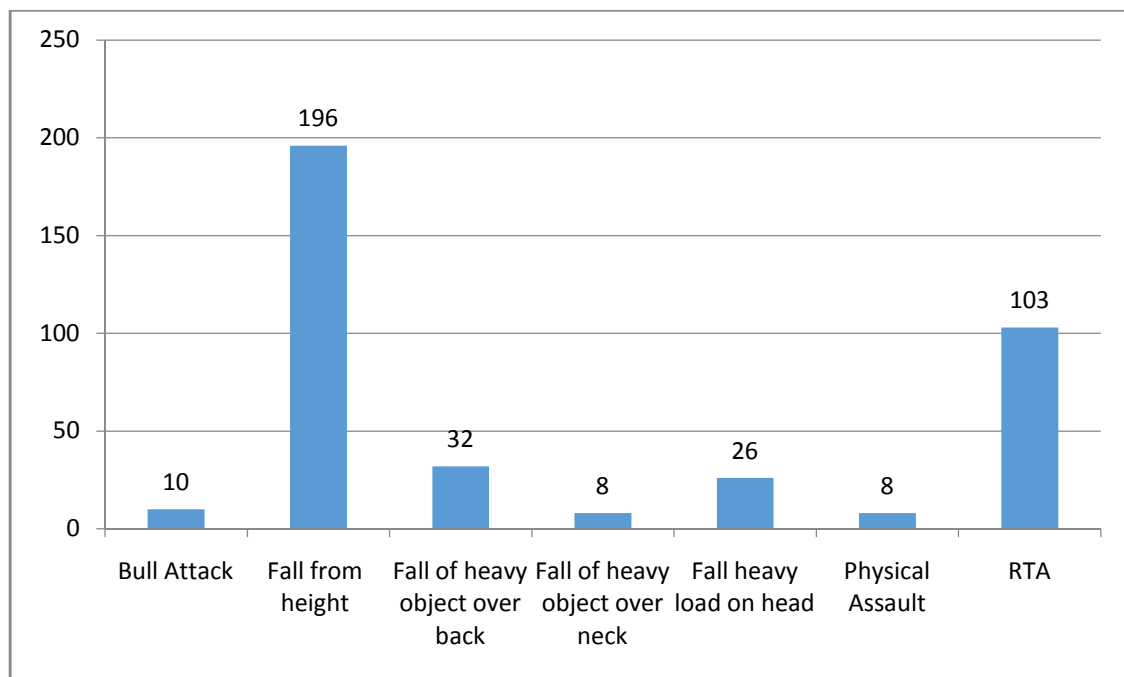


**Figure – 4:** Causes of Non – Traumatic Participants



### 4.2.3. Causes of Traumatic Spinal Cord Lesion

Out of 386 participants, 51% (n=196) of the participants causes were fall from height which included as fall from tree, roof, bed, electric pole, stair, track etc. Road traffic accident (RTA) was the second most common cause of injury about 27% (n=103) of the participants. Fall while carrying heavy object on head, neck and back were in combine 17% (n=66) causes for spinal cord injury where fall while carry heavy object on head, fall while carry heavy object on neck and fall while carry heavy object on back where individually 7% (n=26), 2% (n=8) and 8% (n=32) respectively (Figure - 5) .



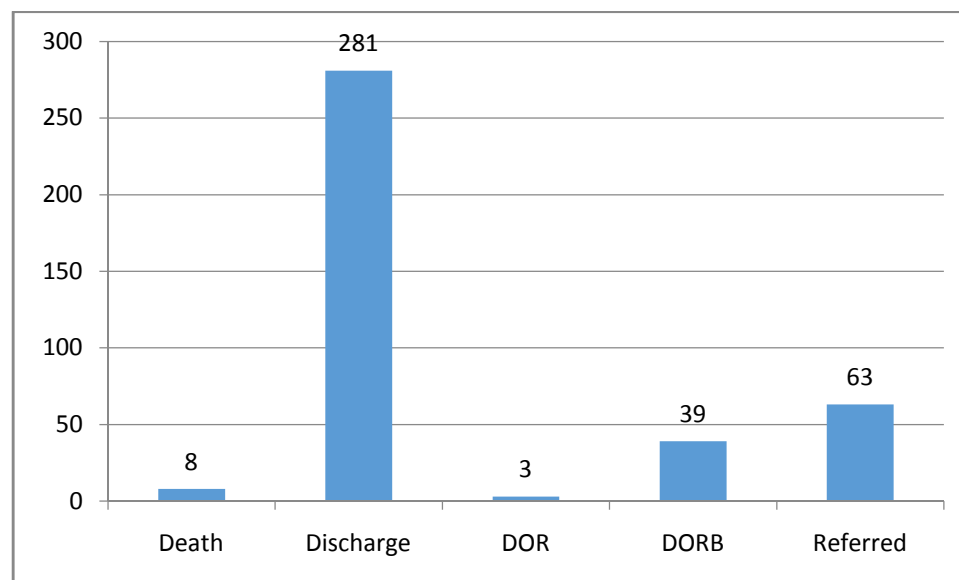
**Figure – 5:** Causes of Traumatic Spinal Cord Injury

#### 4.2.4. Time gaps in days between date of injury and date of admission

Out of 394 participants, the mean duration between date of injury and date of admission at CRP was 57.8 ( $\pm 202.8$ ) days where range from first day to 2190 days that's indicate that participants were coming to the Centre for the Rehabilitation of the Paralyzed from the injury day to 6 years of duration.

#### 4.2.5. Outcome of the Programs

Out of 394 participants, about 71% (n=281) of the participants have successfully completed the rehabilitation program from Centre for the Rehabilitation of the Paralyzed (CRP). Only 2% (n=8) participants died due to their complications during stay at CRP. About 16% (n=63) of the participants were referred to the other hospital for better management. And rest of 0.8% (n=3), 10% (n=39) were discharge on request and discharge on request bond respectively (Figure - 6).



**Figure – 6:** Outcome of the Spinal Cord Lesion

Out of the 8 participants who were deceased all the participants were traumatic tetraplegic and all were male participants. A cross tabulation between outcome with gender reported in Table – 3.

<b>Outcome</b>	<b>Gender</b>		<b>Total</b>
	<b>Female</b>	<b>Male</b>	
	<b>N (%)</b>	<b>N (%)</b>	<b>N (%)</b>
Discharge	30 (65.2%)	251 (72.1%)	281 (71.3%)
Death	-	8 (2.3%)	8 (2.0%)
Discharge On Request	-	3 (0.9%)	3 (0.8%)
Discharge On Request Bond	3 (6.5%)	36 (10.3%)	39 (9.9%)
Referred	13 (28.3%)	50 (14.4%)	63 (16.0%)
<b>Total</b>	<b>46 (100%)</b>	<b>348 (100%)</b>	<b>394 (100%)</b>

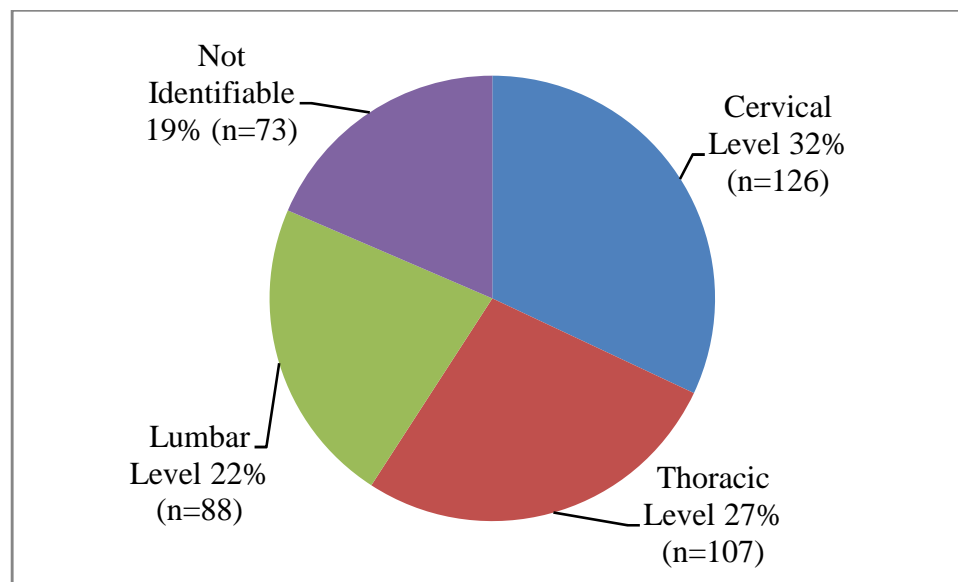
**Table – 3:** Association between outcomes and Gender of the Participants

#### **4.2.6. Duration in stay at CRP (Date of Admission to Successfully Discharge)**

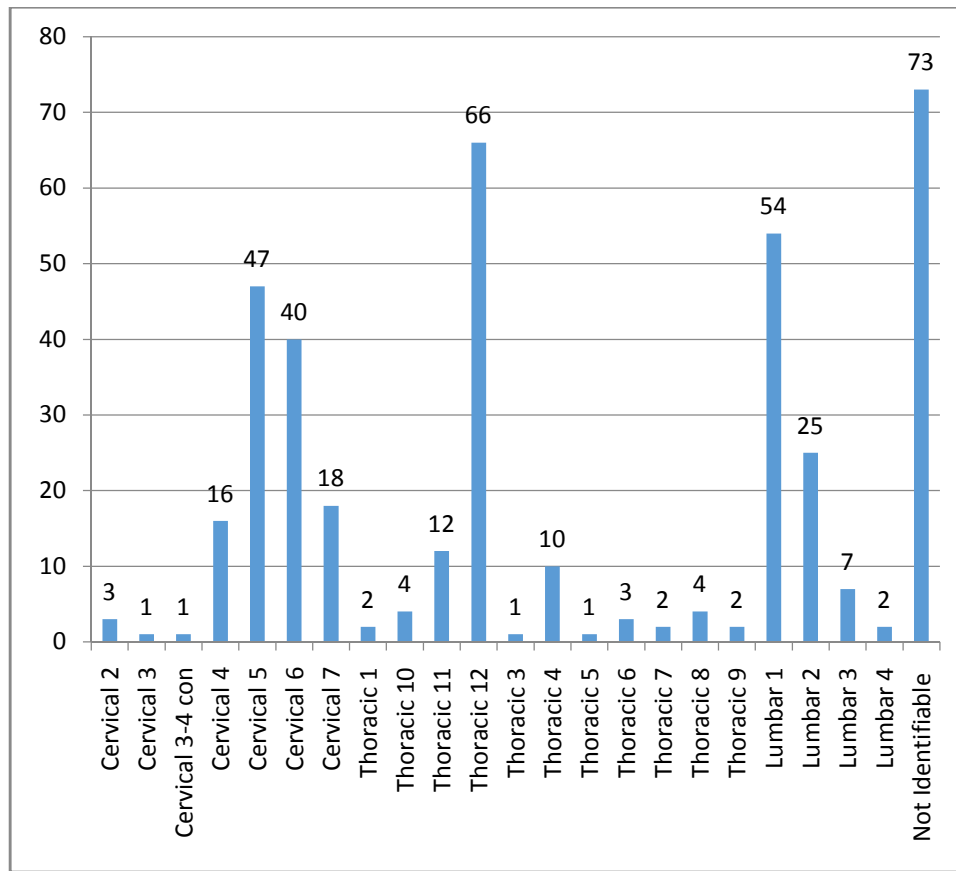
Out of 281 participants who were successfully completed the rehabilitation program from the Centre for the Rehabilitation of the Paralyzed (CRP) among them mean stay in CRP was 138 ( $\pm 71.7$ ) days which indicate that for doing successful rehabilitation in a specialized rehabilitation centre it takes 5 months to hospital stay. The maximum days are 542 which indicate upto 1 year and 6 months.

#### 4.2.7. Skeletal Level of Spinal Cord Lesion

Skeletal level among 394 participants shows that Cervical was the most common site for injury that is 32% (n=126) and second most common site of injury was identified thoracic that is 27% (n=107). Whereas lumbar was the third most common that is 22% (n=88) and rest of the participants 19% (n=73) were not identifiable (Figure - 7). Out of 394 participants, most common skeletal level of injury were indentified for cervical – C<sub>5</sub> that is 12% (n=47); for thoracic – T<sub>12</sub> that is 17% (n=66) and for lumbar – L<sub>1</sub> that is 14% (n=54) Figure -8. About 19% (n=73) of the participants were not identifiable for skeletal level of lesion.



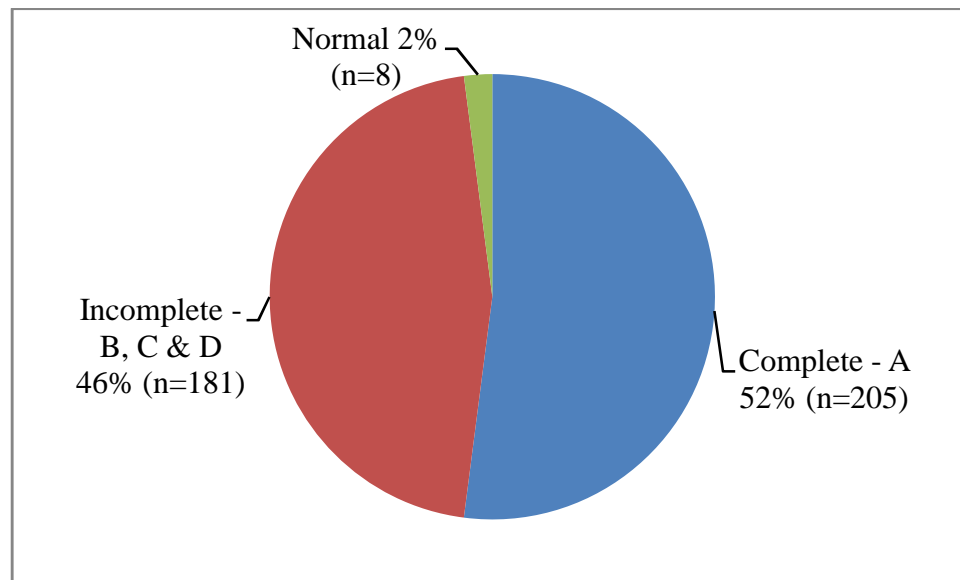
**Figure – 7: Skeletal Level of Spinal Cord Lesion in level wise**



**Figure – 8:** Skeletal Level of Spinal Cord Lesion in individual level

#### 4.2.8. AIS Impairment Scale during Discharge

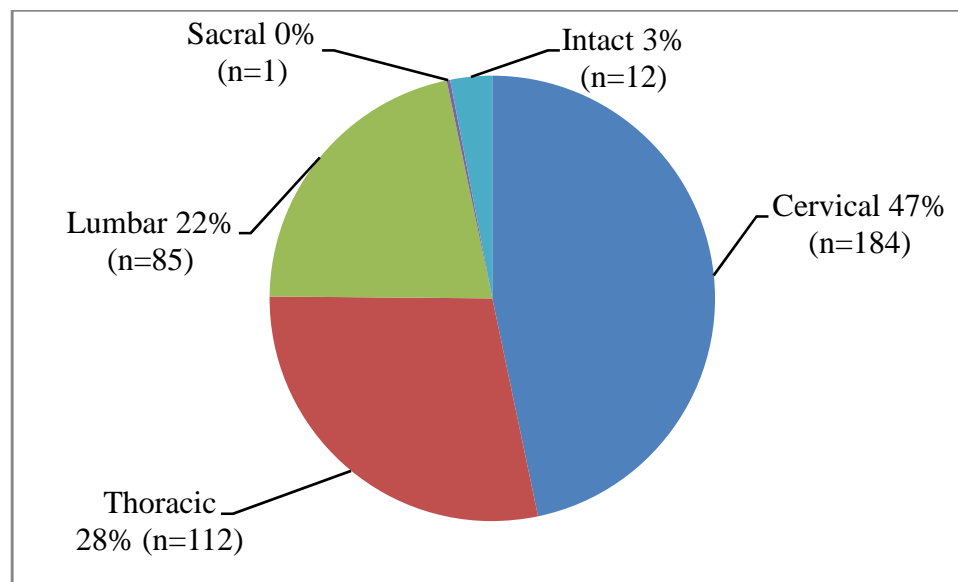
According to American Spinal Injury Association Impairment Scale (AIS), Complete, Incomplete and Normal number of participants were distributed in Figure – 9. Out of 394 participants, most of the participants 52% (n=205) were Complete – A according to AIS Impairment Scale while second most common 21% (n=83) was Incomplete – D. Incomplete – B and Incomplete – C was 9% (n=37) and 16% (n=61) respectively.



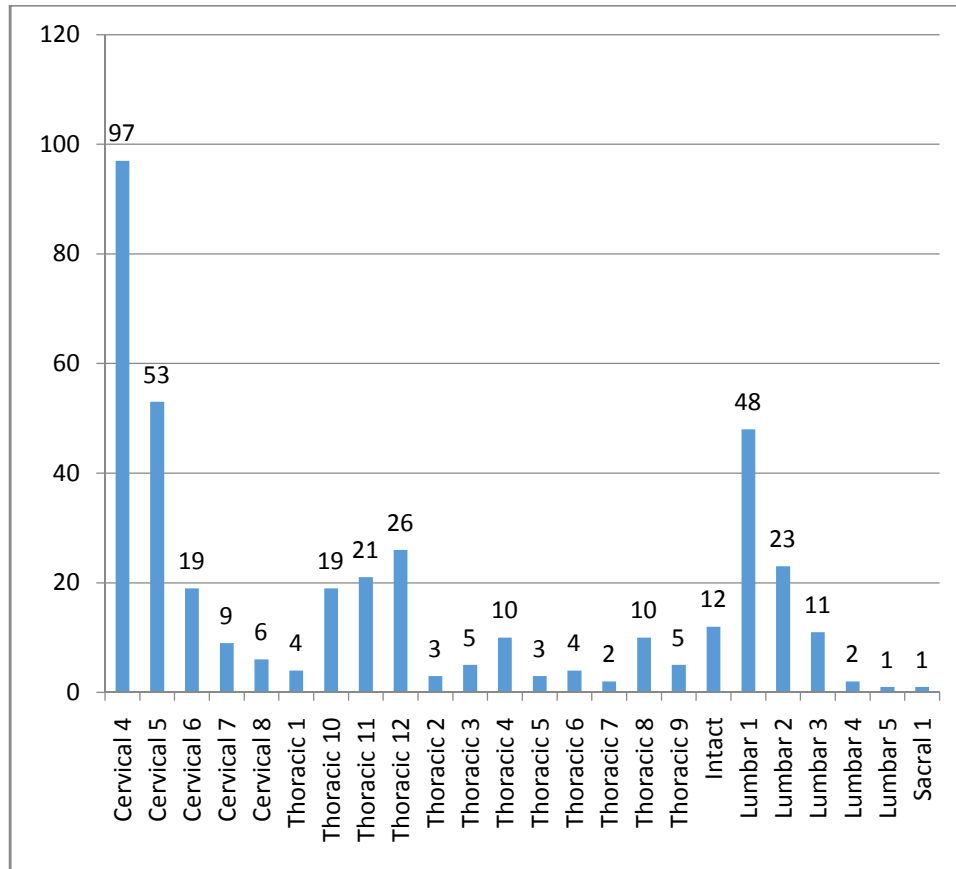
**Figure – 9:** AIS Impairment Scale during Discharge

#### 4.2.9. Neurological Level at the discharge time

Neurological level among 394 participants shows that Cervical was the most common site for injury that is 47% (n=184) and second most common site of injury was identified thoracic that is 28% (n=112). Whereas lumbar was the third most common that is 22% (n=85) and about 3% (n=12) were intact neurological level (Figure -10). Out of 394 participants, most common neurological level were indentified for cervical – C<sub>4</sub> that is about 25% (n=97); for thoracic – T<sub>12</sub> that is about 7% (n=26) and for lumbar – L<sub>1</sub> that is 12% (n=48) Figure -11. About 3% (n=12) of the participants were intact neurological level.



**Figure – 10:** Neurological Level of Spinal Cord Lesion in level wise

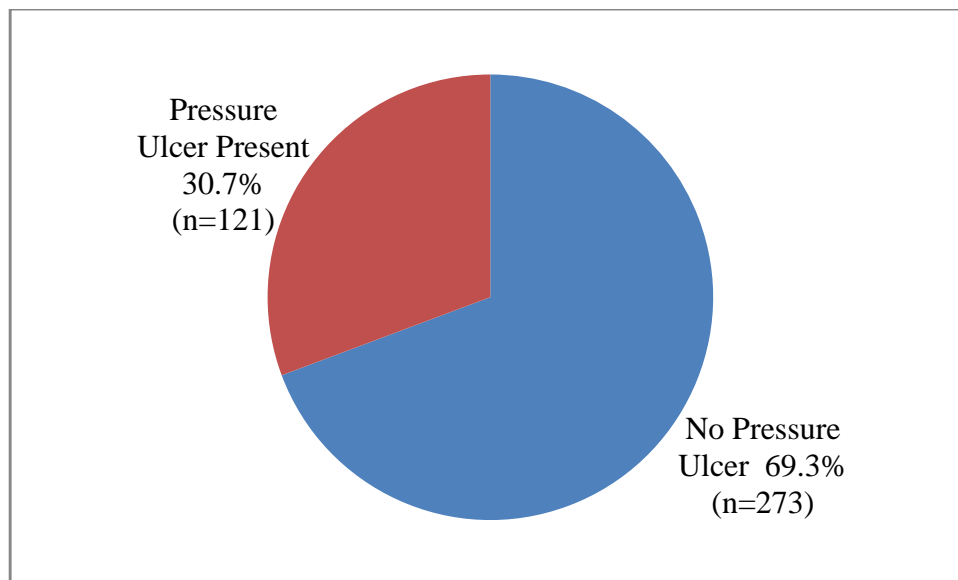


**Figure – 11:** Neurological Level of Spinal Cord Lesion in individual level



#### 4.2.10. Pressure Ulcer at admission

Out of 394 participants, most of the participants did not have pressure ulcer during their admission at the Centre for the Rehabilitation of the Paralyzed (CRP) that was about 69% (n=273) while rest of the participants had pressure ulcer that is about 31% (n=121) (Figure - 12). A cross tabulation between pressure ulcer with gender, type of injury are described in details at Table – 4, Table – 5 respectively.



**Figure – 12:** Pressure Ulcer during admission

<b>Gender</b>			
	<b>Female</b>	<b>Male</b>	<b>Total</b>
<b>Pressure Ulcer</b>	N (%)	N (%)	N (%)
Present	32 (69.6%)	241 (69.3%)	273 (69.3%)
Absent	14 (30.4%)	107 (30.7%)	121 (30.7%)
<b>Total</b>	<b>46 (100%)</b>	<b>348 (100%)</b>	<b>394 (100%)</b>

**Table – 4:** Association between pressure ulcer and Gender of the Participants

<b>Pressure Ulcer</b>			
	<b>Absent</b>	<b>Present</b>	<b>Total</b>
<b>Type of Injury</b>	N (%)	N (%)	N (%)
Traumatic Tetraplegic	127 (46.5%)	67 (55.4%)	194 (49.2%)
Traumatic Paraplegic	138 (50.5%)	54 (44.6%)	192 (48.7%)
Non-Traumatic Tetraplegic	2 (0.7%)	-	2 (0.5%)
Non-Traumatic Paraplegic	6 (2.2%)	-	6 (1.5%)
<b>Total</b>	<b>273 (100%)</b>	<b>121 (100%)</b>	<b>394 (100%)</b>

**Table – 5:** Association between pressure ulcer and type of injury of the Participants

The aim of this study was to find out the causes and characteristics of spinal cord lesion in Bangladesh. Currently there is lack of survey information on spinal cord injury in Bangladesh. Even it is not possible to know the total number of patient of spinal cord lesion in Bangladesh. In this study there was total 394 samples was taken. Here mean age was 34.4 ( $\pm 14.7$ ) years, in other study conduct in Haryana, India mean age was 35.4 years (Singh et al, 2003). A study showed in Jordan mean age of spinal cord injury was 33 (Otom et al., 1997). Spinal cord injury mostly occurred in this age due to in this age most of the people work outside to earn. In this study male female ratio was 8:1. It is higher in Greece 7:1 (Divanoglou & Levi, 2009) and Jordan 5.8:1 (Otom et al., 1997). This is due to majority of woman are remain in home in Bangladesh and are not subjected to violent form of work to which men are more exposed. As Centre for the Rehabilitation of the Paralyzed (CRP) located in Savar, Dhaka so most of the participants were from the Dhaka division that is 41% (n=162).

Etiology of spinal cord injury varies from region to region. According to this study majority of the participants 98% were traumatic causes while rest 2% was the non-traumatic causes. Among the traumatic causes, fall from height was the most common that was 51% while second most 27% common causes was road traffic accident (RTA). A study conduct in Jordan, Otom et al., (1997) shows fall 21.2% & RTA 44%, in Iran Chabok, et al (2009) RTA 52% & fall 45.4%. But in India Singh et al, 2003 fall was 47% & RTA 34.78%.

Skeletal level among 394 participants shows that Cervical was the most common site for injury that is 32% (n=126) and second most common site of injury was identified thoracic that is 27% (n=107). Whereas lumbar was the third most common that is 22% (n=88) and rest of the participants 19% (n=73) were not identifiable. Out of 394 participants, most common skeletal level of injury were identified for cervical – C<sub>5</sub> that is 12% (n=47); for thoracic – T<sub>12</sub> that is 17% (n=66) and for lumbar – L<sub>1</sub> that is 14% (n=54). About 19% (n=73) of the participants were not identifiable for skeletal level of lesion. Out of 394 participants, most of the participants 52% (n=205) were Complete – A according to AIS Impairment Scale while second most common 21% (n=83) was Incomplete – D. Incomplete – B and Incomplete – C was 9% (n=37) and 16% (n=61) respectively. In Pakistan, study among SCL was shows that complete injury were common which is similar to our finding (Rathore et al. 2008).

Neurological level among 394 participants shows that Cervical was the most common site for injury that is 47% (n=184) and second most common site of injury was identified thoracic that is 28% (n=112). Whereas lumbar was the third most common that is 22% (n=85) and about 3% (n=12) were intact neurological level. Out of 394 participants, most common neurological level were identified for cervical – C<sub>4</sub> that is about 25% (n=97); for thoracic – T<sub>12</sub> that is about 7% (n=26) and for lumbar – L<sub>1</sub> that is 12% (n=48). About 3% (n=12) of the participants were intact neurological level. Another finding in Israel, 46 SCL patients among them spinal cord lesion complete neurological injuries 28 (61%) which also support this study (Asher et al., 2005). Out of 396 participants, most of

the participants did not have pressure ulcer during their admission at the Centre for the Rehabilitation of the Paralyzed (CRP) that was about 69% (n=273) which rest of the participants had pressure ulcer that is 31% (n=123). Pressure sores are a major complication associated with spinal cord injury. They occur as a result of excessive pressure, primarily over the bones of the buttock (particularly the ischial tuberosities and the trochanters at the hip). Morbidity during the acute rehabilitation phase (which follows the initial acute hospitalization) includes pressure ulceration, which occurs in about 25% of patients treated in Model Systems centers in the United States (Saulino, 2009). Our study also reveals that pressure ulcer was the most common complications for hospital admission.

**6.1 Conclusion**

Spinal cord lesion affecting mostly young males in their productive years leading to severe disability. Spinal cord lesion (SCL) is an insult to the spinal cord resulting in a change, either temporary or permanent, in its normal motor, sensory, or autonomic function. In Bangladesh the number of spinal cord injury patient is increasing day by day. Spinal cord injury (SCI) is one of the most destructive conditions known to mankind. Although spinal cord injury is one of the most serious injuries that a person can survive, it is possible to return to a healthy, happy and productive life after even the most severe of cord injuries. In Bangladesh many of people in every year face Spinal Cord Lesion and there is lack of much information. And paraplegia is more common then tetraplegia.

## **6.2 Recommendations**

The aim of the study was to find out the causes and characteristics of the spinal cord lesion in Bangladesh. Centre for the Rehabilitation of the Paralysed (CRP) is the only tertiary level rehabilitation centre for spinal cord lesion in Bangladesh. Although it is providing excellent services with its meager resources, CRP cannot adequately address the needs of the whole country. Therefore it is extremely important for the government and the private sector to set up additional rehabilitation centre like CRP to ensure better quality of life for people with spinal cord lesion. Therefore, I recommended the following things:

- Should take samples for from different hospital/ clinic from Bangladesh for generating the result and try to make more valid and reliable.
- Sample should be collected from the patient rather than the hospital documentation so that more precise information should be collected.
- More manpower implemented for collecting data from the different rehabilitation centre so that the real pictures of epidemiology of Spinal cord lesion come out.
- The study needs to do focus on time duration so that more valid and reliable data from different centre can be gathered.

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বাংলাদেশ হেল্থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)  
**Bangladesh Health Professions Institute (BHPI)**  
(The Academic Institute of CRP)

Ref. CRP-BHPI/IRB/02/16/041

Date: 25.02.2016

To  
Mohammad Sohrab Hossain  
Part - II, M.Sc. in Physiotherapy  
Session: 2012-2013, DU Reg. No.: 76  
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

**Subject: Approval of the thesis proposal – “An epidemiological study in Spinal cord lesions in Bangladesh 2014 -2015” by IRB of BHPI.**

Dear Mohammad Sohrab Hossain,

Congratulation!


The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application on February 22, 2016 to conduct the above mentioned thesis, with yourself, as the Principal investigator. The Following documents have been reviewed and approved:

SL#	Name of the Documents
1	Thesis Proposal
2	Questionnaire (English version)

Since the study involves answering a questionnaire that takes 15 to 20 minutes, have no likelihood of any harm to the participants and have possibility of benefit patients in their diabetes management and rehabilitation from the information of their physical activity behavior, IRB has approved the study to be conducted in the presented form at the meeting held at 08:30 AM on February 25, 2016 at BHPI.

IRB expects to be informed about the progress of the study, any changes occurring in the course of the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. IRB of BHPI is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards,

  
S.M. Ferdous Alam  
Assistant Professor  
Dept. of MSc in Rehabilitation Science  
Member Secretary, Institutional Review Board (IRB), BHPI.

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ, ফোন : ৭৭৪৫৪৬৪-৫, ৭৭৪১৪০৪ ফ্যাক্স : ৭৭৪৫০৬৯

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পক্ষাঘাতগ্রস্তদের পুনর্বাসন কেন্দ্র (সিআরপি)

Centre for the Rehabilitation of the Paralysed (CRP)

a project of the Trust for the Rehabilitation of the Paralysed

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Ref:

Date:

CRP-R&E-0401-188

29.02.16

To,  
Mohammad Sohrab Hossain  
M.Sc in Physiotherapy  
Bangladesh Health Professions Institute  
CRP, Chapain, Savar, Dhaka-1343

Ref: *Study Title* "An epidemiological study in spinal cord lesion in Bangladesh 2014-15".

*Sub:* Approval of the study titled "An epidemiological study in spinal cord lesion in Bangladesh 2014-15".

Dear Mohammad Sohrab Hossain,

The CRP Ethics Committee reviewed and discussed your application to conduct the clinical trial entitled "An epidemiological study in spinal cord lesion in Bangladesh 2014-15" on 29.02.16.

The following documents were reviewed:

SL No	Documents	Version	Dated	Copy
1	Study Protocol	-	22.02.16	1

The following members of the ethics committee were present at the meeting held on 29<sup>th</sup> February, 2016 at 10:00 AM in CRP conference room.

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## পক্ষাঘাতগ্রস্তদের পুনর্বাসন কেন্দ্র (সিআরপি)

Centre for the Rehabilitation of the Paralyzed (CRP)

a project of the Trust for the Rehabilitation of the Paralyzed

Head Office: CRP- Savar, CRP- Chapain, Savar Dhaka-1343, Bangladesh

Tel: +880 02 7745464-5, Fax: 7745069, E-mail: contact@crp-bangladesh.org, www. crp-bangladesh.org

Ref:

Date:

S. No.	Name	Role in EC	Affiliation with Institute(Yes/No) If yes, Specify.....
1	Dr. Mohammad Alamgir Kabir	Chair of CRPEC	No
2	Prof. Dr. MA Quader	Co-chair of CRPEC	Yes, Principle, Bangladesh Health Professions' Institute
3	Muhammed Shahriar Zaman	Member Secretary	Yes, Research and Development Officer
4	Mohammad Anwar Hossain	Executive Member	Yes, Associate Professor and Head, Physiotherapy Department.
5	Julker Nayan	Executive Member	Yes, Head of Occupational Therapy Dpt.
6	Sharmin Hasnat	Executive Member	Yes, Sr. SLT & Acting Head and Lecturer, Speech and Language Therapy Department.
7	Nayma Nazneen	Executive Member	No


We confirm that neither you nor your study team members participated in the deliberations of the Ethics Committee & did not vote on the proposal for this study.

**We approve the trial to be conducted in its presented form at Centre for Rehabilitation of the paralysed Ethics Committee (CRPEC).**

The CRP Ethics Committee expects to be informed about the progress of the study, any SAE occurring in the course of the study, any changes in the protocol and patient information / informed consent and asks to be provided a copy of the final report.

Please submit to the EC the status report of the study as per EC SOP's

The EC is organized & operates according to the requirements of Declaration of Helsinki and ICH-GCP, local regulatory requirements and guidelines

Yours sincerely, For 

Member Secretary of CRPEC

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# Questionnaire

**Title:** An epidemiological study in Spinal cord lesions in Bangladesh

<b>Part- I: Patient's Socio-demographic Information</b> <b>(This information collected from the hospital record)</b>	
<b>1.1</b>	Patient Name:
<b>1.2</b>	Mobile Number:
<b>1.3</b>	<b>a. Identification Number :</b> _____
<b>1.4</b>	<b>Age Yrs:</b> _____
<b>1.5</b>	<b>Sex:</b> 1= Male 2= Female <div style="text-align: right;"><input type="checkbox"/></div>

1.6	Home District: _____
<b>Part-II: Disease Condition related Information</b> <b>(To be collected from hospital Record)</b>	
2.1	Date of Admission CRP: Day/ Month/Year: ____/____/____.
2.2	Date of Injury: Day/ Month/Year: ____/____/____.
2.3	<b>Length of time between date of injury and admission at CRP</b> _____(Days)
2.4	Date of Discharge: Day/ Month/Year: ____/____/____.
2.5	<b>Length of hospital stay between date of admission and date of discharge from CRP</b> _____(Days)



<p><b>2.6</b></p>	<p><b>Causes of lesion:</b></p> <p>1= Traumatic <input data-bbox="1251 340 1350 392" type="checkbox"/></p> <p>2= Non-traumatic(Skip Q. 2.7)</p>
<p><b>2.7</b></p>	<p><b>Causes of lesion if Traumatic:</b></p> <p>1= Road Traffic Accident (RTA) <input data-bbox="1251 640 1350 692" type="checkbox"/></p> <p>2= Fall from height</p> <p>3= Fall carrying heavy load on head</p> <p>4= Fall of heavy object on neck</p> <p>5= Fall of heavy object on back</p> <p>6= Diving in shallow water</p> <p>7= Assault</p> <p>8= Bull Attack</p> <p>9= Bullet injury</p> <p>10= Sports injury</p> <p>11= Electric Shock</p> <p>12= Fall from Bi-cycle</p> <p>13= Stab Injury</p> <p>14= Others (specify)_____</p>
<p><b>2.8</b></p>	<p><b>Causes of lesion if Non-traumatic/ Diseases:</b></p> <p>1= TB spine <input data-bbox="1225 1910 1324 1962" type="checkbox"/></p> <p>2= Transverse myelitis</p>

	<p>3= Spinal tumor</p> <p>4= GullinBarri Syndrome (GBS)</p> <p>5= Polyneuropathy</p> <p>6= Others (Specify) _____</p>
<p><b>2.9</b></p>	<p><b>Type of Paralysis:</b></p> <p>1= Paraplegia <input data-bbox="1225 712 1326 763" type="checkbox"/></p> <p>2= Tetraplegia</p>
<p><b>2.10</b></p>	<p><b>Skeletal level of injury at admission:</b></p> <p>1= Cervical-1 <input data-bbox="1225 1003 1326 1055" type="checkbox"/></p> <p>2= Cervical-2</p> <p>3= Cervical-3</p> <p>4= Cervical-4</p> <p>5= Cervical-5</p> <p>6= Cervical-6</p> <p>7= Cervical-7</p> <p>8= Thoracic-1</p> <p>9= Thoracic-2</p> <p>10= Thoracic-3</p> <p>11= Thoracic-4</p> <p>12= Thoracic-5</p> <p>13= Thoracic-6</p> <p>14= Thoracic-7</p>

	<p>15= Thoracic-8</p> <p>16= Thoracic-9</p> <p>17= Thoracic-10</p> <p>18= Thoracic-11</p> <p>19= Thoracic-12</p> <p>20= Lumbar-1</p> <p>21= Lumbar-2</p> <p>22= Lumbar-3</p> <p>23= Lumbar-4</p> <p>24= Lumbar-5</p> <p>25= Others</p>
<p><b>2.11</b></p>	<p><b>Neurological condition according to ASIA Scale at discharge:</b></p> <p>1= Complete A <input data-bbox="1225 1243 1326 1294" type="text"/></p> <p>2= Incomplete B</p> <p>3= Incomplete C</p> <p>4= Incomplete D</p> <p>5= Normal E</p>
<p><b>2.12</b></p>	<p><b>Neurological level at discharge:</b></p> <p>1=Cervical-1 <input data-bbox="1225 1825 1326 1877" type="text"/></p> <p>2= Cervical-2</p> <p>3= Cervical-3</p>

	4= Cervical-4
	5= Cervical-5
	6= Cervical-6
	7= Cervical-7
	8= Thoracic-1
	9= Thoracic-2
	10= Thoracic-3
	11= Thoracic-4
	12= Thoracic-5
	13= Thoracic-6
	14= Thoracic-7
	15= Thoracic-8
	16= Thoracic-9
	17= Thoracic-10
	18= Thoracic-11
	19= Thoracic-12
	20= Lumbar-1
	21= Lumbar-2
	22= Lumbar-3
	23= Lumbar-4
	24= Lumbar-5
	25= Sacral-1
	26= Sacral-2
	27= Sacral-3
	28= Sacral- 4-5

<p><b>2.13</b></p>	<p><b>Pressure sore existed at admission to CRP</b></p> <p>1= Yes</p> <p>2= No</p> <div style="text-align: right; margin-top: 10px;"> <input style="width: 50px; height: 20px;" type="text"/> </div>
<p><b>2.14</b></p>	<p><b>Successfully Complete the Rehabilitation (Outcome)</b></p> <p>1= Discharge</p> <p>2= Dearth</p> <p>3= Discharge On Request</p> <p>4= Discharge On Request Bond</p> <p>5=Referred</p> <div style="text-align: right; margin-top: 10px;"> <input style="width: 50px; height: 20px;" type="text"/> </div>