Secondary Health Complications and its Association with Socio-demographic Factors Among the Patients with Spinal Cord Injury Attending at Center for Rehabilitation of Paralysis, Bangladesh.

By

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Submitted in Partial Fulfillment of the Requirements for the Degree of

MSc in Rehabilitation Science

May 2018

Bangladesh Health Professions Institute (BHPI) Faculty of Medicine

University of Dhaka

We the undersigned certify that we have carefully read and recommended to the Faculty of Medicine, University of Dhaka, for acceptance of this thesis entitled,
"SECONDARY HEALTH COMPLICATIONS AND ITS ASSOCIATION WITH SOCIODEMOGRAPHIC FACTORS AMONG THE PATIENTS WITH SPINAL CORD INJURY ATTENDING AT CENTER FOR REHABILITATION OF PARALYSIS, BANGLADESH"
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• This work has not previously been accepted in substance for any degree and is not concurrently submitted in candidature for any degree.

• This dissertation is being submitted in partial fulfillment of the requirements for the degree of MSc in Rehabilitation Science.

• This dissertation is the result of my own independent work/investigation, except where otherwise stated. Other sources are acknowledged by giving explicit references.

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ACKNOWLEDGEMENT

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List of Abbreviations

SCI= Spinal Cord Injury

SHCs= Secondary Health Complications

CRP= Center for Rehabilitation of Paralysis

SCI-SCS= Spinal Cord Injury Secondary Complications Scale

TSCI= Traumatic Spinal Cord Injury

UTI= Urinary Tract Injury

ED= Emergency Department

HBO= Heterotopic Bone Ossification

ASIA= American Spinal Injury Association

AIS= American Spinal Injury Association Impairment Scale

AD= Autonomic Dysreflexia

ANS= Autonomic Nervous System

HO= Heterotopic Ossification

IRB= Institutional Review Board

BHPI= Bangladesh Health Professions Institute

SPSS= Statistical Package for the Social Sciences

Abstract

Spinal Cord Injury (SCI) is one of the major cause of disability in developing country like Bangladesh. Secondary Health complications(SHCs) are the main factors of mortality in SCI patients. The socio-demographic factors have vital role in causing the Secondary Health complications.

With an aim to trace the factors socio-demographic and predictive variable that are mainly responsible for SHCs of SCI patients a sample of 102 SCI patient were selected. The questionnaire was Spinal Cord Injury Secondary Complications Scale(SCI-SCS) with 16 questions with the added socio-demographic questions and was carried out to collect the data from respondents. All the patients attending at CRP within 1-month period with SCI were taken in to account as our samples. We used the SPSS v.16 to analyze the data. Binary logistic regression analysis was also done to find out the relationship between socio-demographic variables and SHCs.

By analyzing the data, it has found that out of 102 patients 82.4% persons were male and 17.6% were female, and most of the participants were within 21-50 years of age 67.6%. 41.2% patients were tetraplegic whereas 58.8% were paraplegic, employment of participants in this study was 51%. Most common SCHs were bowel and bladder dysfunction (77.5%), pain (71.6%), pressure ulcer (58.8%), circulatory problem (39.2%) and UTI (33.3%). The significant association was found ($p<0.05$) between age, duration of injury, level of injury, age and education level of the patients with the SHCs.

Finally, from the data analysis it has been noticed that being bowel-bladder dysfunction, pain and pressure ulcer most common SHCs male, middle age and tetraplegic were dominance in prevalence in SCI. The SHCs had association with some socio-demographic and predictive variables like gender, age, level of injury and education level, duration of injury and hospital stay.

Chapter-I	**Introduction**

1.1 Background

The spinal cord is the major conduit through which motor and sensory information travels between the brain and body (Kirshblum, S C. et al. 2011). Spinal cord injury (SCI) is an insult to the spinal cord resulting in a change, either temporary or permanent, in the cord's normal motor, sensory, or autonomic function (Adriaansen, J. 2016). Spinal cord injury is arguably the most devastating life changing condition as it affects both the motor and sensory and the autonomic components of body.

The secondary health complications are the conditions which are derived due to the major injury or disease. The main disease should have firm role to cause the secondary complications. Our concern being the complications due to or following spinal cord injury they could be following; pressure ulcer, urinary tract infection, cardio-respiratory conditions, pain, autonomic dysreflexia, sexual dysfunction, diabetes, bowel-bladder dysfunction, postural hypotension, spasticity, contracture, heterotrophic ossification, etc.

Long-term, secondary medical complications are common and play an important role in the continuum of care for patients with SCI. Complications are the frequent cause of morbidity and mortality and lead to increasing rates of rehospitalization, loss of employability and decreased quality of life (Sezer N et al. 2015). Spinal cord injury (SCI), depending on the level and severity of the damage to the cord, will interfere with smaller or larger parts of the autonomic nervous system (ANS), i.e. may involve respiratory, cardiovascular, urinary bladder, bowel, and sexual function etc. (Biering-Sørensen, F. et al. 2017). SCI usually have permanent and often devastating neurologic deficits and disability. The neurologistic level and completeness of the injury determine the degree of impairment. The SCI level is roughly divided into tetraplegia and paraplegia. Tetraplegia refers to impairment or loss of motor and/or sensory function in the cervical segments of the spinal cord. Tetraplegia results in impairment of function in all four extremities, the trunk, and pelvic organs. Paraplegia refers to impairment or loss of motor and/or sensory function in the thoracic, lumbar or sacral segments of the spinal cord. With paraplegia, arm functioning is spared, but, depending on the level of injury, the trunk, legs and pelvic organs may be involved (Adriaansen, J. 2016).

Living with a spinal cord injury (SCI) implicates increased vulnerability for morbidity and premature death. To maintain good health, regular medical follow-ups are essential to prevent, identify and treat secondary complications (Löfvenmark, I. et al. 2016). Complications after SCI are commonly prevalent with pain being one of the most reported problems. Pressure ulcers (PUs) and urinary tract infections (UTIs) are also reported in high rates, 30–54% and 17–46%, respectively and contribute to the high mortality rates in low- and middle-income countries, 24–85%. In contrast, mortality after SCI in high-income countries is mainly caused by respiratory and cardiovascular diseases (Löfvenmark, I. et al. 2016). The incidence of spinal cord injury is increasing with time with an annual rate of 15-40 cases per million with male predominance and a propensity of affecting the low-socio economic group. The condition leads not only to varying degrees of physical disabilities including paralysis, sensory deficit, dysfunction of bowel and bladder but also to various crippling complications such as pressure sore, autonomic dysreflexia, deep vein thrombosis, spasticity, sexual dysfunction and pneumonia. On top of that, spinal cord injury poses grave impact over the economy both personal and national, as the condition itself as well as the complications lead to significant increase of cost. Moreover, the psychologistic effects of spinal cord injury create burden for the patient as well as family members and also for the society (Rahman, A. et al. 2017). These so-called secondary health conditions (SHCs) are defined as "physical or psychologistic health conditions that are influenced directly or indirectly by the presence of a disability or underlying physical impairment". A number of reports have described an increasing prevalence of SHCs associated with aging in people with SCI. There have also been several reviews summarizing the impact of aging with SCI by organ system. People with SCI report more health problems, and they do so at a younger age, than non-disabled individuals (Adriaansen, J. 2016).

In low- and middle-income countries, people who initially survive spinal cord injury subsequently face the significant challenge of surviving in the community following discharge from hospital (Hossain, MS. et al. 2016). Individuals with SCI experience secondary conditions per year with more than one condition typically occurring concurrently. Respiratory infections, urinary tract infections, spasticity, pain, blood pressure, and pressure sores are common secondary conditions among the SCI population. As the leading causes of re-hospitalization and additional financial burden among individuals with SCI, secondary health conditions can also be disruptive to participation within one's life. This is especially common within the realm of social participation and

daily life (Piat J A. et al. 2015). Traumatic Spinal Cord Injury (TSCI) in developed (high income) and developing countries primarily affects males aged 18–32 years, and in developed countries, due to an ageing population, males and females over the age of 65 years. Globally, information on the number of people living with TSCI (prevalence) as well as the number of new cases annually (incidence) is minimal, particularly in developing countries, hindering injury prevention, health care and other social planning (Lee, B.B. et al. 2014).

Nearly 95% of individuals with SCI currently have at least one secondary complication, whereas the majority of these individuals (58%) have three or more complications (Hetz, S.P. et al. 2011). SHCs can include the following: respiratory disease, urinary tract infections (UTIs), heart disease, osteoporosis, overuse upper extremity injuries, sleep disorders, sexual disorders, suicides, pressure ulcers, chronic pain, fatigue, depression and/or respiratory infection. Despite the fact that many of these SHCs are potentially preventable, they are purported to be key contributors for ED visits, re-hospitalizations and/or death in the post-acute phase (Guilcher, S. J. T. et al. 2013). It is unclear how many people are currently living with SCI in the world, but the international incidence data of 40 to 80 new cases per million population per year suggest that every year between 250 000 and 500 000 people become spinal cord injured. The majority of these cases are traumatic spinal cord injuries, the leading causes of which are road traffic injuries, falls and violence. Recent studies show an increase in the age of SCI onset and a gradual increase in the proportion of non-traumatic SCI cases, partly attributable to the world's aging population (Adriaansen, J. 2016).

1.2 Justification

Bangladesh is a densely populated developing country which has poor occupational safety measures, poor road conditions and mixed traffic, with vehicle users reluctant to use seat-belts. This makes the population vulnerable to SCI (Razzak, ATMA. Et al. 2016). Living with a spinal cord injury (SCI) in low and middle-income countries is challenging. Support for people with SCI is often limited and wheelchair access may be very restricted (Hossain, MS. et al. 2016). Bangladesh a poor developing country with a literacy rate of about 61.0% among the age of 15 years and above spinal cord injury and its health-related complications are a major issue as it causes a great deal of morbidity and mortality as well as economic problems (Quadir et al. 2017). The incidence of spinal cord injury (SCI) in low-income countries is four times that in high-income countries. In most low-income countries, people who sustain a SCI are discharged home with little access to support services. Not surprisingly, they often then develop life-threatening complications. Many dies within a few years of discharge. Recently research shown that 19% of wheelchair-dependent patients discharged from a large SCI unit in Bangladesh die within 2 years of discharge and the most common cause of death was sepsis due to pressure ulcers. There are no directly comparable data from high-income countries but death in the first 2 years following discharge in those <40 years of age is unusual. The high incidence of serious but preventable complications following SCI in Bangladesh suggests that a suitable intervention could yield large health and social benefits at relatively little cost (Hossain MS, et al. 2016).

This study aimed to looking into the trend in demographic distribution of spinal cord injury, diagnosis, as well as complications in patients with spinal cord injury which will help to identify the specific population group at risk and take preventive measure to prevent the associated complications. Participants were from one of the biggest rehabilitation centers in Bangladesh, Center for Rehabilitation of Paralysis (CRP). The samples data were collected within a definite period of time i.e. March to May 2018. The center was reliable source for data collection and the procedure was face to face interview.

1.3 Research question:

What is the relationship between socio-demographic and predictive factors with the prevalence of secondary health complications?

1.4 Operational definitions:

Spinal cord: Spinal cord is the part of central nervous system extending from the cervical vertebrae to lumbar vertebrae. Spinal cord carries the message from brain to periphery of the body. It is protected by the vertebras which runs through vertebral canal channel between them.

Spinal cord injury: Any discontinuity, disruption or impact on the spinal cord is called spinal cord injury. As spinal cord passes the message signals from brain to periphery, injury to the spinal cord causes dysfunctions of the body parts and organ which is called paralysis and sometimes sensory loss.

Secondary health complications: These are the medical or non-medical conditions which are not directly caused due to spinal cord injury but has role in causing them. These are the consequences of spinal cord injury. They are;

Pressure ulcer: Wound (infected) caused at certain prominent body parts due to continuous pressure at it. Happens in SCI due to long bed rest and continuous static posture.

Spasticity: It is jerky involuntary movement in paralyzed or partially paralyzed muscles.

Contracture: loss in joint mobility that is present even when a joint is slowly stretched.

Heterotopic bone ossification: Excessive laying down of the bone.

Diabetes mellites: Irregularities in blood sugar level.

Bladder dysfunction: Frequent urination and incontinence, as well as kidney problem, kidney or bladder stone, urine back up.

Urinary tract infection: Infection in urinary tract i.e. bladder, urethra which may cause pain, burning during urination and other problem if not treated.

Bowel dysfunction: It includes diarrhea, constipation, incontinence and associated problems.

Sexual dysfunction: It is dissatisfaction with sexual functioning.

Autonomic dysreflexia: It has the symptoms of sudden rise in blood pressure and sweating, skin blotches, goose bumps, pupil dilation and headache.

Postural hypotension: It's a strong sensation of faintness following a change in position caused by sudden drop in blood pressure.

Circulatory problems: It includes swelling of the hands and feet, or blood clot.

Respiratory problem: Includes respiratory infection, difficulty in breathing, coughing.

Pain not related to overuse: Neuropathic and visceral pain which is not related to overuse.

Pain related to overuse: It's a pain in muscle or joints due to over using it. Such as shoulder pain, knee pain etc.

2.1 Spinal Cord Injury (SCI):

Spinal cord injury (SCI) is a serious medical condition that causes functional, psychologistic and socioeconomic disorder (Sezer, N. et al. 2015). SCI is a particularly abrupt and life altering neuromuscular condition. It can have detrimental physiologistic, psychologistic and social impacts on the individual. The main pathology of SCI involves death of neural tissue within the spinal cord, thus obscuring supraspinal signals from reaching their target organs to perform normal bodily functions. This can result in motor paralysis, autonomic dysfunctions and sensory malfunction. Some of these dysfunctions manifest immediately after an injury, while others develop chronically over time. Spinal cord tissue damage can occur from traumatic or non-traumatic causes. Traumatic SCI occurs when an external physical impact damages the spinal cord either directly, or by crushing the vertebral column around the spinal cord or by reducing blood supply to the spinal cord. In contrast, non-traumatic SCI can result from infection, disease or radiation that causes neural tissue necrosis. The resultant spinal cord damage from the initial injury is called the primary injury, which leads to localized and often small spinal damage. However, within hours to approximately a month after the initial trauma, the secondary injury phase occurs, whereby the site of injury starts to expand due to inflammation, ischemia and ion degradation (Adriaansen, J. 2016).

It is the secondary damage that causes the majority of complications following an injury due to the increased neural tissue death. Immediately after a SCI, the individual experiences both spinal shock and neurogenic shock. Spinal shock is a temporary period of complete motor, and often sensory, paralysis below the level of injury. This period lasts for approximately a week until the individual starts to regain some function, which may be attributed to spontaneous regeneration or myelination of neural tissue. Neurogenic shock on the other hand is complete ablation of autonomic regulation, which is characterized by dangerously low blood pressure and uncontrolled cardiac arrhythmias. Neurogenic shock also dissipates within approximately a week after an injury, however, this is the time period when other autonomic dysfunctions, such as autonomic dysreflexia, start to manifest. Animal studies have shown that axons undergo severe atrophy during the neurogenic shock

stage but regain their size and arborization at approximately the same time as when autonomic regulation starts to work again. As axonal size and arborization is regained (Adriaansen, J. 2016).

2.2 Classifications of Spinal Cord Injury:

Spinal cord injury is classified according to three categories: level of injury, severity of injury and whether the injury is an upper or a lower motor neuron injury. Regarding level of injury, SCI that results in damage to the cervical spine is called tetraplegia, which involves impaired sensory and/motor function in the upper limbs, trunk, pelvic area and lower limbs. An injury that inflicts damage below the cervical region is known as paraplegia, which involves impaired sensory and/motor function in the trunk, pelvic area and lower limbs. The severity of SCI is governed by its completeness. Anatomically, a complete SCI spans the whole width of the spinal cord thus not allowing any spared neurons to bypass the site of injury. An incomplete injury does not span the whole width of the spinal cord, resulting in some neurons to bypass the injury. With respect to function, in a complete injury there is no sensory or motor function below the neurologistic level of injury, including the 4th and 5th sacral dermatomes and myotomes. In an incomplete injury, there is spared motor and/or sensory function below the neurologistic level of injury, including the 4th and 5th sacral dermatomes and myotomes. A more accurate way to assess the level of completeness is by the ASIA (American Spinal Injury Association) impairment scale (AIS). In order to assign an individual with an AIS score, the neurologistic level of injury needs to be established using motor and sensory examinations. Finally, an upper motor neuron injury refers to an injury to the central nervous system (spinal cord) whereas a lower motor neuron injury refers to an injury to the peripheral nerves (Adriaansen, J. 2016).

2.3 Epidemiology:

It is unclear how many people are currently living with SCI in the world, but the international incidence data of 40 to 80 new cases per million population per year suggest that every year between 250 000 and 500 000 people become spinal cord injured. The majority of these cases are traumatic spinal cord injuries, the leading causes of which are road traffic injuries, falls and violence. Recent studies show an increase in the age of SCI onset and a gradual increase in the proportion of non-traumatic SCI cases, partly attributable to the world's aging population (Adriaansen, J. 2016). The incidence of spinal cord injury (SCI) in low-income countries is four times that in high-income countries. In most low-

income countries, people who sustain a SCI are discharged home with little access to support services. Not surprisingly, they often then develop life-threatening complications. Many dies within a few years of discharge. Recently research shown that 19% of wheelchair-dependent patients discharged from a large SCI unit in Bangladesh die within 2 years of discharge and the most common cause of death was sepsis due to pressure ulcers. There are no directly comparable data from high-income countries but death in the first 2 years following discharge in those <40 years of age is unusual. The high incidence of serious but preventable complications following SCI in Bangladesh suggests that a suitable intervention could yield large health and social benefits at relatively little cost (Hossain MS, et al. 2016).

2.4 Secondary Health Complications (SHCs):

Pressure ulcer:

Pressure ulcers are an important and potentially life threatening secondary complication of SCI. They can lead to further functional disability and fatal infections and surgical interventions can be required (Sezer, N. et al. 2015). The study done by C Joseph and L Nilsson Wikmar in 2015 shows that pressure sore is the dominant secondary health complication following SCI. In developing countries like Bangladesh, the prevalence of pressure sore among SCI patient is very high (67.5% had pressure ulcer in study done by Quadir, et al. 2017). A study done by Hossian MS, et al. 2016, in Bangladesh, shows 2 years of survival rate in SCI patients after discharge from Rehabilitation center and the main cause being sepsis due to pressure ulcer (56%). Pressure ulcers account for one-fourth of the cost of caring for SCI patients. Prevention of these ulcers would cost less than one-tenth the amount spent on treatment (Byrne, DW, et al. 1996). So, the prevention should be emphasized more.

Spasticity:

Spasticity is a common secondary impairment after SCI characterized by hypertonus, increased intermittent or sustained involuntary somatic reflexes (hyperreflexia), clonus and painful muscle spasms. Spasticity affects 70% of patients with SCI and causes considerable disability for many (Sezer, N. et al. 2015). Symptoms of spasticity are experienced by the majority of individuals with SCI and are a possible contributor to reduced Quality of Life (QOL). Unequivocally, 'spasticity' is understood to be among the symptoms resulting from

injury to the upper motor neurons within the central nervous system (CNS) and is a common but not an inevitable sequela of spinal cord injury (SCI). (Adams, MM. et al. 2005)

Contracture:

The development of contractures in patients with spinal cord injury (SCI) has been recognized but not well studied. Occurrence of contracture in SCI patients can be an important physical factor delaying rehabilitation and may hamper dressing, seating, transfers, and interfere with nursing care. The study done by Dalyan, M. et al. 1998, shows that 9% of their total sample developed contracture during hospitalization.

Heterotrophic bone ossification:

Heterotopic ossification (HO) is the abnormal formation of bony material in soft tissues, a pathologistic condition first identified in spine-injured soldiers during World-War I. Severe trauma is the main cause of HO, particularly in defense personnel, among whom>50% of blast and gun-shot wound victims develop HO. HO is also frequent in civilians, affecting 20–29% of patients with spinal cord injuries (SCIs) and 5–20% of those with traumatic brain injuries (TBIs). (Genet, F. et al. 2015).

Bladder, bowel and Sexual dysfunction:

One of the most important complications following SCI is the loss of genitourinary and gastrointestinal function (Sezer, N. et al. 2015). Lumbar sympathetic, sacral parasympathetic and sacral somatic nerves responsible for bladder, bowel and sexual function. And any injury to them in spinal cord results in dysfunction of bladder, bowel and genital organ (Park, SE et al. 2016). Out of the 51 participants, 58.8% reported bladder incontinence, 54.0% bowel incontinence, 60.8% sexual dysfunction and 29.4% had all three in the research conducted by Park et al. 2016. There is high prevalence of self-reported bowel/bladder incontinence and sexual dysfunction in the traumatic thoracolumbar SCI population and support the need for standardized assessments. Several demographic, injury-related and SHCs impacted health status and should be considered for the management of individuals living in the community (Park, SE et al. 2016).

Urinary tract infection:

Spinal cord injury patients experience an increased frequency of urinary tract infection as a consequence of impaired bladder emptying associated with a neurogenic bladder. Urinary tract infection and renal failure were the most common causes of death in these patients before the introduction of current bladder management strategies, which maintain a low-pressure bladder (Nicolle, LE.et al. 2014). The incidence of symptomatic urinary infection in men with spinal cord injury is reported to be 0.41/100 person-days with intermittent catheterization and 0.36/100 person-days when a condom catheter is used (Nicolle, LE.et al. 2014).

Autonomic dysreflexia:

Autonomic dysreflexia (AD) is a well-known medical emergency. It generally occurs in patients with SCI at levels of T6 and above. AD is characteristic for the chronic stage but may appear any time after SCI. It is reported that the life time frequency among patients with SCI is 19%-70% (Sezer, N. et al. 2015). It is more common in patients with cervical and complete lesions. AD is caused by spinal reflex mechanisms initiated by a noxious stimulus entering the spinal cord below the level of injury. This afferent stimulus generates a sympathetic overactivity leading to vasoconstriction below the neurologistic lesion, along with involvement of splanchnic circulation that causes vasoconstriction and hypertension. The excessive parasympathetic activity (and lack of sympathetic tone) leads to vasodilation above the level of the lesion and is thought to be responsible for headache, flushing, sweating and nasal congestion. The reflex bradycardia is secondary to vagal stimulation. Bladder distension is the most common triggering factor for AD. The distension can result from urinary retention or catheter blockage and accounts for up to 85% of cases (Sezer, N. et al. 2015). The second most common triggering for AD is bowel distension due to fecal impaction. Other potential factors include hemorrhoids and anal fissures, gastrointestinal precipitants (appendicitis, cholecystitis, etc.), pressure ulcers, ingrown toenails, heterotopic ossification, fractures, menstruation, pregnancy or labor, deep vein thrombosis, pulmonary embolism and sexual activity (Sezer, N. et al. 2015).

Postural hypotension and Circulatory problems:

A spinal cord injury (SCI) interferes with the autonomic nervous system (ANS). The effect on the cardiovascular system will depend on the extent of damage to the spinal/central component of ANS. The cardiac changes are caused by loss of supraspinal sympathetic control and relatively increased parasympathetic cardiac control. Decreases in sympathetic activity result in heart rate and the arterial blood pressure changes, and may cause arrhythmias, in particular bradycardia, with the risk of cardiac arrest in those with cervical or high thoracic injuries (Biering-Sørensen, F. et al.2017). Postural hypotension is particularly common in cervical and high thoracic lesions. It is also reported that the prevalence of postural hypotension was 21% and cervical injuries had the highest prevalence in a large cohort study with incomplete. The symptoms associated with postural hypotension include dizziness, light headedness, headache, pallor, yawning, sweating, muscle weakness, fatigue and occasionally syncope (Sezer, N. et al. 2015).

Respiratory problems:

As seen through the literature, SCI often leads to respiratory dysfunction, including insufficiency of respiratory muscles, reduction in vital capacity, ineffective cough, reduction in lung and chest wall compliance and excess oxygen cost of breathing. Due to these problems, atelectasis, pneumonia and respiratory failure are the most common respiratory complications in patients with SCI. Pleural effusion, pneumothorax and hemothorax are less common respiratory complications of SCI (Sezer, N. et al. 2015). Additionally, it is reported that SCI patients have a high prevalence of sleep-related respiratory disorders, particularly obstructive sleep apnea syndrome, which can adversely affect quality of life and rehabilitation. The number of studies of patients with SCI have shown that the syndrome occurs in 25%-45% of those with long-term follow-up (Sezer, 2015). Patients with cervical and high thoracic SCI are at higher risk for developing atelectasis and pneumonia due to paralysis of the respiratory muscles below the level of injury, resulting in a weak cough mechanism and difficulty mobilizing lung secretions.

Pain:

In the acute phase the patients encounter a range of sensory experiences following the trauma. Acute pain commonly accompanies the injury and recedes as healing occurs. Chronic pain is a frequent, disabling complication of SCI. Up to 80% of patients with SCI

are reported to suffer from pain (Hagen, 2015). Patients with SCI may have nociceptive or neuropathic-type of pain or a combination of the two. Musculoskeletal pain is common in chronic SCI. The muscles atrophy in response to reduced activity. Studies have found that all patients with complete SCI have some extent of deterioration of muscle, joints and ligaments. Therefore, the patients with SCI experience a period of "metabolic chaos", i.e., strong catabolic process, which is generated by the loss of physical pressure on muscle, joints and ligaments (Hagen, 2015).

2.5 Spinal Cord Injury Secondary Complications Scale (SCI-SCS):

The Spinal Cord Injury Secondary Conditions Scale (SCI-SCS) is a self-report questionnaire specifically targeting physiologistic secondary conditions associated with SCI that directly and indirectly impact health and physical functioning. The SCI-SCS covers skin, musculoskeletal, pain, bowel/bladder, sexual dysfunction, respiratory, and cardiovascular conditions. Length: 16 items Scoring: Items rated 0-3. Total score (0-48) is sum of items. Higher scores indicate greater problems with secondary conditions. Validity – Moderate to High Reliability – Moderate to High. Adapted from Kalpakijan CZ et al. Preliminary Reliability and Validity of a Spinal Cord Injury Secondary Conditions Scale, J Spinal Cord Med, 30: 131-139, 2007; Appendix A.

3.1 Objectives:

General objective:

To assess the relationship between secondary health complications and socio-demographic factors of the SCI patient attending at CRP.

Specific objectives:

To find out the prevalence of secondary health complications among the SCI patients attending at CRP.

To compare the sociodemographic factors.

3.2 Conceptual Framework:

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┌─────────────────────┐                          ┌──────────────────────┐
│   Predictive         │                          │                      │
│   Variables:         │                          │  Response Variable:  │
│                      │                          │                      │
│      Age             │                          │  Secondary health    │
│                      │                          │  complications       │
│      Gender          │                          │                      │
│                      │         ═══════►         │                      │
│   Hospital stays     │                          │                      │
│                      │                          │                      │
│   Environment        │                          │                      │
│                      │                          │                      │
│   Assistive aids     │                          │                      │
│                      │                          │                      │
│   Duration of injury │                          └──────────────────────┘
│                      │
│   Occupation         │
│                      │
│   Educational status │
│                      │
│   Level of injury    │
└─────────────────────┘
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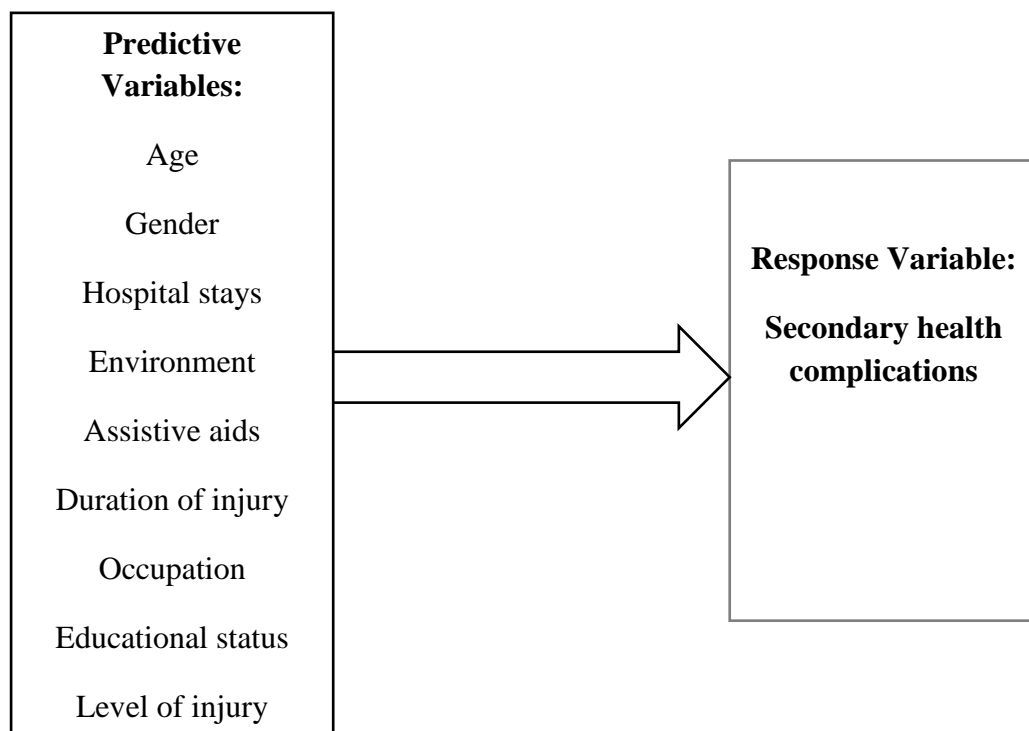
Fig 3.1 Conceptual framework

3.3 Study Design:

This study is the quantitative, cross-sectional study. The information's were from respondents.

3.4 Study Place:

The study place was the various neurology wards at CRP, Savar, Dhaka Bangladesh.

3.5 Study Population:

SCI patients attending at CRP.

3.6 Study Period:

The estimated study period is 6 months, from November 2017 to April 2018.

3.7 Sampling technique:

The sampling technique was hospital attending patients.

3.8 Sample Size Determination:

The sample has included all the patients attending at CRP from 15st March to 15th of April 2018.

3.9 Inclusion Criteria:

- ➤ SCI patients attending at CRP during the data collection period.

- ➤ Both the genders were included

- ➤ All the age group

3.10 Exclusion criteria:

- ➤ Patients who don't give consent.

- ➤ Patients who do not attend at CRP.

3.11 Data collection tools:

Spinal Cord Injury Secondary Complications Scale (SCI-SCS) was used as a questionnaire. The Spinal Cord Injury Secondary Complications Scale (SCI-SCS) is a self-report questionnaire specifically targeting physiologistic secondary conditions associated with SCI that directly and indirectly impact health and physical functioning. The SCI-SCS covers skin, musculoskeletal, pain, bowel/bladder, sexual dysfunction, respiratory, and cardiovascular conditions. 16 items Scoring Items rated 0-3. Total score (0-48) is sum of items. Higher scores indicate greater problems with secondary complications. Validity – Moderate to High Reliability – Moderate to High. Adapted from Kalpakijan CZ et al. Preliminary Reliability and Validity of a Spinal Cord Injury Secondary Complicationss Scale, J Spinal Cord Med, 30: 131-139, 2007; Appendix A.

3.12 Data collection technique:

Direct interview was carried out with the self-directed structured questionnaire.

3.13 Data collection procedure:

The questionnaire was prepared in English medium but a Bengali translation version was used to make respondents easy understand.

3.14 Data editing and analysis:

The computerized data editing and analysis software or system was used to edit and analyze the data. The data was interpreted with the tables and graphs and the relationship between the variables were analyzed using binary regression model. The logit model was fit and according to the exponential values it was analyzed.

3.15 Data presentation:

Data were presented in different data presentation methods like data sheets, documents, different types of graphs and charts.

3.16 Ethical consideration:

- WHO guideline was followed.

- Permission was taken from Institutional Review Board (IRB) and the BHPI Review board.

- Permission was taken from respected department.

- Personal consent was taken from every respondents verbally.

- Confidential guarantee to the participants was given.

This chapter includes results of the data, analysis and frequency tables and graphs of demographic data have been presented. Tables, bar charts, histograms, pie charts and crosstabs are used to show the frequencies of different variables and Multinomial logistic regression is used to show the relationship between different variables. The data was collected from 102 samples from the Rehabilitation center.

4.1 Frequency distribution of demographic data:

4.1.1 Age distribution:

Table 4.1.1 Statistics and Frequency of age groups

Statistics of age distribution	
Mean	34.38
Median	34.00
Mode	40
Std. Deviation	13.013
Minimum	12
Maximum	65

Age groups	Frequency	Percent
11-20	20	19.6
21-30	24	23.5
31-40	31	30.4
41-50	15	14.7
51-60	10	9.8
61-70	2	2.0
Total	102	100.0

So, according to these tables we can say that, minimum age and maximum age of the sample are 12 and 65. Most of the spinal cord injury patients are of 21 to 50 years of age which

includes 88.2% of the total observation. This age group is productive age group and are most active thus, it is considerable.

4.1.2 Gender distribution:

Table 4.1.2 Frequencies of gender

Gender of the Patient	Frequency	Percent
Male	84	82.4
Female	18	17.6
Total	102	100.0
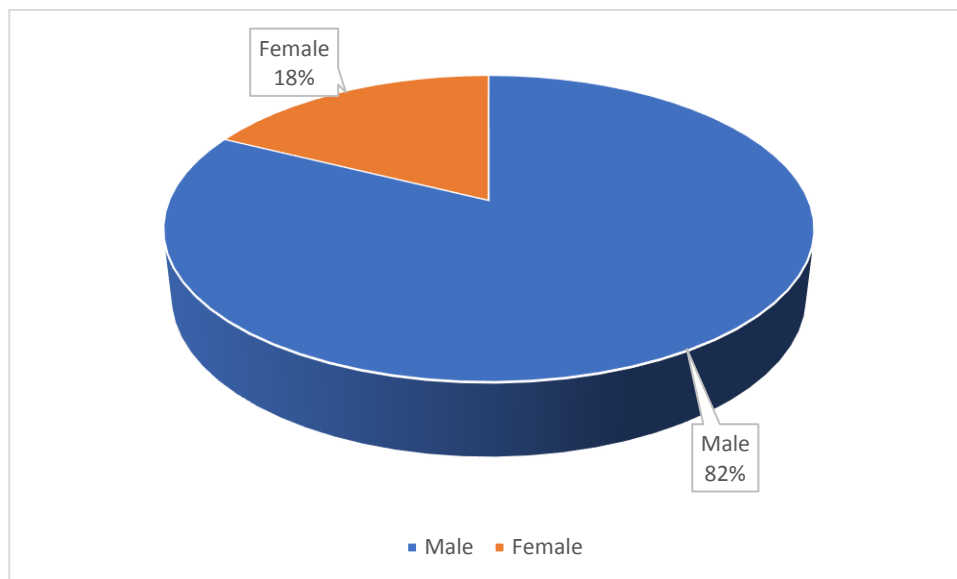
Fig: 4.1.2 Gender distribution

The sample has uneven distribution of gender, that is; 84(82.4%) persons are male and 18(17.6%) are female. Therefor we can say that males are more prone to SCI than females in Bangladesh. It may be because of the male people are mostly involved with physical risky tasks and this is why they has to face SCI problems.

4.1.3 Education distribution:

Table 4.1.3 Education level of the patients

Education level	Frequency	Percent
Illiterate	20	19.6
Primary	20	19.6
Secondary	48	47.1
University	14	13.7
Total	102	100.0
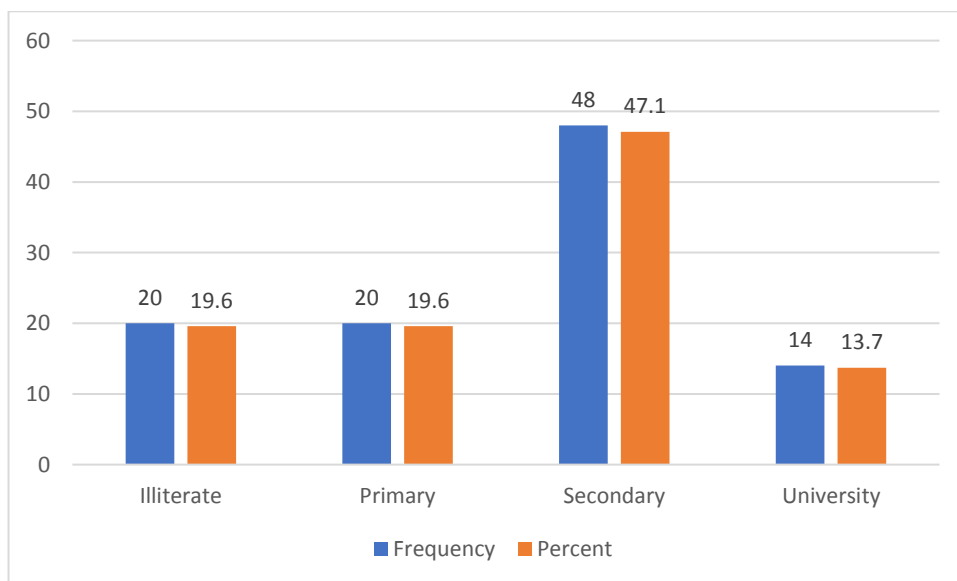
Fig: 4.1.3 Education level of the patients

The education level was categorized in 4 groups they are illiterate (who have not formal education), primary (who have 1-5 class of formal education), secondary (who have 6-12 grades of formal education) and university (who have bachelor and above education).

From the table it is evident that among all SCI patients 47.1% have secondary level education and only 13.7% have university level of education.

4.1.4 Occupational distribution:

Table 4.1.4 Occupations of the patients

Occupation	Frequency (n)	Percent (%)
Business	10	9.8
Farmer	13	12.7
Housewife	8	7.8
Job	25	24.5
Labor	26	25.5
Student	20	19.6
Total	102	100.0
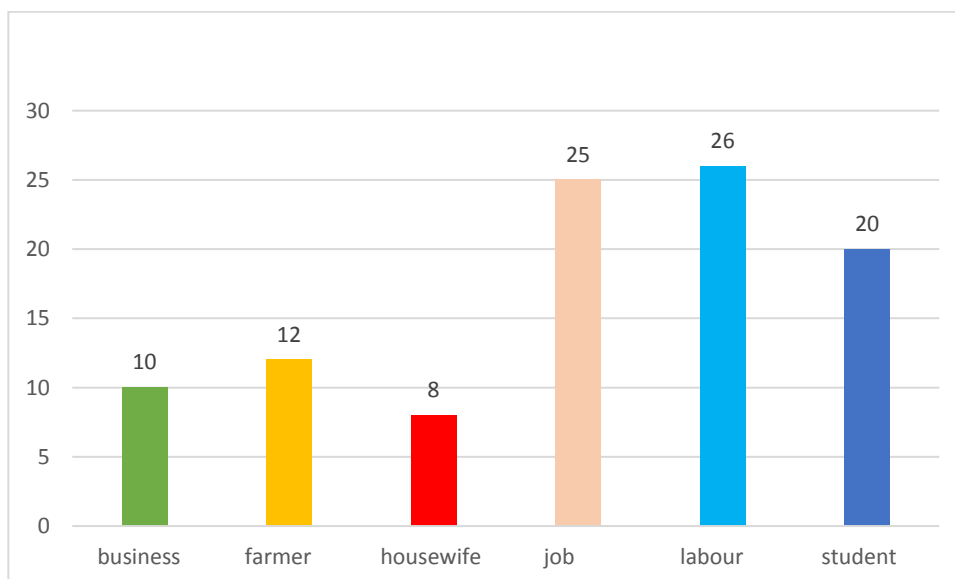
Fig: 4.1.4 Occupation of the patients

Among the participants, their occupation before injury was as above. This distribution shows maximum of SCI patients were labor (25.5% n=26), job holders (24.5% n=25), students (19.6% n=20), farmer (12.7% n=12), business (9.8% n=10) and most of the females were housewife (7.8% n=8). Here, the table shows higher percentage of SCI cases in the group of students and job holder, it may be due to high level of involvement in different physical activities and driving.

4.1.5 Marital status:
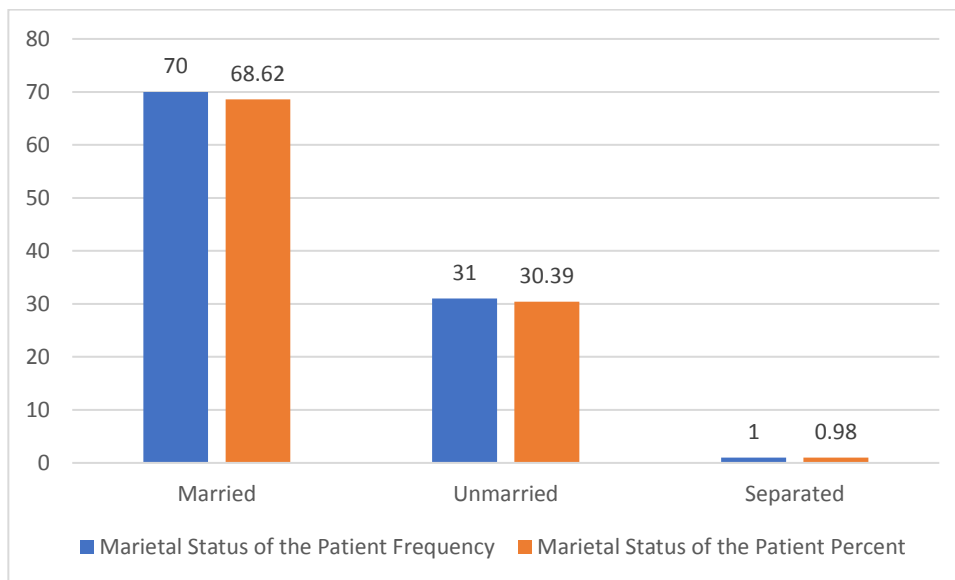
Fig: 4.1.5 Marital status of participants

We have asked the participants about their marital status giving them the 4 options (married, unmarried, widowed and separated). Among them only one was separated and there were no widowed, about 68.63% are married and 30.69% of them are unmarried.

4.1.6 Religion distribution:

Religion of the Patient Percent

Hindu
11%

Muslim
89%
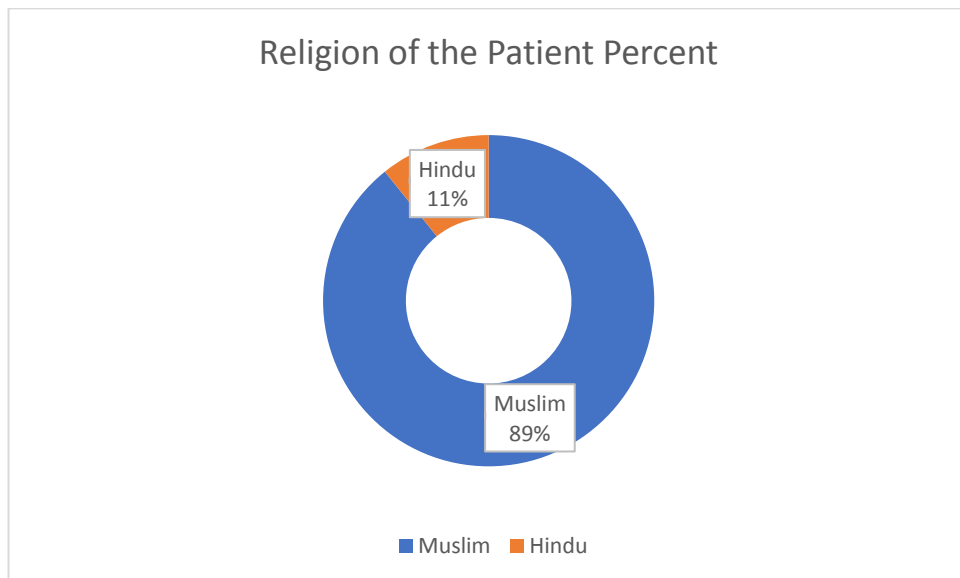
■ Muslim ■ Hindu

Fig: 4.1.6 Religion of the patients

In this sample 90% (n=91) of the patients were Muslims and rest 10% (n=11) were Hindu.
It matches with the overall population distribution of the country.

4.1.6 Duration of injury:

Table 4.1.6 Frequency of duration of injury

Duration of injury	Frequency	Percent
1- 12 months	91	89.2
13 months and above	11	10.8
Total	102	100.0
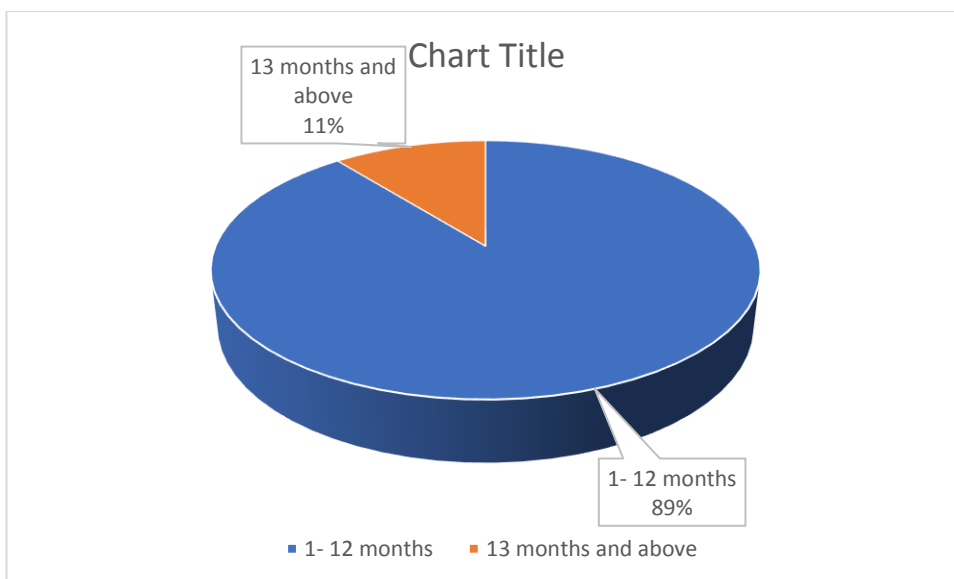
Fig: 4.1.6 Duration of injury of the patients

Most of the SCI patients attending at CRP have injury duration one year or less (about 90%) and the other 10% had more than one year of injury duration. It implies that in Bangladesh maximum patient's follow-up within one years of injury due to high mortality rate or other causes.

4.1.7 Duration of hospital stay:

Table 4.1.7 Duration of hospital stay

Duration of hospital stay	Frequency	Percent
1-3 months	70	68.6
More than 3 months	32	31.4
Total	102	100.0
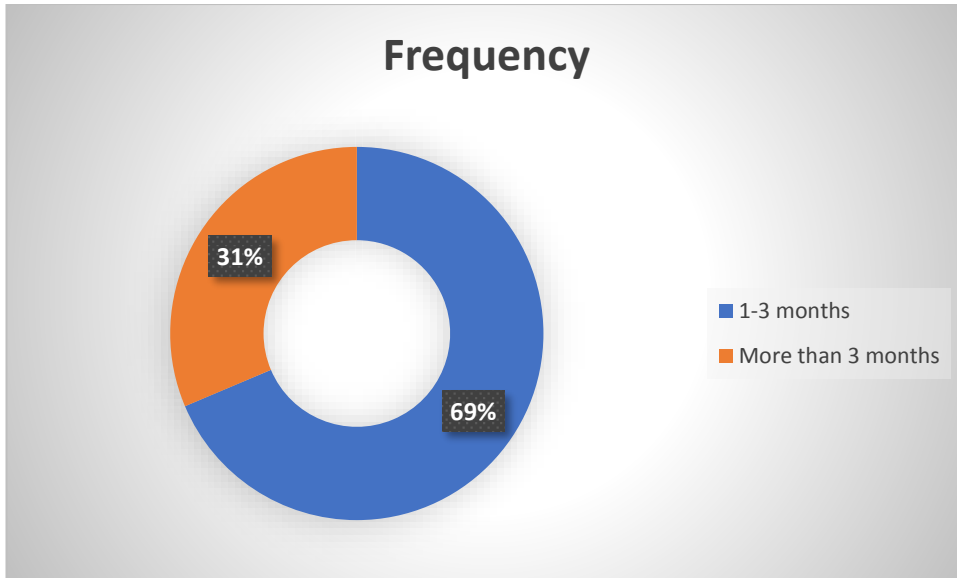
Fig: 4.1.7 Duration of hospital stay

About 68.6% of the total patient's duration of stay in the hospital was 1-3 months and about 31.4% of them had made in the hospital is more than 3 months. Thus, majority of the patients stay less than 3 months in CRP after the injury and any secondary complications.

4.1.8 Assistive aids used by patients:
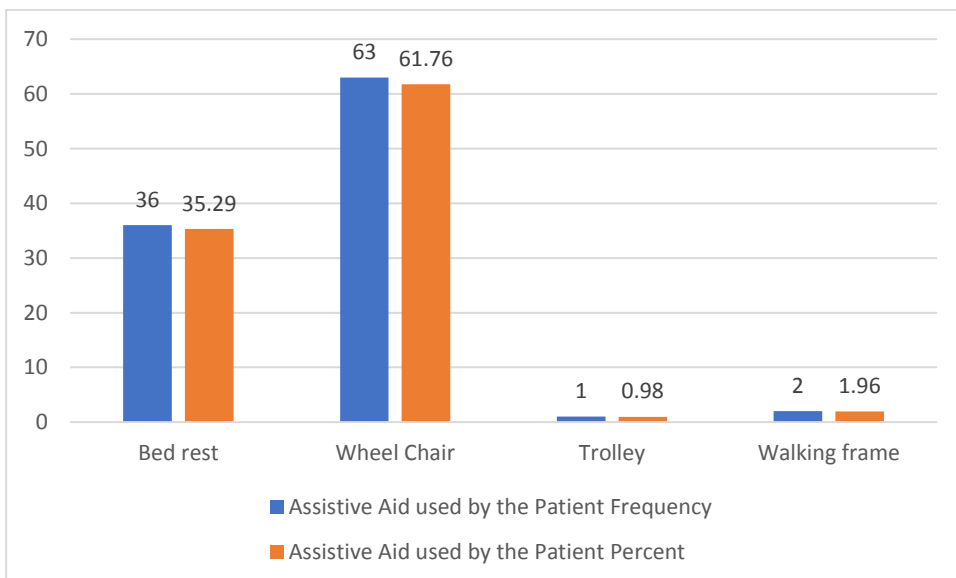
Fig: 4.1.7 assistive aids used by patient

There were 4 assistive aids which are using by patients. It was an open-ended question so we found above mentioned assistive aids. Here, out of 102 participants 36 (35.29%) were not using any kind of assistive devices because they were in bed rest, majority were using wheel chair 63 (61.7%) some of them were using trolley and walking frame as assistive aids. It is not wrong to say that in CRP most of the SCI patients use wheel chair as a assistive device.

4.1.8 Level of Injury distribution:

Table 4.1.8 Frequencies of level of injury

Level of the Injury	Frequency	Percent
Cervical	42	41.2
Upper Thoracic	27	26.5
Lower Thoracic	28	27.5
Lumbar	5	4.9
Total	102	100.0
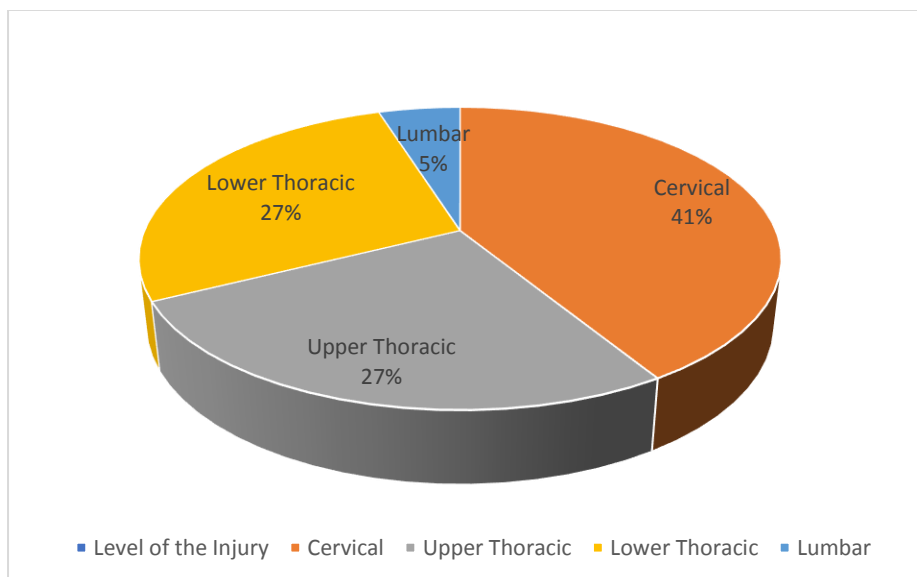
Fig: 4.1.8 Diagram of level of injury distribution

The questionnaire contains 5 options for level of injury where we could not find any sacral level injury patient so there are 4 level of injury distribution. They are, cervical which includes 41.18% of sample, upper thoracic level of injury possesses 26.47% of sample obsecvation, lower thoracic being second highest of prevalence poses 27.45% of the patients second to cervical injury and at last lumbar injury were less common among the participants 4.95%.

So, we can say that in Bangladesh, injury at cervical level is the most common followed by lower thoracic and upper thoracic.

4.2. Distribution of Secondary Health Complications:

Table 4.2 Distribution of secondary health complications

Secondary health Complications	Not Affected		Affected	
	Frequency	N %	Frequency	N %
Pressure Ulcer	42	41.2%	60	58.8%
Injury caused by loss of sensation	57	55.9%	45	44.1%
Spasticity	62	60.8%	40	39.2%
Contractures	86	84.3%	16	15.7%
Heterotrophic Bone Ossification	97	95.1%	5	4.9%
Diabetes Mellites	86	84.3%	16	15.7%
Bladder dysfunction	27	26.5%	75	73.5%
Urinary Tract Infection	68	66.7%	34	33.3%
Bowel Dysfunction	23	22.5%	79	77.5%
Sexual Dysfunction	87	85.3%	15	14.7%
Autonomic Dysreflexia	71	69.6%	31	30.4%
Postural Hypotension	78	76.5%	24	23.5%
Circulatory Problems	62	60.8%	40	39.2%
Respiratory Problems	73	71.6%	29	28.4%
Pain not related to overuse	29	28.4%	73	71.6%
Pain related to overuse	67	65.7%	35	34.3%

The above presented frequency table has the number and percentage of sample those who are affected or not affected by the secondary health complication after the spinal cord injury. As we have mentioned earlier that we have collected information from a total of 102 patients from one of the biggest rehabilitation center in Bangladesh called CRP. There are 16 complications listed in questionnaire and were asked to every SCI patients individually. The frequency of those complications among the participants are shown in the table 4.2.

The first complication asked was pressure ulcer and out of 102 SCI patients 60 patients were affected by pressure ulcer. Whereas, 42 persons were not affected by pressure ulcer.

There were considerable numbers of patients affected by injury due to loss of sensation. The data shows 44.1% were affected and 55.9% were not affected from this condition.

Third condition was spasticity, and the prevalence was 39.2%. Rest of them i.e. 60.8% were not affected from this condition.

Contracture is another complication that may arise after SCI. In this data set, 15.7% were affected by contracture and 84.3% were not affected by contracture.

Fifth condition was heterotrophic bone ossification. It has low prevalence in this data set. Only 4.9% were found with this condition whereas rest of them 95.1% had not suffered from this condition.

Diabetes mellites was also less common among the SCI patients. Only 15.7% were affected by diabetes mellites and 84.3% were not affected by diabetes mellites.

Bowel and bladder dysfunctions were the most common complications among all the conditions. Out of total patients 73.5% and 77.5% have these prevalence rate respectively, and 26.5% and 22.5% were not affected by those conditions.

33.3% were affected by the urinary tract infection (UTI) and 66.7% were not affected by this condition.

It was a little difficulty in assessing the sexual dysfunction as patients hesitated to share this issue. However, our finding is, 14.7% experienced problems and 85.3% said that they didn't experience any problem or do not wanted to tell.

Autonomic dysreflexia (AD) had a prevalence of 30.4% and rest 69.6% were free from this condition.

Postural hypotension is another condition which has great impact on SCI patient's life. Here, the prevalence of postural hypotension was found 23.5% and 76.5% were not affected by the postural hypotension.

39.2% (n=40) were affected by the circulatory problems whereas 60.8% (n=62) were not affected by circulatory problems.

The data shows that 28.4% of the patients are affected by the respiratory problems and rest of the 71.6% are free from respiratory problem.

Another common secondary condition was chronic pain. The prevalence of chronic pain was found 71.6% and 28.4% were not experiencing it.

The last condition we questioned was pain due to over use and it was less common compared to pain not due to over use. 34.3% are experiencing pain due to over use and 65.7% told that they are not experiencing such kind of pain.

4.3 Severity of Secondary Health Complications:

Table 4.3 Severity of SCHs

Secondary health Complications	Not Affected		Mild		Moderate		Severe	
	F	N %	F	N %	F	N %	F	N %
Pressure Ulcer	42	41.2%	3	2.9%	11	10.8%	46	45.1%
Injury caused by loss of sensation	57	55.9%	4	3.9%	9	8.8%	32	31.4%
Spasticity	62	60.8%	2	2.0%	10	9.8%	28	27.5%
Contractures	86	84.3%	1	1.0%	4	3.9%	11	10.8%
Heterotrophic Bone Ossification	97	95.1%	1	1.0%	0	.0%	4	3.9%
Diabetes Mellites	86	84.3%	0	.0%	1	1.0%	15	14.7%
Bladder dysfunction	27	26.5%	3	2.9%	6	5.9%	66	64.7%
Urinary Tract Infection	68	66.7%	2	2.0%	2	2.0%	30	29.4%
Bowel Dysfunction	23	22.5%	4	3.9%	8	7.8%	67	65.7%
Sexual Dysfunction	87	85.3%	1	1.0%	0	.0%	14	13.7%
Autonomic Dysreflexia	71	69.6%	5	4.9%	6	5.9%	20	19.6%
Postural Hypotension	78	76.5%	2	2.0%	5	4.9%	17	16.7%
Circulatory Problems	62	60.8%	10	9.8%	9	8.8%	21	20.6%
Respiratory Problems	73	71.6%	8	7.8%	11	10.8%	10	9.8%
Pain not related to overuse	29	28.4%	7	6.9%	21	20.6%	45	44.1%
Pain related to overuse	67	65.7%	3	2.9%	4	3.9%	28	27.5%

This table shows the severity of the secondary health complications in SCI patients (within our sample). The severity was higher in bladder/bowel dysfunction, pressure ulcer, pain,

UTI and spasticity. Other conditions had less severe effect on SCI patients. All the samples (102) were affected by at least one condition and maximum were affected by multiple conditions. Least severity was found in HBO, respiratory, contracture, diabetes and sexual dysfunction.

So, we can say that severity is higher in bowel/bladder dysfunction, pressure ulcer and pain, therefore, these conditions need to be focused more and dealt with treatment and prevention.

4.4 Association between socio-demographical variables and secondary health complications:

4.4.1 Relation between pressure ulcer and socio-demographic variables using binary logistic regression model:

Table 4.4.1 Pressure ulcer and socio-demographic variables

Pressure ulcer

	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B) Lower	Upper
Step 1ª Gender (1)	.135	.622	.047	1	.829	1.144	.338	3.870
Education	.178	.242	.542	1	.462	1.195	.744	1.921
Marital status	.627	.689	.827	1	.363	1.872	.485	7.229
Religion	-.476	.713	.444	1	.505	.622	.154	2.516
Duration injury	.074	.043	2.979	1	.084	1.077	.990	1.171
Duration hospital	.029	.111	.069	1	.793	1.030	.828	1.281
Assistive aids	-.928	.432	4.626	1	.031	.395	.170	.921
Level of injury	-.093	.254	.135	1	.713	.911	.554	1.498
Age of patient	.266	.267	.992	1	.319	1.304	.773	2.201
Constant	.134	1.739	.006	1	.939	1.143		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

In the above table 4.4.1, we tried to establish the relation between pressure ulcer and socio-demographic factors which are listed above.

At first there is gender which has two categories male and female and the e^{β} value is 1.144, which is >1 so the interpretation is male has 1.144 times more pressure ulcer than female.

Similarly, higher education level patients had more pressure ulcer by 1.195 times than lower education level patients. Unmarried were more affected by pressure ulcer than married by 1.89 times. Muslims have more pressure ulcer ratio than Hindus. And duration of injury and hospital stay have positive relation i.e. pressure ulcer is higher for patients with longer duration of injury and hospital stay. Age has positive relation i.e. elders had more pressure ulcer than youngers. Whereas, for assistive aids and level of injury the e^{β} value is<1 so the interpretation is in this sample pressure ulcer in patients who are in bed rest was higher than the wheel chair user patients and lower the level of spinal cord injury had lesser pressure ulcer.

Only the assistive aids used have statistical significance ($p<0.05$) So, we can state that there is association between pressure ulcer and assistive aids using.

Model $\pi(x) = \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{0.134+\beta x}}{1+e^{0.134+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi}) = \alpha + \beta x$

Here, odds ratio for duration of injury is $e^{\beta} = e^{0.074}$

$e^{0.074} = 1.077$

So, increase in duration of injury increases the pressure ulcer by 1.077 times.

And odds ratio for assistive aids is $e^{\beta} = e^{0.031}$

$e^{0.031} = 0.395$

So, pressure ulcer for wheelchair users is 0.395 times less than bed rest patients.

4.4.2 Relation between injury due to loss of sensation and socio-demographic variables:

Table 4.4.2 Injury due to loss of sensation and socio-demographic variables using binary logistic regression model:

Injury due to loss of sensation

	B	S.E.	Wald	Df	Sig.	Exp(B)	95.0% C.I. for EXP(B) Lower	Upper
Step 1ª Gender (1)	1.004	.835	1.447	1	.229	2.730	.532	14.016
Education	-.193	.287	.452	1	.501	.825	.470	1.446
Marital status	-.794	.805	.974	1	.324	.452	.093	2.189
Religion	.868	.893	.945	1	.331	2.382	.414	13.700
Duration injury	.062	.031	4.158	1	.041	1.064	1.002	1.130
Duration hospital	.003	.131	.000	1	.984	1.003	.775	1.297
Assistive aids	-2.720	.616	19.490	1	.000	.066	.020	.220
Level of injury	.117	.299	.153	1	.696	1.124	.625	2.022
Age of patient	.052	.294	.031	1	.860	1.053	.592	1.874
Constant	2.929	1.970	2.210	1	.137	18.706		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.2 it is evident that, the value of e^β is >1 in gender, religion, duration of injury and hospital stay, level of injury and age, so, Muslims males and having longer duration of injury and hospital stay, with lower level of spinal cord injury and elders were more affected by injury due to loss of sensation than females, Hindus, having shorter duration of injury and hospital stay, with higher level of spinal cord injury and youngers.

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Whereas, e^β value of education level, marital status and assistive aids use is <1 so, higher education level, unmarried and wheel chair user patients were less affected by injury due to loss of sensation than the married, lower education level and bed rest patients.

Here, duration of injury and assistive device have statistical significance (p<0.05) so we can state that there is a significant relationship between these factors and injury due to loss of sensation.

Model $\pi(x)= \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{2.929+\beta x}}{1+e^{2.929+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi})= \alpha + \beta x$

Here, odds ratio of duration of injury is $e^B = e^{0.062}$

$e^{0.062} = 1.064$

So, increase in duration of injury increases the injury due to loss of sensation by 1.064.

And, odds ratio for assistive aids is $e^B = e^{-2.720}$

$e^{-2.720} = 0.066$

So, injury due to loss of sensation in wheelchair users is 0.066 times less than bed rest patients.

4.4.3 Relation between spasticity and socio-demographic variables:

Table 4.4.3 spasticity and socio-demographic variables using binary logistic regression model:

Spasticity

		B	S.E.	Wald	Df	Sig.	Exp(B)	95.0% C.I. for EXP(B) Lower	Upper
Step 1[a]	Gender (1)	.373	.700	.284	1	.594	1.452	.368	5.721
	Education	.060	.272	.049	1	.825	1.062	.623	1.811
	Marital status	-.320	.659	.235	1	.628	.726	.199	2.645
	Religion	1.306	.839	2.424	1	.119	3.693	.713	19.124
	Duration injury	.016	.023	.473	1	.492	1.016	.971	1.062
	Duration hospital	.427	.143	8.959	1	.003	1.532	1.159	2.026
	Assistive aids	.859	.452	3.618	1	.057	2.361	.974	5.721
	Level of injury	-.037	.272	.018	1	.893	.964	.565	1.644
	Age of patient	-.645	.289	4.984	1	.026	.525	.298	.924
	Constant	-2.840	1.932	2.162	1	.141	.058		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.3 it is evident that, the value of e^β is >1 in gender, education, religion, duration of injury and hospital stay and assistive aids therefore, spasticity in male, patients with high education level, Hindus, with longer duration of injury and hospital stay and wheel chair patients was higher than the female, patients with lower level of education,

with shorter duration of injury and hospital stay and bed rest patients. Whereas, e^{β} is <1 in marital status, level of injury and age of the patients therefore, unmarried, patients with lower level of injury and elders had less affected by spasticity than married, patients with higher level of spinal cord injury and youngers.

Here, duration of hospital stays and assistive aids used have significance level <0.05 so, patients with spasticity have stayed longer in hospital and wheel chair users were more affected by spasticity than bed rest patient.

Model $\pi(x)= \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{-2.840+\beta x}}{1+e^{-2.840+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi})= \alpha + \beta x$

Here, the odds ratio of duration of hospital stay $e^{B}=e^{0.427}$

$e^{0.299}= 1.532$

So, patients with spasticity tend stay longer duration in hospital by 1.532 times.

And, the odds ratio for assistive aids is $e^{B}= e^{0.859}$

$e^{0.859}= 2.361$

So, spasticity is more wheel chair users by 2.361 times than bed rest patients.

4.4.4 Relation between contracture and socio-demographic variables:

Table 4.4.4 Contracture and socio-demographic variables using binary logistic regression model:

Contracture

	B	S.E.	Wald	Df	Sig.	Exp(B)	95.0% C.I. for EXP(B) Lower	Upper
Step 1ᵃ Gender (1)	1.299	1.034	1.577	1	.209	3.664	.483	27.820
Education	.373	.376	.983	1	.321	1.452	.695	3.033
Marital status	-1.046	.880	1.413	1	.235	.351	.063	1.972
Religion	-.946	1.360	.483	1	.487	.388	.027	5.585
Duration injury	.042	.026	2.642	1	.104	1.043	.991	1.097
Duration hospital	.299	.131	5.203	1	.023	1.348	1.043	1.743
Assistive aids	-.220	.506	.189	1	.664	.803	.298	2.165
Level of injury	-.040	.353	.013	1	.909	.961	.480	1.920
Age of patient	-.430	.355	1.467	1	.226	.650	.324	1.305
Constant	-.733	2.696	.074	1	.786	.481		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.4 it is evident that, the value of e^{β} is >1 in gender, education and duration of injury and hospital stay, so contracture in males, patients with higher education level and the patients with longer duration of injury and hospital stay was higher than the females, with lower education level and patients with shorter duration of hospital stay. Whereas, e^{β} of marital status, religion, assistive aids, level of injury and age of the patients is <1 therefore, unmarried, Hindus, wheel chair users, lower level of injury patients and

elders were less affected than married, Muslims, bed rest patients, patients with higher level of injury and youngers.

Here, the patients with contracture tend to stay more in hospital (p<0.05).

Model $\pi(x) = \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{-0.733+\beta x}}{1+e^{-0.733+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi}) = \alpha + \beta x$

Here, odds ratio of duration of hospital stay is $e^B = e^{0.299}$

$e^{0.299} = 1.348$

So, patients with contractures stay at hospital 1.348 times longer than the patients without contractures.

4.4.5 Relation between heterotopic bone ossification and socio-demographic variables:

Table 4.4.5 Heterotopic bone ossification and socio-demographic variables using binary logistic regression model:

Heterotopic bone ossification

	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B) Lower	Upper
Step 1ᵃ Gender (1)	31.236	5.903E3	.000	1	.996	3.677E13	.000	.
Education	-2.563	1.587	2.608	1	.106	.077	.003	1.729
Marital status	1.260	2.140	.347	1	.556	3.524	.053	233.626
Religion	6.662	3.557	3.508	1	.061	781.887	.734	8.327E5
Duration injury	-.197	.291	.459	1	.498	.821	.465	1.452
Duration hospital	1.832	.997	3.376	1	.066	6.246	.885	44.083
Assistive aids	-1.843	1.852	.990	1	.320	.158	.004	5.972
Level of injury	-1.932	1.501	1.657	1	.198	.145	.008	2.745
Age of patient	-.608	.792	.590	1	.443	.544	.115	2.571
Constant	-38.074	5.903E3	.000	1	.995	.000		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.5 it is evident that, the value of e^{β} is >1 in gender, marital status, duration of injury and religion so, heterotopic bone ossification was higher in male, unmarried, with longer duration of hospital stay and Hindus than female, married, patients

with shorter duration of hospital stay and Muslims. Whereas, e^{β} is <1 in level of education, duration of injury, assistive aids used, level of injury and age therefore, HBO in patients with higher level of education and duration of injury, wheel chair user patients, patients with lower level of injury and elders is lesser than patients with lower level of education, shorter duration of injury, bed rest patients, higher level of injury and youngers. Patients with HBO tend to stay longer in hospital ($p<0.05$).

Model $\pi(x) = \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{-38.074+\beta x}}{1+e^{-38.074+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi}) = \alpha + \beta x$

Here, odds ratio of duration of hospital stay is $e^{B} = e^{1.832}$

$e^{1.832} = 6.246$

So, patients with HBO stay 6.246 times longer duration than the patients without HBO.

4.4.6 Relation between diabetes mellites and socio-demographic variables:

4.4.6 Diabetes mellites and socio-demographic variables using binary logistic regression model:

Diabetes mellites

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B) Lower	Upper
Step 1[a]	Gender (1)	.368	1.218	.091	1	.763	1.444	.133	15.731
	Education	.366	.325	1.267	1	.260	1.442	.762	2.727
	Marital status	-.522	1.234	.179	1	.672	.593	.053	6.665
	Religion	-.096	.979	.010	1	.922	.908	.133	6.188
	Duration injury	-.005	.050	.010	1	.919	.995	.902	1.098
	Duration hospital	-.234	.185	1.594	1	.207	.792	.551	1.138
	Assistive aids	-.602	.667	.814	1	.367	.548	.148	2.025
	Level of injury	-.071	.400	.031	1	.860	.932	.426	2.039
	Age of patient	.867	.354	5.990	1	.014	2.380	1.189	4.766
	Constant	-2.890	2.483	1.355	1	.244	.056		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.6 it is evident that, only the age has significance level <0.05 so there is a relation between diabetes mellites and age. To know the pattern, we should know the value of e^{β} and it is 2.31 and it is higher than 1. So, we can say that increase in age has increased the diabetes mellites by 2.31 times in this sample.

Model $\pi(x)= \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{-2.890+\beta x}}{1+e^{-2.890+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi})= \alpha + \beta x$

Here, odds ratio of age is $e^B = e^{0.867}$

$e^{0.867} = 2.380$

So, increase in age increases the risk of getting diabetes mellites by 2.380 in SCI patients.

4.4.7 Relation between bladder dysfunction and socio-demographic variables:

Table 4.4.7 Bladder dysfunction and socio-demographic variables using binary logistic regression model:

Bladder dysfunction

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B)	
								Lower	Upper
Step 1[a]	Gender (1)	.172	.702	.060	1	.806	1.188	.300	4.705
	Education	-.360	.306	1.383	1	.240	.698	.383	1.271
	Marital status	-.330	.740	.198	1	.656	.719	.169	3.069
	Religion	-.638	.800	.636	1	.425	.528	.110	2.535
	Duration injury	.024	.032	.556	1	.456	1.025	.961	1.092
	Duration hospital	-.120	.127	.888	1	.346	.887	.691	1.138
	Assistive aids	-1.436	.528	7.410	1	.006	.238	.085	.669
	Level of injury	-.618	.302	4.201	1	.040	.539	.298	.973
	Age of patient	-.057	.305	.036	1	.851	.944	.520	1.716
	Constant	6.829	2.311	8.729	1	.003	924.046		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.7 it is evident that, significance level for assistive aids used and level of injury is <0.05. Therefore, there is a relationship between these predictive variables and bladder dysfunction. The e^{β} value for both is <1 so, we can say that patients with bladder dysfunction are in bed rest rather than wheel chair users and higher level of injury i.e. cervical and upper thoracic have higher ratio of bladder dysfunction than the lower levels.

Model $\pi(x)= \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{6.829+\beta x}}{1+e^{6.829+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi})= \alpha + \beta x$

Here, the odds ratio of assistive aids is $e^B = e^{-1.436}$

$e^{-1.436} = 0.238$

So, bladder dysfunction is 0.238 times less in wheelchair users than patients with bed rest.

And, the odds ratio of level of injury is $e^B = e^{-0.618}$

$e^{-0.618} = 0.539$

So, bladder dysfunction is 0.539 times less in the patients with lower level of injury than the patients with higher level of injury.

4.4.8 Relation between urinary tract infection and socio-demographic variables:

Table 4.4.8 Urinary tract infection and socio-demographic variables using binary logistic regression model:

Urinary tract infection

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B)	
								Lower	Upper
Step 1ᵃ	Gender (1)	.094	.638	.022	1	.883	1.098	.315	3.836
	Education	-.008	.256	.001	1	.975	.992	.600	1.640
	Marital status	-.457	.619	.547	1	.460	.633	.188	2.128
	Religion	-.087	.753	.013	1	.908	.917	.210	4.007
	Duration injury	.062	.028	4.971	1	.026	1.064	1.008	1.124
	Duration hospital	-.032	.110	.082	1	.775	.969	.781	1.203
	Assistive aids	-.009	.397	.000	1	.983	.992	.456	2.158
	Level of injury	-.179	.266	.453	1	.501	.836	.496	1.409
	Age of patient	-.331	.267	1.537	1	.215	.719	.426	1.212
	Constant	.779	1.742	.200	1	.655	2.178		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.8 it is evident that, the statistical significance is only in duration of injury (p<0.05), and e^{β} value is >1 therefore, patients having longer history of injury have more chance to get affected by UTI.

Model $\pi(x) = \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{0.779+\beta x}}{1+e^{0.779+\beta x}}$ here β= value of B in each category.

Logit Model $\left(\dfrac{\pi}{1-\pi}\right) = \alpha + \beta x$

Here, odds ratio of duration of injury is $e^B = e^{0.062}$

$e^{0.062} = 1.064$

So, UTI is 1.062 times odds of duration of injury.

4.4.9 Relation between bowel dysfunction and socio-demographic variables:

Table 4.4.9 Bowel dysfunction and socio-demographic variables using binary logistic regression model:

Bowel dysfunction

		B	S.E.	Wald	Df	Sig.	Exp(B)	95.0% C.I. for EXP(B) Lower	Upper
Step 1ᵃ	Gender (1)	-.555	.778	.508	1	.476	.574	.125	2.638
	Education	-.620	.350	3.129	1	.077	.538	.271	1.069
	Marital status	-.610	.741	.676	1	.411	.543	.127	2.324
	Religion	-.891	.828	1.158	1	.282	.410	.081	2.078
	Duration injury	.011	.029	.132	1	.717	1.011	.954	1.071
	Duration hospital	-.138	.132	1.089	1	.297	.871	.673	1.128
	Assistive aids	-1.377	.523	6.938	1	.008	.252	.091	.703
	Level of injury	-.545	.321	2.882	1	.090	.580	.309	1.088
	Age of patient	-.014	.318	.002	1	.965	.986	.528	1.841
	Constant	8.574	2.564	11.185	1	.001	5.294E3		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.9 it is evident that, the assistive device used has statistical significant effect (p<0.05) and the level of injury also have statistical significance at 10% level of significance (p<0.10). And e^β value is <1 in both the cases.

It suggests that, higher ratio of patients with bowel dysfunction are at bed rest and have higher level of spinal cord injury i.e. upper thoracic or cervical.

Model $\pi(x) = \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{8.574+\beta x}}{1+e^{8.574+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi}) = \alpha + \beta x$

Here, odds ratio of level of injury is $e^B = e^{-0.545}$

$e^{-0.545} = 0.580$

So, bowel dysfunction is 0.580 times less in lower level of injury than higher level of injury.

4.4.10 Relation between sexual dysfunction and socio-demographic variables:

Table 4.4.10 Sexual dysfunction and socio-demographic variables using binary logistic regression model:

Sexual dysfunction

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B)	
								Lower	Upper
Step 1ª	Gender (1)	20.771	8.148E3	.000	1	.998	1.049E9	.000	.
	Education	-.110	.346	.101	1	.751	.896	.455	1.765
	Marital status	-23.688	5.026E3	.000	1	.996	.000	.000	.
	Religion	-1.045	1.297	.650	1	.420	.352	.028	4.466
	Duration injury	.129	.088	2.130	1	.144	1.138	.957	1.353
	Duration hospital	.096	.161	.356	1	.551	1.101	.803	1.508
	Assistive aids	-.925	.670	1.904	1	.168	.397	.107	1.475
	Level of injury	.327	.384	.726	1	.394	1.387	.654	2.941
	Age of patient	-.794	.390	4.146	1	.042	.452	.210	.971
	Constant	5.680	9.574E3	.000	1	1.000	292.964		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.10, only the age has statistical significance i.e. $p<0.05$. And the e^{β} value is <1. It suggests that younger age group were sexually not satisfied than the older age group.

Model $\pi(x) = \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{5.680+\beta x}}{1+e^{5.680+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi}) = \alpha + \beta x$

4.4.11 Relation between autonomic dysreflexia and socio-demographic variables:

Table 4.4.11 Autonomic dysreflexia and socio-demographic variables using binary logistic regression model:

Autonomic dysreflexia

	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B) Lower	Upper
Step 1ᵃ Gender (1)	-.792	.689	1.322	1	.250	.453	.117	1.747
Education	-.238	.291	.665	1	.415	.788	.445	1.396
Marital status	-1.056	.768	1.889	1	.169	.348	.077	1.568
Religion	.598	.883	.458	1	.498	1.818	.322	10.255
Duration injury	.012	.024	.246	1	.620	1.012	.966	1.061
Duration hospital	.065	.122	.288	1	.592	1.068	.841	1.356
Assistive aids	.039	.404	.010	1	.922	1.040	.471	2.297
Level of injury	-.998	.344	8.403	1	.004	.369	.188	.724
Age of patient	-.784	.340	5.314	1	.021	.457	.235	.889
Constant	4.429	2.109	4.411	1	.036	83.808		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.11 it is evident that, the level of injury and the age group have statistical significance i.e. $p < 0.05$. and the e^{β} value is <1.

Therefore, we can state that, AD is less in lower level of injury and for older age group patients. In other word prevalence of AD is higher in higher level of injury patients i.e. upper thoracic or cervical, and in younger age group.

Model $\pi(x) = \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{4.429+\beta x}}{1+e^{4.429+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi}) = \alpha + \beta x$

Here, odds ratio of level injury is $e^B = e^{-0.998}$

$e^{-0.998} = 0.369$

So, AD is 0.369 times odds of lower level of injury patients than higher level of injury patients.

And, odds ratio of age of the patients is $e^B = e^{-0.784}$

$e^{-0.784} = 0.457$

So, AD is 0.457 times odds of age of the patients.

4.4.12 Relation between postural hypotension and socio-demographic variables:

Table 4.4.12 Postural hypotension and socio-demographic variables using binary logistic regression model:

Postural hypotension

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B) Lower	Upper
Step 1[a]	Gender (1)	.299	.781	.147	1	.701	1.349	.292	6.234
	Education	.449	.340	1.737	1	.187	1.566	.804	3.053
	Marital status	.207	.774	.072	1	.789	1.230	.270	5.611
	Religion	-1.136	1.227	.858	1	.354	.321	.029	3.554
	Duration injury	-.007	.026	.067	1	.796	.993	.944	1.045
	Duration hospital	.056	.128	.190	1	.663	1.058	.822	1.360
	Assistive aids	.836	.461	3.288	1	.070	2.307	.935	5.694
	Level of injury	-.859	.368	5.455	1	.020	.424	.206	.871
	Age of patient	-.320	.333	.921	1	.337	.727	.378	1.395
	Constant	-.482	2.375	.041	1	.839	.617		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.12 it is evident that, level of injury has statistical significance i.e. $p<0.05$. And e^{β} value is <1. So, we can say that lower level of injury is less significant to postural hypotension, in other word higher level of injury have caused postural hypotension than lower level.

Model $\pi(x) = \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{-0.482+\beta x}}{1+e^{-0.482+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi}) = \alpha + \beta x$

Here, odds ratio of level of injury is $e^B = e^{-0.859}$

$e^{-0.859} = 0.424$

So, postural hypotension is 0.424 times odds for lower level of injury patients than higher

level of injury patients.

4.4.13 Relation between circulatory problems and socio-demographic variables:

Table 4.4.13 Circulatory Problems and socio-demographic variables using binary logistic regression model:

Circulatory problems

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B)	
								Lower	Upper
Step 1ª	Gender (1)	.059	.647	.008	1	.927	1.061	.299	3.767
	Education	.011	.249	.002	1	.965	1.011	.620	1.647
	Marital status	-1.103	.630	3.067	1	.080	.332	.097	1.140
	Religion	1.168	.742	2.481	1	.115	3.217	.752	13.766
	Duration injury	.042	.024	3.023	1	.082	1.043	.995	1.093
	Duration hospital	.269	.125	4.608	1	.032	1.308	1.024	1.672
	Assistive aids	-.025	.387	.004	1	.948	.975	.457	2.081
	Level of injury	.025	.256	.009	1	.923	1.025	.621	1.692
	Age of patient	-.478	.259	3.399	1	.065	.620	.373	1.031
	Constant	-.119	1.698	.005	1	.944	.888		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.13 it is evident that, duration of injury and age have statistical significance i.e. $p<0.10$ at 10% level of significant and hospital stays has $p<0.05$ at 5% level of significance.

Duration of injury has e^{β} value is >1, so it suggests that circulatory problems are more in patients with history of longer duration of injury. Similarly, the patients with circulatory problems tend to stay longer in hospital.

Age has e^{β} value is <1, so the patients with circulatory problems less likely for elders.

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Model $\pi(x) = \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{-0.119+\beta x}}{1+e^{-0.119+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi}) = \alpha + \beta x$

Here, odds ratio of duration of injury is $e^{B} = e^{0.042}$

$e^{0.042} = 1.043$

So, circulatory problems are 1.043 times odds of duration of injury in SCI patients.

4.4.14 Relation between respiratory problems and socio-demographic variables:

Table 4.4.14 Respiratory problems and socio-demographic variables using binary logistic regression model:

Respiratory problems

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B) Lower	Upper
Step 1[a]	Gender (1)	-1.978	.797	6.157	1	.013	.138	.029	.660
	Education	-.022	.298	.005	1	.942	.978	.545	1.755
	Marital status	1.134	.680	2.784	1	.095	3.108	.820	11.778
	Religion	.463	.910	.259	1	.611	1.589	.267	9.465
	Duration injury	.000	.023	.000	1	.996	1.000	.955	1.046
	Duration hospital	.009	.128	.005	1	.944	1.009	.784	1.298
	Assistive aids	-.066	.421	.025	1	.875	.936	.410	2.135
	Level of injury	-1.568	.436	12.959	1	.000	.208	.089	.489
	Age of patient	.515	.291	3.132	1	.077	1.673	.946	2.959
	Constant	.030	1.940	.000	1	.988	1.031		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.14 it is evident that, gender, level of injury and age have statistical significance ($p<0.05$ and $p<0.10$). The age has significance at 10% level of significant. e^{β} value is <1 for gender, it means female were affected more than male by respiratory problems. For level of injury, e^{β} value is <1, so the respiratory problems are less in lower level of injury patients or higher level of injury patients have significant level of respiratory

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problems. Whereas, the e^β value of age group is >1, that means older the patients higher the respiratory problems.

Model $\pi(x)= \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{0.03+\beta x}}{1+e^{0.03+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi})= \alpha + \beta x$

Here, odds ratio of gender is $e^B = e^{-1.978}$

$e^{-1.978} = 0.138$

So, for respiratory problems males are 0.138 times odds than female with SCI injury.

Odds ratio of level of injury is $e^B = e^{-1.568}$

$e^{-1.568} = 0.208$

So, respiratory problems are 0.208 times odds in higher level injury patients than lower level of injury patients with SCI injury.

And, odds ratio of age of the patients is $e^B = e^{0.515}$

$e^{0.515} = 1.673$

So, respiratory problems are 1.673 times odds with age of the patients.

4.4.15 Relation between pain not related to overuse and socio-demographic variables:

Table 4.4.15 Pain not related to overuse and socio-demographic variables using binary logistic regression model:

Pain not related to overuse

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B) Lower	Upper
Step 1[a]	Gender (1)	.357	.647	.304	1	.581	1.429	.402	5.084
	Education	.081	.264	.094	1	.759	1.084	.647	1.818
	Marital status	-.098	.619	.025	1	.874	.906	.270	3.048
	Religion	-.283	.766	.136	1	.712	.754	.168	3.386
	Duration injury	-.004	.022	.031	1	.861	.996	.954	1.040
	Duration hospital	.035	.112	.095	1	.758	1.035	.831	1.290
	Assistive aids	.201	.408	.243	1	.622	1.223	.550	2.720
	Level of injury	.550	.294	3.487	1	.062	1.733	.973	3.087
	Age of patient	.183	.265	.474	1	.491	1.200	.714	2.018
	Constant	-.967	1.752	.305	1	.581	.380		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.15 it is evident that, only the level of injury has statistical level of significance at 10% level of significant (p<0.10). e^{β} value is >1, therefore, lower level of injuries has greater ratio of pain not related to overuse than higher level of injury.

Model $\pi(x)= \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{-0.967+\beta x}}{1+e^{-0.967+\beta x}}$ here β= value of B in each category.

Logit Model $(\dfrac{\pi}{1-\pi})= \alpha + \beta x$

Here, odds ratio of level of injury is $e^B = e^{0.550}$

$e^{0.550}= 1.733$

So, pain not related to overuse is 1.733 times greater lower level of injury than higher level of injury.

4.4.16 Relation between pain related to overuse and socio-demographic variables:

Table 4.4.16 Pain related to overuse and socio-demographic variables using binary logistic regression model:

Pain related to overuse

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B)	
								Lower	Upper
Step 1a	Gender (1)	-.366	.678	.291	1	.590	.694	.183	2.621
	Education	-.422	.276	2.348	1	.125	.655	.382	1.125
	Marital status	.023	.682	.001	1	.973	1.024	.269	3.899
	Religion	-1.530	1.155	1.757	1	.185	.216	.023	2.081
	Duration injury	-.023	.027	.738	1	.390	.977	.926	1.030
	Duration hospital	.126	.112	1.258	1	.262	1.134	.910	1.414
	Assistive aids	1.295	.507	6.537	1	.011	3.652	1.353	9.858
	Level of injury	-.324	.277	1.374	1	.241	.723	.421	1.243
	Age of patient	-.015	.271	.003	1	.957	.985	.580	1.675
	Constant	.130	2.083	.004	1	.950	1.139		

a. Variable(s) entered on step 1: Gender, Education, Marital status, Religion, Duration injury, Duration hospital, Assistive aids, Level of injury, Age of patient.

From the above table 4.4.16 it is evident that, the assistive aid has a statistical significance with pain related to overuse ($p<0.05$). And e^{β} value is >1. It suggests that wheel chair users have more prevalence ratio than bed rest patient in pain related to overuse.

Model $\pi(x) = \dfrac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \dfrac{e^{0.130+\beta x}}{1+e^{0.130+\beta x}}$ here β= value of B in each category.

Logit Model $\left(\dfrac{\pi}{1-\pi}\right) = \alpha + \beta x$

Here, the odds ratio of assistive aids is $e^{B} = e^{1.295}$

$e^{1.295} = 3.652$

So, pain related to overuse is 3.653 times odds in patients with wheel chair user than the patients with bed rest.

Chapter- V	Discussion

5.1 Socio-demographic

This study investigated the spinal cord injury (SCI) patients and the secondary health complication following the injury in CRP (Center for Rehabilitation of Paralysis) one of the top rehabilitation centers in Bangladesh. This study emphasized on socio demographic factors analysis and their relationship with the secondary health complications. In this chapter, we are going to discuss the findings of this study and the comparison with the other related article of same interests.

Similar type of work done by Quadir et.al in 2017. at CRP and have found that out of 201 respondents 176 (87.6%) were male and 25 (12.4%) were female and the most of the participants were 21- 50 years of age (83.6%). In this work we have found that out of 102 patients 84(82.4%) persons are male and 18(17.6%) are female. This is slightly different may be due to the sample size. And most of the participants were within 21-50 years of age (67.6%). Another study was done in Sweden by Lundström et. al. 2017, has quite similar gender ratio 75% males but the mean age was 63.7 with the standard deviation of 9.6, which is quite high. It shows the difference of prevalence in European and South Asian countries. This study has found that 41.2% patients were tetraplegic whereas 58.8% were paraplegic, the research done by Razzak et al. in 2016 to describe the overall socio-demographic prevalence in Bangladesh showed that 29.5% are tetraplegia and 70.5% paraplegia. Finding of their study is more or less similar to finding of our study. The small amount of different may be due to the study place and sample sizes. Epidemiological study by Rahman et al. in 2017 has similar results too. Employment in participants in this study is 51% and the similar study by Quadir et al. had 47%. This statement suggests similarities to our findings.

5.2 Secondary health complications:

In this study all the 102 participants have at least one secondary health complication.

In our study among 102 SCI patients 60 patients were affected by pressure ulcer. It is 58.8% of total participants. Similar type of study by Quadir et al. had 22.7% of prevalence of pressure ulcer. But the work done my Hossain et al. had stated that there were 2 years of survival after the discharge from the hospital for spinal cord injury and the main cause is

pressure ulcer (55.6%). The South African researcher Joseph C 2016 showed most common complication is pressure ulcer (29.8%). Löfvenmark, I, in 2017 found that 48% of prevalence of pressure ulcer in his study.

There were considerable numbers of patients affected by injury due to loss of sensation. The data shows 44.1% were affected and 55.9% were not affected by this condition. We did not find any supporting article for this, but the injury due to sensation loss may lead to ulcerated wounds and the sepsis.

The prevalence of spasticity was 39.2% rest of them i.e. 60.8% were not affected from this factor. Based on a review work Hegan 2015 indicated that around 70% of the SCI cases experience spasticity.

Contracture is another complication that may arise after SCI. In the present study we have checked that 15.7% of the total SCI patient are affected by contracture and the rest of 84.3% are not affected by contracture. A study was done by Dalyan et al. in 1998 in Turkey and they have showed that 9% of prevalence of contracture among SCI patients. So, our result and Dalyan's result are consistent result.

Heterotrophic bone ossification has low prevalence in this data set. Only 4.9% were found with the condition. Jenet et al. in (2015) show a prevalence rate 20-29% of the SCI patients may get HBO in their life. Hagen (2015) stated that incidence of HBO in SCI patients is 10-53%.

Diabetes mellites was also less common among the SCI patients. Only 15.7% were affected by diabetes mellites and 84.3% were not affected by diabetes mellites. We did not find any articles that relate with this condition but there is significant prevalence in our current study.

Bowel and bladder dysfunctions were the most common complications among all the conditions. They have 73.5% and 77.5% of prevalence rate respectively, and 26.5% and 22.5% were not affected by those conditions. There was a little difficulty in observing the sexual dysfunction as patients hesitated to share this condition. However, our finding was, 14.7% (n=15) experienced problems and 85.3% did not experienced problems. The study done by Park et al. in 2015 in Canada has the similar type of finding as in this study. They have found 58.8% bladder incontinence, 54.0% bowel incontinence, 60.8% sexual dysfunction and 29.4% had all three.

The prevalence of Urinary tract infection (UTI) was 33.3% and 66.7% were not affected by this condition. A study by Adriaansen et al. in 2016 have found that exactly the same result 33.3% were affected by the urinary tract infection.

Autonomic dysreflexia (AD) had a prevalence of 30.4% and rest 69.6% were free from this condition. The study was done by Sezzer et al. in 2015. A literature review on complications following SCI and had found that frequency of AD is in between 19-70% that match with our finding.

Postural hypotension is another condition which has great impact in SCI patient's life. Here, the prevalence of postural hypotension was found to be 23.5% and 76.5% were not affected by the postural hypotension. The literature review by Sezzer et al. in 2015 have found that 21% of SCI patients get postural hypotension. This result supports our finding.

39.2% were affected by the circulatory problems whereas 60.8% did not affected by circulatory problems. Wecht et al. in 2015 have stated that Blood pressure of the patients with SCI was significantly lower than the control group.

The study shows that 28.4% of the patients were affected by the respiratory problems and rest of the 71.6% were free from respiratory problem. A South African research by Joseph C 2016 showed that one of the most common complication as pulmonary complication having prevalence of 23.4%. Hagen (2015) stated that 65% of acute SCI patients suffer from respiratory conditions. All these results match with findings of our findings.

Another common secondary condition was pain which is not due to over use. It has 71.6% of prevalence and 28.4% were not experiencing it. Gorp et al. 2015 has done a literature review on pain in SCI and the literatures suggested that 19-95% of SCI patients have suffered from pain. In our study 34.9% have suffered from pain due to overuse. Another literature review research by Sezzer in 2015 have found that 85% of SCI have suffered from chronic pain. These researches support our findings. Adriaasen et al. in 2016 have found that 63.5% of the SCI patients have musculoskeletal pain and 34.1% have neuropathic pain.

5.3 Secondary health complications and predictive factors:

In this study we have done logistic regression analysis to find the association between socio-demographic variables and secondary health conditions. Here, the socio-demographic

variables and predictive variables like gender, age, duration of injury, level of injury and assistive devices used have significant relations with the secondary health complications. Studies, by Qadir et al., Sezzer, Adriaasen et al., Rehman et al., Dalyan et al., Hagen, Gorp et al., Wecht et al., and so on have supported the outcomes of the current study by showing the similar relations between those variables. Study by Vevo et al (1992) have given the relationship between age and pressure ulcer. Byrne and Salzberg have stated that elders are more likely to get pressure ulcer and other conditions. The study by the Hossain et al. also suggest that the socio- demographical variables have vital role in conditions occurrence and alteration. The research by Joseph C 2016 showed the relation between the level of injury and impairments and consequences all these study result supports the current study result.

Chapter- VI	**Conclusion**

6.1 Conclusion

In conclusion we may say that the males and 3rd decade of age group is more prone to spinal cord injury. The prevalence of paraplegic SCI is more than the tetraplegic SCI. Similarly, most of the patients are wheelchair bound. Pressure ulcer, pain, bladder and bowel dysfunction, UTI and circulatory and respiratory problems have higher prevalence in SCI patients as a secondary health complication. The socio-demographic components as stated gender, level of injury, duration of injury, age and education level have significant association with the secondary health complications of Bangladeshi patients attending at CRP.

6.2 Expected outcomes:

➢ Prevalence of secondary health complications among the SCI patients at CRP.

➢ Association of the secondary health complications with the sociodemographic factors.

➢ Comparisons among and within the sociodemographic factors of the secondary health complications among SCI patients at CRP.

6.3 Utilization of result:

It will help to know the scenario of secondary health complications among the SCI patients at CRP.

This study will also help in relating the secondary health complications with the socio-demographic factors so that, to know the factors which are important to be considered to manage secondary health complications among the SCI patients at CRP.

The results also may indicate the organization and patients to start the programs to aware and manage the secondary health complications.

6.4 Limitation and recommendation:

➢ This study is confined within single institute so may not be applicable in general.

➢ The sample size is not very large and it may not reflect the scenario of the total SCI patients of Bangladesh.

➢ We recommend that, further studies have to be done in similar area and consider the causative factors and risk factors of the complications individually.

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Appendix

I. Questionnaire

Secondary health complications and its association with sociodemographic factors among the patients with spinal cord injury at CRP.

Sociodemographic

1. Name:

2. Permanent address:

3. Age:

4. Gender: Male [ ]   Female [ ]   Others [ ]

5. Educational status:

6. Occupation:

7. Marital status: Married [ ]   Unmarried [ ]   Widowed [ ]   Separated [ ]

8. Religion:

9. Staying

   a) Inside CRP   [ ]

   b) Outside CRP   [ ]

10. Duration of injury:

11. Duration of hospital stay:

12. Assistive aids using:

13. Level of Injury: Cervical (C1-C7)   [ ]

                            Upper Thoracic (T1-T6)   [ ]

Lower Thoracic (T7-T12) ☐

Lumbar (L1-L5) ☐

Sacral ☐

SCI Secondary Conditions Scale

Code:

0   NOT experienced in the last 3 months or not a significant problem
1   MILD or INFREQUENT problem
2   MODERATE or OCCASIONAL problem
3   SEVERE or CHRONIC problem

(put a tick in one box per item only)

	0 Not experienced	1 Mild/ infrequent	2 Moderate/ occasional	3 Severe/ chronic
Q1. Pressure ulcer(s). This includes early signs of pressure ulcers or late stage pressure ulcers.	☐	☐	☐	☐
Q2. Injury caused by loss of sensation. This includes burns from carrying hot liquids on the lap or sitting too close to a heater or fire.	☐	☐	☐	☐
Q3. Muscle spasms (spasticity). This includes jerky involuntary movements in paralysed or partially paralysed muscles.	☐	☐	☐	☐
Q4. Contractures. This includes loss of joint mobility that is present even when a joint is slowly stretched.	☐	☐	☐	☐
Q5. Heterotopic bone ossification. This includes excessive laying down of bone. It is characterised by loss of joint mobility, local swelling and warmth at the area to the touch. This condition is diagnosed by a physician.	☐	☐	☐	☐
Q6. Diabetes mellitus. Diabetes is a problem resulting from irregularities in blood sugar levels. Symptoms include frequent urination and excessive thirst. This condition is diagnosed by a physician.	☐	☐	☐	☐

	0 **Not experienced**	1 **Mild/ infrequent**	2 **Moderate/ occasional**	3 **Severe/ chronic**
Q7. Bladder dysfunction. This includes problems related to incontinence, bladder or kidney stones, kidney problems, urine leakage and urine back up. NOTE: There is a separate item for urinary tract infections.	☐	☐	☐	☐
Q8. Urinary tract infections: This includes infections such as cystitis and pseudomonas. Symptoms include pain when urinating, a burning sensation throughout the body, blood in the urine and cloudy urine.	☐	☐	☐	☐
Q9. Bowel dysfunction: This includes diarrhoea, constipation, incontinence and associated problems.	☐	☐	☐	☐

	0 Not experienced	1 Mild/ infrequent	2 Moderate/ occasional	3 Severe/ chronic
Q10. Sexual dysfunction: This includes dissatisfaction with sexual functioning.	☐	☐	☐	☐
Q11. Autonomic dysreflexia: Symptoms of dysreflexia include sudden rises in blood pressure and sweating, skin blotches, goose bumps, pupil dilation and headache.	☐	☐	☐	☐
Q12. Postural hypotension: This involves a strong sensation of light headedness following a change in position. It is caused by a sudden drop in blood pressure.	☐	☐	☐	☐
Q13. Circulatory problems: This includes swelling of the hands or feet, or blood clots.	☐	☐	☐	☐
Q14. Respiratory problems: This includes respiratory infections or problems due to difficulties breathing, coughing or clearing secretions.	☐	☐	☐	☐
Q15. Pain not related to overuse. This includes neuropathic or visceral pain or pain from any cause except overuse.	☐	☐	☐	☐
Q16. Pain in muscles or joints related to overuse injuries. This includes pain in muscles or joints which is related to overuse (typically occurs in shoulders of people who are pushing manual wheelchairs a lot).	☐	☐	☐	☐

II.Approval letter

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

Ref.

CRP-BHPI/IRB/01/18/189

Date 8/01/2018

To
Ghanshyam Panthi
Part II, M.Sc. in Rehabilitation Science
Session: 2016-17, Student ID: 181160073
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Subject: Approval of the thesis proposal- "Secondary health complications and its association with sociodemographic factors among the patients with spinal cord injury at CRP, Bangladesh" by ethics committee.

Dear Ghanshyam Panthi

Congratulations.
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application on 06/05/2017 to conduct the above mentioned dissertation, with yourself, as the Principal investigator. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Dissertation Proposal
2	Questionnaire (English version)
3	Information sheet & consent form.

Since the study involves answering a questionnaire that take about 20-30 minutes and have no likelihood of any harm to the participants, the members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 9.00 AM on 6th May, 2017 at BHPI.

The institutional Ethics committee 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. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards,

Muhammad Millat Hossain
Assistant Professor, Dept. of Rehabilitation Science
Member Secretary, Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

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

CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404, Fax : 7745069, E-mail : contact@crp-bangladesh.org, www.crp-bangladesh.org

III.Permission letter

Date: 27/01/2018

To

The Head of department,

Department of Spinal Cord Injury

CRP,Chapain, Savar, Dhaka-1343

Subject:Application for permission of data collection for master's thesis

Dear Sir,

With due respect, I am **Ghanshyam Panthi**, student of part-II M.Sc in Rehabilitation Science at Bangladesh Health Professional Institute (BHPI).As per course curriculum,I need to complete a thesis for completion of my Masters program. Hence, I have to conduct a thesis entitled, **"Secondary health complications and its association with sociodemographic factors among the patients with spinal cord injury at CRP"** under honorable supervisor **Professor Dr. Farhad Hossain.** As my research includes spinal cord injury patients, I would like you to grant me the permission to use the information among patients. The purpose of the study is to assess the knowledge and attitude regarding complication of spinal cord injury among patients attended at CRP. Related information will be collected from the patients attending in CRP.

Data collection will require the patients and a small space of CRP. Data will be collected for 3 months from January, 2018. Data collectors will receive informed consents from all participants. Ethical approval is received from the Institutional Review Board (IRB) of Bangladesh Health Profession's Institute (BHPI).

Sincerely yours,

Yours sincerely

Ghanshyam Panthi

Part-II, M.Sc in Rehabilitation Program

BHPI, CRP, Savar, Dhaka

Approved
Please contact with m.m Hossai Incharge, SCI Unit, CRP as a caumfm part of data collection process
28/01/18

Allow to him for data Collection at SCI unit CRP. Savar. Dhaka

Muzaffor Hossain
Senior PT & Incharge SCI Unit
Physiotherapy Department
Savar Dhaka-1343