Faculty of Medicine

University of Dhaka

"REHABILITATION OUTCOME OF SPINAL FIXATION TO THE PARAPLEGIC SPINAL CORD INJURY (SCI) PATIENTS IN BANGLADESH"

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October, 2019

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"REHABILITATION OUTCOME OF SPINAL FIXATION TO THE PARAPLEGIC SPINAL CORD INJURY (SCI) PATIENTS IN BANGLADESH"

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DECLARATION

I declare that the work presented here is my own. All sources used have been cited appropriately. Any mistakes or inaccuracies are my own. I also declare that for any publication, presentation or dissemination of information of the study. I would be bound to take written consent from the Head of the Department of Physiotherapy, BHPI.

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Acronyms

ASIA : American Spinal Injury Association

BHPI : Bangladesh Heath Professions Institute

BMRC : Bangladesh Medical Research Council

CRP : Centre for the Rehabilitation of the Paralysed

FIM : Functional Independence Measure

IRB : Institutional Review Board

IMOSOP : International Medical Society of Paraplegia

NFOWD : National Forum of Organization Working with the Disable

PLoS : Public Library of Science

SCI : Spinal Cord Injury

SPSS : Statistical Package for the Social Science

WHO : World Health Organization

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Abstract

Purpose: To assess the rehabilitation outcome of spinal fixation to the paraplegic spinal cord injury (SCI) patients in Bangladesh. *Objectives:* To explore the socio-demography (age, male& female ratio, occupation, educational background, religion, family types, smoking habit, economical status, marital status, residential area) and also injury related questions like- duration of injury, date of admission, date of discharge, length of hospital stay and cause of injury of the affected group, to measure the rehabilitation outcome of the SCI patients especially the patients of paraplegic spinal cord injury with spinal fixation, their functional independent during admission and after the completing of rehabilitation process. *Methodology:* The study design was Quasi-experimental quantitative study. The sample size were 30 and hospital based simple random sampling technique was used for sample selection from inpatient of Centre for the Rehabilitation of the paralysed (CRP) in Bangladesh which is the largest spinal cord injury rehabilitation centre in South Asia. Motor score was measured by Oxford Muscle Grade Scale, sensory score was measured by Sensory Grading Scale and neurological level, skeletal level and ASIA scale was measured by using ASIA assessment and also functional outcome data was collected by Functional Independence Measure (FIM) scale and data was measured two times during admission and after completing rehabilitation services. All data was analyzed by Statistical Package for the Social Science (SPSS) software version 20.0. *Result:* The finding of the study was that among 30 participants 90% were male most of participants were 11-25 years 46.7% and female participants were 10% where 23.3% (n=7) completed their primary education. Most of them about 86.7% (n=26) lived in rural area. According to Wilcoxon Signed rank test (post-test – pre-test) ASIA scale z= -2.428 and p=0.015 which was less than < 0.05 where total Functional Independence Measure z= - 4.784 and p=0.000 which was significant. *Conclusion:* The results of this study provided more insight into the rehabilitation outcome along with functional outcome of a group of paraplegic spinal cord injury patients with spinal fixation. More research is needed to evaluate the rehabilitation program for these patients.

Key words: Spinal cord injury (paraplegic), Spinal fixation, Rehabilitation.

| CHAPTER-I | INTRODUCTION |

1.1 Background

Spinal cord injury (SCI) is a demolishing disorder that has consequences that comprise deprivation in physical, psychological, and social functioning (Gurcay et al., 2010). It is the most complicated injury of all mischievous injuries where patients usually have permanent and subversive neurologic deficits with disability and the injury causes negative effect on the injured person's functional, medical, psychological and profitable well being (Smith et al., 2013). It is a dense cause of fatality and is reflected in basal changes in lifestyle and quality of life (QOL) for both the persons with SCI and their family members (Kawanishi & Greguol, 2013).

These devastating injury receive into millions of people worldwide and typically has life-long consequences (Friedli et al., 2015). Almost 30 individuals sustain these catastrophic injury every day, in the United States alone (Gomes-Osman et al., 2016).Most usual cause is motor vehicle accidents (38%), falls (>22%), violence (13.5%) and sports and recreational accidents (9%). spinal cord injury increases the risk of other diseases (Jardin et al., 2013).

The range of global prevalence between 236 - 4187 per million is reported (Lee et al., 2014). Standard from the United States appraised that, prevalence rates with traumatic SCI are vary from 50 to 906 people with per million population. One study from Canada appraised that appearance rate is 1,298 per million among Populations. On the other hand, the rate of these injury were estimate about 227, 280, 419 and 526 individuals per million people in the Sweden, Finland, Norway and Iceland. In fine, in Australia, lately avowed a prevalence rate of 681 per million. The prevalence rates of traumatic SCI from Nepal and India, two Asian studies reported that as 849.8 cases per million population in Nepal and 236 cases per million population in India. But there is not available statistics about Bangladesh (Furlan et al., 2013).

The annual incidence of catastrophic SCI is 12.1–57.8 cases per million worldwide (Munce et al., 2013). According to the Noonan et al., (2012) , a number of people living with SCI in the US is approximately 270,000. Every year, an estimated 11,000 SCIs occur in the U.S (American Association of Neurological Surgeons, 2017) and in Europe, the incidence rate is 10.4 to 29.7 per million per year. In Western Europe calculated that 280 per million to 316 per million were injured spinal cord injury (Lee et al., 2014). Lim et al. (2017) stated that the highest prevalence rate of SCI in the United States and which is 906 per million. In Asia, the incidence rates of SCI range from 12.06 - 61.6 per million, while the average age range of affected persons is 26.8 - 56.6 years (Ning et al., 2012). In Asia South and South-East 236 to 464 per million TSCI (Lee et al., 2014). In the United States, the annual incidence of traumatic SCI is 40 cases per million or 12000 new cases each year. Australasia 370 in 1987 to 681 per million in 1998 (Lee et al., 2014). An incidence rate was assessed of 440 per million population in Iran (Furlan et al., 2013).

One of the most immensely populated countries in the world is Bangladesh which is situated in the South Asian subcontinent. Bangladesh carry about 130 million of total population and there about 830 people lived per square kilometre. Jahan & S. (2012) claimed that more than 80% of the population lives in rural area and about 60% of the total diligence force is involved in agriculture. In CRP, Bangladesh, most commonly affected the people of aged between 25-29 of years among them males are more commonly affected (83%) than female and 92% came from rural area and 8% came from urban area further majority of the patients are paraplegia 56%, Cervical lesion present in 44% cases, thoracic lesion 27% and lumber lesion 29% (Islam et al., 2011).

Bangladesh is a developing country where life expectancy of spinal cord injured persons is much inferior than the developed country (Razzak et al., 2011). In all respects of Asia as well as in Bangladesh SCI continues to be a major occasion of incapability (Islam et al., 2011). According to the age, sex, race and socio- cultural activities the causes of SCI may differ from person to person (Hoque et al., 2012). Motor vehicle accidents is the most dense cause of traumatic spinal cord injury. (Chen et al., 2013; Mothe & Tator, 2013; Nwankwo & Uche, 2013).Saunders et al. 2012 reported that the percentage of most

dense causes of SCI are motor vehicle accidents (40.4%), falls (27.9%), and acts of violence (15%) and people with the average age of 40.7 years are most at risk.

Contusion or bruising of the spinal cord are most usual cause of Spinal cord injuries (SCIs) that causes fracture or dislocation occur at the spine due to injury. SCI patient faces distinguishable sorts of contraventions (De Vivo &Chen, 2011). Traffic accidents, gunshot injuries, knife injuries, falls and sports injuries are the most common causes of SCI in the world. Diving was reported to be the most common sport injury. "primary damage'' occurs as a result of flexion, compression, hyperextension or flexion-rotation mechanisms which is the cause of SCI. Primary damage overcome the body by responds such as hemorrhage, inflammation and the release of various chemicals, which are described as secondary damage (Nas et al., 2015).

Complications had a significant impression on those with SCI. Lower level of health-related aspects, such as physical capacity, activities and functional outcome is associated with high incidence of complexity (Haisma et al., 2007). On the early or acute stage of the rehabilitation process the quality of life significantly decreases due to domino effect following the injury (Quadir et al., 2017).Acute complications after a SCI are motor and sensory deficits, instabilities of the thermoregulatory, broncho-pulmonary and cardiovascular system. Neurogenic shock, brady-arrhythmias, hypotension, ectopic beats, abnormal temperature control and disturbance of sweating, vasodilatation and autonomic dysreflexia are the most frequent complications of cervical and high thoracic SCI (Hagen & E.M, 2015). Functional independence and quality of life have been negatively influenced by chronic complications of SCI. Respiratory complications, cardiovascular complications, urinary and bowel complications, spasticity, pain syndromes, pressure ulcers, osteoporosis and bone fractures are common long-term secondary complications afterwards SCI (Sezer et al., 2015).

Because of Spinal cord Injury, patient's faces problem in coping up with society with their new incapacity and serious changes occur within an individual's physical and psychosocial relationship in where they survive. If they suffer long term physical problems, they experience poor health related quality life than the normal persons and it's

minimize the person's involvement in works, education, social and community participations (Ottomaneli & Lind, 2009).

By the calculation of the patient's ASIA scale short and long term functional targets are determined   and taking into consideration medical and social status and the individual rehabilitation plan (Nas et al., 2015). SCI brings biophysical, psychosocial and economic problems because the treatment and rehabilitation process is long, expensive and exhausting (Nas et al., 2015). Now-a-days, enhancing participation in work and restraining disability vocational rehabilitation plays an effective role (Kvam & Eide, 2014). Treatment begins shortly after the injury with acute care and early surgical interventions; thereafter, in the chronic phase, sensory, motor and autonomic dysfunction is treated and it is an ongoing treatment process (Nas et al., 2015). DeVivo et al. (2011) reported that overall mean first year costs were $222,087 and that mean annual cost after 1 year were $68815 (2009 US $). Mean initial acute care costs of $76711 and mean rehabilitation costs of $68543 (2009 US $) have been reported. Munce et al. (2013) indicated that both the average per patient and total direct costs of health care utilization for traumatic SCI increased between 2003 and 2005. The average patient cost rose from $102900 in 2003-2004 to $123674 in 2005-2006.

 Management of nonsurgical treatment is immobilization and advanced trauma life support (Paddison et al., 2011). Passive, active-assisted, active and resistive exercises, cycling and water exercises have to be compatible with the level of SCI and the complications. These exercises will reduce muscle atrophy, decubitus ulcers, inactivity, obesity and bone fractures (Nas et al., 2015).The surgical treatment is decompression and stabilizing technique. Membrane stabilizing agents and neuro-protective agents are recent most popular treatment (Paddison et al., 2011).

In Bangladesh, there are two specialized hospitals for the management of spinal cord injuries (SCI). They are the National Institute of Traumatology Orthopedics and Rehabilitation (NITOR) and the Center for the Rehabilitation of the Paralysed. The Centre for the Rehabilitation of the Paralysed is the only non- government organization in Dhaka, involved in the rehabilitation and management of patients with spinal cord injury for the last 30 years (Islam et al., 2011). In Bangladesh CRP are also continuing

Community Based Rehabilitation (CBR) for SCI people, so that they can participate in the community properly (Ema, 2013).

No curative treatment is left to overcome the difficulties faced by persons with SCI. Therefore rehabilitation programs is the valid goal for treatment for persons with SCI and it's aim to maximizing the independence in daily living activities and providing optimal reintegration in the society (Kong et al., 2013).

Long term rehabilitation programs can improve quality of life, the aim of this study was to determine the rehabilitation outcome of a persons with SCI and make recommendations so that treatment can be tailored to their needs and also aimed to evaluate patient's functional outcome.

1.2 Rational

Spinal cord usually result from an accident that breaks or severely damage the central nerve cord in the body below the level of injury are lost or reduce .The experience of living with SCI varies greatly depending on environmental factors.

The purpose of the study is to find out the perceptions of SCI patients about their rehabilitation outcome and functional independence, during admission and after rehabilitation period prior to discharge from reintegration stage. In Bangladesh, Physiotherapy is new and very challenging health care profession and CRP is the only place where the SCI patients are rehabilitated by a holistic approach. It is very important to measure the neurological level, skeletal level, motor score, sensory score, ASIA scale and functional independency of a spinal cord injured persons during admission and after discharge. Measurement of these in SCI patients is an essential component of the rehabilitation process and has a variety of applications both in patient care and in clinical research. Clinicians uses these components to assess rehabilitation needs, to set goals, to set treatment plan and evaluate outcomes. Almost 60% of countries with rehabilitation facilities uses the Functional Independence Measure (FIM) Besides, a patient classification structure based on it, called the FIM-Function Related Groups (FIM) is now being measured by the Health Care Financing Administration for development of a Medical care prospective payment system .As physical activity (PA) has imminent benefits after spinal cord injury (SCI), particularly in moving forward effectiveness and useful capability in exercises of day by day living.

The interventions which are provided to the spinal cord injury (SCI) patients have been limited to prevention, good initial resuscitation, pharmacotherapy and nursing care. As the Bangladesh is a developing country and trying to develop health care system. So the spinal cord injury patient needs a specialized and comprehensive rehabilitation services to continue their activities of daily living in the community. This research may help to gain the prerequisite consideration about the patients. It will generate exact information considering detail about which causes, occupation, age, gender, diagnosis, duration. It will also help to raise awareness among the population and will help to get full information about spinal cord injury.

1.3 Hypothesis

Alternative Hypothesis

Ha: $\mu1 - \mu2 \neq 0$ or $\mu1 \neq \mu2$, where the rehabilitation outcome is effective for paraplegic spinal cord injury patients.

Null hypothesis

Ho: $\mu1 - \mu2 = 0$ or $\mu1 = \mu2$, where the rehabilitation outcome is not effective for paraplegic spinal cord injury patients.

Where,

Ha = Alternative hypothesis

Ho = Null hypothesis

$\mu1$ = mean difference in initial assessment

$\mu2$ = mean difference in final assessment

1.4 Objectives of the study

1.4.1 General objective:

To find out the rehabilitation outcome of spinal fixation to paraplegic spinal cord injury in Bangladesh.

1.4.2 Specific objectives:

➢ To find out the socio-demographic characteristics among the paraplegic spinal cord injury patients.

➢ To find out the rehabilitation outcome of spinal fixation to the paraplegic spinal cord injury patient.

➢ To assess the rehabilitation outcome of spinal fixation to the paraplegic spinal cord injury patients during admission and after completing rehabilitation program.

1.5 Operational definition:

Spinal cord injury: When the spinal cord is damaged following trauma to the spine or disease process than it is called spinal cord injury which resulting in either temporary or permanent change in its normal motor, sensory, or autonomic functions.

Paraplegia: The term paraplegia means impairment of motor and/ or sensory function in the thoracic, lumber and sacral segments of the spinal cord which is secondary to the damage of neural elements within the spinal canal. With paraplegia, arm functioning is spared but the trunk, legs and pelvic organs may be involved depending on the level of injury. The term is used in referring to cauda equina and conus medullaris injuries, but not to lumbosacral plexus lesions or injury to peripheral nerves outside the neural canal.

Tetraplegia: These injuries, which are the result of damage to the cervical spinal cord, are typically the most severe, producing varying degrees of paralysis of all limbs. Sometimes known as quadriplegia, tetraplegia eliminates your ability to move below the site of the injury, and may produce difficulties with bladder and bowel control, respiration, and other routine functions. The higher up on the cervical spinal cord the injury is, the more severe symptoms will likely be.

Complete lesion: Absence of sensory and motor functions in the lowest sacral segments.

Incomplete lesion: An incomplete lesion is the term used to describe partial damage to the spinal cord. With an incomplete lesion, some sensory and/or motor function remains at the lowest sacral segments.

Some of the most common types of incomplete or partial spinal cord injuries include:

Anterior cord syndrome: This type of injury, to the front of the spinal cord, damages the motor and sensory pathways in the spinal cord. You may retain some sensation, but struggle with movement.

Central cord syndrome: This injury is an injury to the center of the cord, and damages nerves that carry signals from the brain to the spinal cord. Loss of fine motor skills, paralysis of the arms, and partial impairment—usually less pronounced—in the legs are common. Some survivors also suffer a loss of bowel or bladder control, or lose the ability to sexually function.

Brown-Sequard syndrome: This variety of injury is the product of damage to one side of the spinal cord. The injury may be more pronounced on one side of the body; for instance, movement may be impossible on the right side, but may be fully retained on the left. The degree to which Brown-Sequard patients are injured greatly varies from patient to patient.

Spinal Fixation: Spinal fixation devices are used in the thoracic and lumbosacral spine to stabilize the spine, reduce deformities and fractures, and replace abnormal vertebrae.

Rehabilitation: Rehabilitation, defined as "a set of measures that assist individuals, who experience or are likely to experience disability, to achieve and maintain optimum functioning in interaction with their environments" (WHO, 2011), is instrumental in enabling people with limitations in functioning to remain in or return to their home or community, live independently, and participate in education, the labour market and civic life.

The function of spinal cord is to carry impulse from brain to the body and from body to the brain (Rahman et al., 2012).The vital and important part of human body is known as spinal cord which is begins at the foramen magnum in the skull and it continuous with the medulla oblongata in the brain. It terminates inferiorly at the level of the lower border of the first lumber vertebra .Between the body and the brain spinal Cord is the major reflex center and conduction pathway (Snell et al., 2010).

It is situated within the spinal column; it propagates down from the brain to the L1−L2 vertebral level and finish in the conus medullaris, continuing from the end of the spinal cord in the spinal canal, is the cauda equina (or "horse's tail"); It is 42-45 cm long. Spinal column exit between each of the vertebrae that correspond to the nerve roots which itself has neurological segmental levels; Due to the inequality in length between the spinal column and the spinal cord, correspond to the vertebral segments do not necessary to the neurological level. There are 31 pairs of spinal nerve roots. Among them 8 cervical, 12 thoracic, 5 lumbar, 5 sacral and 1 coccygeal; (International perspective on spinal cord injury; WHO, 2013).

The spinal cord contains longitudinally oriented (white matter) surrounding (gray matter) spinal tracts (white matter) around the central areas (gray matter) where most vertebrate neurological cells are situated. The segments of sensory and motor neurons the gray matter is organized into it. Through the nerves or roots of the spinal cord axons from spinal sensory neurons enter and axons from motor neurons leave (Kirshblum et al., 2011).Vertebral bodies anteriorly protect the spinal cord and vertebral arches protects it laterally and posteriorly. Between the vertebral nerves and the brain it's form a link. Motor and sensory information travels between the brain and the body through the major spinal canal of the spinal cord (Kirshblum et al., 2011). The motion of the body produce when the body receptor receives adjacent stimuli from the environment that sends signals in the brain, and then the brain which sends messages to the nerves of the library and motion occur (Snell et al., 2010).

Spinal cord injury is called when spinal cord becomes damage or gets injured. Its breaks up the signals due to injury in the spinal cord which interrupting whole body communication (Mediline Plus, 2014). If immediate treatment has taken long-term effects can be reduced. After the initial spinal cord trauma effective therapies helps to reduce tissue destruction and improving neurologic outcomes which is cleared by the impact of the SCI on individuals and society (Fehlings et al., 2012).

According to the disturbances of the normal sensory, motor or autonomic function spinal cord injury can be traumatic or non-traumatic that ultimately impacts a patient's physical, psychological and social well-being (Singh et al., 2014) which is the major public health problem in Bangladesh (Hoque et al., 2012). Spinal cord injury (SCI) is the injury of the spinal cord which occurs as a result of compulsion, incision or contusion from the foramen magnum to the cauda equina (Nas et al., 2015). "The clinical definition of spinal cord injury euxcludes intervertebral disc disease, vertebral injuries in the absence of spinal cord injury, nerve root avulsions and injuries to nerve roots and peripheral nerves outside the spinal canal, cancer, spinal cord vascular disease, and other non-traumatic spinal cord diseases" (Jardin et al., 2013).

At the level of the neck vertebrae C5, C6 and C7 and at the level of the chest and back vertebrae, T12 and L1 which is the most common sites of this injury. Spinal cord injury create great problems in the life of the affected individual's previous social and occupational life roles which mostly happens at youth and middle age (Babamohammadi, 2011).

In Bangladesh about 44% patients had cervical lesion, of the cervical, C-6, C-5 and C-10 had quite close frequency distribution ranging between 9 and 15%. 27% had thoracic lesion, T-12 with 13% had the majority. 29% had lumbar injury, among lumbar region L-1 had the majority incidence. About 78% of the patients falling into the complete group which is according to the American Spinal Injury Association (ASIA) scale. Traumatic incidence rate is about 93%. Tetraplegia and paraplegia were almost equal with 46 and 54%, respectively. About 44% patients had all four limbs paralyzed, 43% had pressure sore and about 90% needed bladder function management through use of catheter (Islam et al., 2011).

A 10-years study aimed at investigating the life of the people affected by the spinal cord injury has been observed that only 16.4% of the research population has survived for 10years in Bangladesh, which is Finland (97.9%), Australia (86%), Canada (92%), UK (85%), and United States (80.7%). In addition, this study also found that worse conditions in Bangladesh than other developing countries. The information clearly mentions that there are very bad medical facilities in Bangladesh to promote safe and suitable life after spinal cord injury. Referring to potential possible causes of poor living with spinal cord injury, lack of inadequate acute management and proper social rearrangement (Razzak et al., 2011).

The causes of spinal cord injuries in Bangladesh can be both traumatic and non-traumatic. The aim of the study in Bangladesh to discover life expectation of persons with SCI showed that, falling from height, either from trees, construction works, electric poles or roofs, was found to be the most common cause (40.30%) and falling while carrying a heavy load on the head was second most common cause (16.0%).Among the non -traumatic cases of SCI, spinal tuberculosis was found to be the most common cause, comprising 7.0%. Other causes were road traffic accidents, fall of object on back, Guillain Barre Syndrome, and Transverse Myelitis (Razzak et al., 2011).

A person with spinal cord injury causes various impacts on physical, psychological, social, emotional and cultural aspects in individuals and may be dependent on others for support to do many tasks of ADLs such as toileting, bathing, brushing dressing, grooming, eating, community access, and leisure activities (Saadat et al., 2010). Like as depression several types of psychological problems or impacts may also happen due to SCI. In one study, it was reported that 60% of individuals with SCI suffers from residential depression during rehabilitation phase and during the hospital admission 33% of these persons persisted that depression. Self-neglect is also measured as a pointer of adjustment with difficulties in the SCI people. When a person perception a trauma or everlasting disability such as SCI, there will be radically change the ability to participate in daily performance. They may not be able to contribute to full-time paid employment or education as he or she did before the injury. He/she often lose their confidence and they becomes fully dependent on their families for their

existence. (Barclay et al., 2011). The life altering disease of spinal cord injury not only affects the patients but also affects their spouses, parents, siblings and children and the significant cause of mortality and morbidity (Ali & Tawfiq, 2013).

The various types of spinal cord injury are - Tetraplegia: In tetraplegic injury motor and /or sensory function is impaired or loss in the cervical segments of the spinal cord due to damage or neural elements within the spinal canal (Kirshblum et al., 2011).If injury at C1-C8 segments tetraplegia occurs and feature is loss of muscle strength in all four extremities associated with injury to the spinal cord in the cervical region. Tetraplegic are not included in the definition if injuries of the brachial plexus and the nerves outside the neural canal (Nas et al., 2015). Paraplegia: In paraplegic injury motor and /or sensory function impaired or loss in the thoracic, lumber or sacral segments of the spinal cord which leads to secondary damage to the neural elements within the spinal column (Kirshblum et al., 2011). Tetraparesis and paraparesis: For neurologically complete injuries tetraplegia and paraplegia should only be used and is discouraged as they narrate incomplete lesions imprecisely and incorrectly imply. Instead, the description of severity (completeness) of the SCI the ASIA Impairment Scale (AIS) provides a more precise approach (Nas et al., 2015). Incomplete injury: The injury is defined as incomplete if sensory and/or motor functions is found partially preserved below the neurological level and includes the lowest sacral segment (Hossain et al., 2008).

Considering the motor and sensory functions spinal cord injuries are classified by the American Spinal Injury Association (ASIA). In 2011 the last revision of the ASIA Disorder Scale was made. The term "deep anal pressure" is used by the replacement of "deep anal sense''. In the latest "International Standards for Neurological Classification of Spinal Cord Injury (ISNCSC)'' the term skeleton level was not included ; contents as it is not always present in spinal cord lesions (Kirshblum et al., 2011). Roberts et al. (2017) categorized SCI according to the American spinal cord injury association impaired scale as following types:

Complete A – No motor or sensory function is preserved in the sacral segments S4-S5.

Incomplete B – Sensory function preserved but not motor function is preserved below the neurological level and includes the sacral segments S4- S5.

Incomplete C – Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3.

Incomplete D – Motor function is preserved below the neurological level, and at least half of key muscles below the neurological level have a muscle grade of 3 or more.

Normal E – Motor and sensory function are normal.

In American Spinal Injury Association (ASIA) C or D motor function is incomplete but the patient must have voluntary contraction of the anal sphincter or protection of motor function at more than three levels below motor level on the same side of the body with sacral sensory protection. If the muscle function except the key muscles more than three levels below the motor level in discrimination of ASIA B and C. Motor levels in both sides are used to distinguish between ASIA B and C. To distinguish between ASIA C and D single neurological level is used (Nas et al., 2015).

From the level T1- L5 and lower level paraplegic injury are starts. Patients are independent in daily living activities, bowel-bladder care, using a manual wheelchair and transferring if the injury levels are T11-T12. The objective is therapeutic ambulation in upper thoracic injury patients. If the injury level is lower thoracic patients can control their body and by the use of lower extremity orthoses and a walker, they manage their ambulant at home. Patients are fully independent in activities of daily living and need personal care if injury levels are L1-L2. For the ambulatory their requirement is long leg

walking device for short distances but for a long distance they need a wheelchair. Patients can lock the knee fully and dorsiflexion of the ankle can be partly made if injury levels are L3-L4. With the assistive device elbow crutches and ankle foot orthoses patients can ambulate socially. They are free in bowel and bladder care. If injury levels are L5-lower-They are fetterless in all activities (Nas et al., 2015).

The conservative treatment of spinal cord injury are – pain control, range of motion exercise, strengthening exercise, anticipating and minimizing secondary complications, provision of equipment, orthoses and wheelchairs, advice for patients and caring on holding techniques, teaching patients how to use specialized exercise equipment, teach transfres (getting in and out of a wheelchair ,bed, car, shower/bath and onto and off a toilet), teaching wheelchair skills, hydrotherapy treatment, breathing exercise and chest clearance techniques, patients , family and care giver education, referral to appropriate health professionals (Harvey, 2016).

The development of joint contractures and stiffness are most common and important complication during acute and sub-acute period. Within 1 year about 66% of patients has been reported at least one joint contracture (43% shoulder, 33% elbow, 41% forearm and wrist, 32% hip, 11% knee, 40% foot and ankle). Intensive passive ROM exercises should be given the lower extremities to be consistent with the level of the injury, if the patients are paraplegic or tetraplegic. To prevent contractures and maintain functional capacity ROM exercise should be done. If patients have flaccid type of paralysis then perform ROM exercise at least once a day and in the presence of spasticity perform at least 2-3 times a day (Diong et al., 2012). To protect the tenodesis effect stretching should be done in patients without active wrist extension and fingers that are not fully stretched. During the period of spinal shock muscles are seems to be flaccid. Depending on the injury level if victim have partial bed movements then isometric, active or active-assisted exercises should be done. Current studies have shown that the prevention of pulmonary function decline and in the development of muscle strength early mobilization plays in important roles. In order to protect lung capacity during the acute phase breathing exercises should be carried out and taught and its importance should be explained to complete or

incomplete paraplegic and tetraplegic patients (Jia et al., 2013). In patients with complete paraplegia the most important point is strengthening of the upper extremities to the maximal level in the acute period of rehabilitation. For using crutches, swimming, electric bicycles and walking empowering exercises for shoulder rotation are proposed (Jacobs et al., 2004). Independent transfer from bed are needed at the end of the acute phase. For this purpose, to strengthen the muscles of the upper extremity active and resistance exercises should be initiated at the earliest possible period. By the use of dumbbells weight and resistance exercises can be applied in bed depending on the patient's muscle strength (Curtis et al., 1999). The patient's position should be changed every 2-3 h, in order to prevent decubitus ulcers. It's densely occur on the sacrum, ischium, trochanter and superior aspect of the heel. On the basis of the patient's individual risk profile the appropriate measures to be taken can then be determined, with an emphasis on two cardinal principles: active promotion of movement and passive pressure reduction through frequent changes of position. Besides, restrict mobility should be addressed with specific therapy which is caused by malnutrition, impaired perfusion, and any underlying diseases and accompanying symptoms, should be treated symptomatically such as pain. The liability, implementation, and efficacy of therapeutic measures should be periodically reviewed and documented and any necessary corrections should be made over the course of the patient's treatment (Anders et al., 2010). To facilitate the return to as many pre injury activities as possible wheelchairs have been used by people with disabilities and to engage in many of life's activities, people with SCI rely on their wheelchair (Tsai et al., 2014).

In surgical management most of the spinal cord injury patients are mostly treated by various fixation device such as: 1.spine fixation devices: A spine fixation device is used for temporary attachment to a pair of adjacent vertebrae on a body, at least two surgical screws, and at least one spacer includes an alignment plate having top and bottom surfaces. The alignment plate is adapted not to move transversely with respect to the longitudinal axis of the spine (Cook & Scodary, 2006). 2. Vertebrae fixation devices: Fixation (or fusion) of vertebral columns includes a connecting element where several bone screws is inserted in the vertebral bodies of a vertebral column. Between bone

screws and connecting element a firm connection is achievable because the screws are each provided with a head part for receiving the connecting element. The rigid sections and elastic sections are composed of these connecting element. Through the connecting devices the rigid sections are connectable to the elastic sections. This invention is usually to the field of surgical devices and process of fixing clinging vertebrae in the spine. More specifically, the present invention is utilized in such way which helps to fix the adjacent vertebrae together to prevent movement of the vertebrae with respect to each other. During surgical operations and implant for permanent as spinal fixation these device may be used (cook & Scodary, 2006).

The three primary systems of spinal fracture fixation may be categorized as follows: (1) Anterior spinal fixation: Surrounding the aorta the anterior spinal body is located which is primarily used for burst fractures, spinal tumors, spinal deformities, and degenerative diseases. Articulations between bony vertebras of a human spine frequently collapse with age or trauma and turn out a source of pain. Through anterior approach to the human spine this device is used for reconstruction, fixation and bone fusion. It's enables rigid fixation in all planes of motion including extension of the spine, it occupies structural landmark essential to reconstruct and keep up disk height, for bone grafting material it provides space and through endplates above and below to enhance bony fusion by generating a plurality of perforations (Aferzon, 2011). (2) Posterior spinal fixation: The term posterior fixation means of devices that attached to the spinal column posteriorly. By a posterior fixation approach it's help to correct scoliosis, or extreme lordotic or kyphotic curves by applying flextion-resisting forces and thereby holding it in place between the adjacent spinous processes, it helps to prevent lateral movement of the body portion, thereby avoiding a fusion of the anterior column (Mastrorio & Gibson, 2010). (3) Lateral spinal fixation: Lateral spinal fixation is a system, device and method that are figured for minimally invasive. This apparatus encircle a weight-bearing shell configured to fit into a disk space between two vertebrae, the weight-bearing shell involves a keyway opening within and through plural sidewalls. Normal curvature of the spine across the disk space is maintained by this machine ; pleasure of it's insertion and fixation beneath

the disk space; in adjacent vertebrae it's facilitates bony fusion ; and in respect to across the disk space its restricts the movement of the adjacent vertebrae (Aferzon, 2011).

If the spine is unstable following traumatic spinal cord injury (SCI), to obtain vertical stability and prevent re-injury of the spinal cord from repeated movement of the unstable bony elements, surgical fusion and bracing may be necessary. To promote early rehabilitation and mobilization this spinal fixation surgery has been suggested (Bangall et al., 2003).

Rehabilitation involves the combined and coordinated use of medical, social, education and vocational measures for training or retraining the individual to the highest possible level of functional activity. A delicate balance of the needs and desires of clinicians, clients, the State and the public, rehabilitation is a value-laden process (Ward et al., 2007).A detailed assessment of the individual"s abilities, capacity, goals and preferences in relation to occupation, as well as connection with the employer may be the featured if vocational rehabilitation programmes (Crepeau et al., 2003).

A rehabilitation team made up by physician, physiotherapist, occupational therapists, recreational therapist, rehabilitation nurse, rehabilitation psychologist, counsellor, social workers, nutritionists and other specialists. Care coordinates by a case-worker or program manager. Both upper and lower extremity function and on difficulties with mobility is focused by physiotherapist (National Institute of Neurological Disorders and Stroke, 2010) and they also help to clear excess secretion in the chest by clearing the airway. Upper extremity dysfunction and difficulties in activities of daily living is addressed by occupational therapist where nurses are concerned with the issues of bowel and bladder dysfunction and the management of pressure ulcers. The newly injured patient psychologists deal with emotional and behavioural concerns and with any potential cognitive dysfunction. Among the rehabilitation team, the patient and his/her family, Case manager and social workers are the primary interface (Saulino, 2009).

The conventional rehabilitation system is usually occupied that people must have the necessary physical and emotional adjustments to work at the primary stage of rehabilitation that's why vocational intervention is inappropriate that time (Bloom et al.,

2019). Vocational rehabilitation, which is a multidisciplinary scheme that motives to fetch workers back to the partition of profitable employment or employment, usually includes a special services such as work place for employment, counseling, vocational training and employment opportunities (Escorpizo et al.,2011). Through the disability services of the referral or through the funded of private rehabilitation providers by the insurer, vocational intervention is usually distributed in this manner. Early intervention is consequently called pre-discharge or vocational service during primary or hospital rehabilitation phase (Bloom et al., 2019). Now- a- days, there is a vocational training institute in CRP which provides training at shop management, tailoring, computer application, and electronic repairing (Nahar et al., 2012).

Depend on the overcome to the environmental barriers community reintegration will extent to which a person with spinal cord injury. In this section, environmental barriers are gradually investigate, which commence with housing, lately a person who developed spinal cord injury came back after rehabilitation and works continuously with transport, which is important for participation in the community and access to meet school and education and employment rights where the workplace (WHO, 2013).

For disabled people in Bangladesh a little number of non-governmental organizations are involved in rehabilitation and vocational training. CRP (Centre for the Rehabilitation of the Paralysed) is a non-governmental organization specialized in the rehabilitation of people with spinal cord lesion in Bangladesh. For disabled people, the organization recognizes work rehabilitation as vital to most rehabilitation programmed. It enables the patients to support their families as well as participating in their social life by return to paid employment is regarded as the most important outcome measure of successful reintegration into society (Nahar et al., 2012). As the person's medical condition improves, a skillful shift in priority will make allowance for training in daily living activities, vocational training and education according to the preference (Carpenter et al., 2007).

Many patients at CRP will face difficulty to return to their previous employment after suffering from SCI. If a spinal cord injured person cannot earn a living to support his or her family, the physical and emotional rehabilitation at CRP will be of little value. The

physiotherapist and other health worker make the home environment and workplace accessible as much as possible for successful reintegration into the society and community. Many people with disability have been rehabilitated in various sectors of CRP according to their skill and ability.

A review of literature indicates that many important issues related to employment are included in the persons with SCI. These include employment, disability, intensity, age, time, sex, marital status, social assistance, vocational counseling and medical issues, employer's role, environment, occupational interests and education related to SCI (Ottomanelli & Lind, 2009). Functional independence has especial ability to drive disabled people return to the work. Return to the work functional independence is the solid anticipating factor. Hence, on instruction, self-care capacity, community portability, professional preparing and natural adjustments restoration must be centered manufacturer that may offer assistance them construct up work after SCI. The educational achievement on behalf of a person is very strong for the SCI to return to work (Ramkrishnan et al., 2011). Gupta et al. (2011) shows in their studies that the return to work rate was 46% and the employment rate was 41%. Another evidence shows that, the return to work rate in their study was 57.1%. Ramkrishnan et al. (2011) found that the age is significantly related to returning to work as the following is significant, when the aged persons have the highest employment rate between 16-30 years and among them there is a lower employment rate among 51-60 years old people. Patients need to be prepared to return to the community with sufficient information and good skills necessary for maintaining optimal health and well-being. (Anderson et al., 2007).Functional Independence Measure (FIM) is a functional measurement tool which is used to assess the influence of SCI on the patient's functional abilities. By providing scores it quantifies the extent of individual disability and complements the neurological assessment (Maynard Jr et al., 1997).

It is an 18-item, 7-level ordinal scale designed to assess severity of patient disability, estimate burden of care and determine medical rehabilitation functional outcome. The items are rated two times by the physiotherapist, first at admission of rehabilitation and second at discharge of rehabilitation (Dawson et al., 2008). FIM scores range from one to seven: a FIM item score of seven is categorized as "complete independence" while a

score of one is "total assistance" (performs less than 25% of the activity). Scores falling below six require another person for supervision or assistance (Wright, 2000). The seven levels rating of FIM are: Independent (no human assistance is required): 7= Complete independence: The activity is typically performed safely, without assistive devices or aids, and within reasonable time. 6= modified independence: The activity requires an assistive device and/or more than reasonable time and/ or is not performed safely. Dependent (human supervision or physical assistance is required): 5=Supervision or setup: No physical assistance is needed, but cuing, coaxing or setup is required. 4=Minimal contact assistance: Subject requires no more than touching and expends 75% or more of the effort required in the activity. 3=Moderate assistance: Subject requires more than touching and expends $50 \pm 75\%$ of the effort required in the activity. 2=Maximal assistance: Subject expends $25 \pm 50\%$ of the effort required in the activity.1=Total assistance: Subject expends $0 \pm 25\%$ of the effort required in the activity. It appears to be the best functional outcome scale used to describe disability among SCI patients, both early and late after injury. It is easy to administer and is valid and reliable.

CHAPTER–III	METHODOLOGY

3.1 Study design

The study was a Quasi-experimental quantitative research design. Quasi-experimental designs was used when randomization will impractical and or unethical, it's easy to set up than true experimental designs, which require random assignment of subjects. These studies helps to predict what the outcome of an event is to be. This design was chosen rather than any other design because the aim of the study is to "To explore the rehabilitation outcome of spinal fixation to paraplegic spinal cord injury patient in Bangladesh". Quasi-experimental quantitative study design was performed with structured questionnaires and interviews were conducted with persons having paraplegic spinal cord injury with spinal fixation. This study design was appropriate to find out the objectives.

3.2 Study site

Physiotherapy department of spinal cord injury (SCI) unit,CRP, Savar, Dhaka- 1343. CRP is one of largest rehabilitation centre in Bangladesh for spinal cord injury patients.

3.3 Study population

The population who was diagnosed as paraplegic spinal cord injury and having spinal fixation and also completed rehabilitation program from the Centre for the rehabilitation of the Paralyzed (CRP), Savar, Dhaka.

3.4 Study duration

11 August 2019 to August 2019

3.5.1 Inclusion criteria of the study

- Patients must be paraplegic spinal cord injury.

- **Age between 15- 64 years old:** This age range was selected because most of the people around the age meet spinal cord injury in their life (Jazayeri et al., 2015).

- **Both sexes were of equal priority:** Both male and female were included decause study conducted by Islam et al. (2011) majority of the patients are paraplegia 56% where the people of aged between 25-29 of years among them males are more commonly affected (83%) than female and female percentage is 17%.

- **Patient skeletal level must be within thoraco-lumber area:** Because, most of the vertebral fractures are located in the thoraco-lumber region T10-L4 (Siebenga et al., 2007).

- The patients who had interest to participate in the interview.

- SCI patients after completing rehabilitation phage were selected (Nas et al., 2015).

3.5.2 Exclusion criteria of the study

- Patient age range below the 15 and above 64 years will be excluded because age 15 and above 64 years might be due to pathological cause (Webb et al., 2010).

- Patient skeletal level without thoracolumbar area (Siebenga et al., 2007).

- The patient who had not successfully complete rehabilitation program from CRP.

- Subjects who had unwillingness to participate.

3.6 Sample size

According to the inclusion and exclusion criteria 30 patients were selected for this study. Due to time limitation the researcher has to choose 30 participants to conduct this study; within the short time it could not be possible to conduct the study with a large number subjects.

3.7 Sampling scheme

Sampling refers to the process of selecting the subjects or individual. The researcher was selected Hospital based simple random sampling technique. The study subjects were selected in the way who were coming to CRP for receive treatment with in a particular time period. As these patients attained in these CRP randomly without the choice of CRP authority or the researcher's choice.

3.8 Method of data collection

3.8.1 Data collection tools

Data collection tools were informed consent form, structured questionnaire, Papers, Pen, Pencil, Diary, Computer and pen drive.

3.8.2 Measurement tools

A structured questionnaire was used for measuring the rehabilitation outcome of SCI patients. This questionnaire is developed after reviewing literature about the spinal cord injury and their rehabilitation outcome. In the questionnaire participant's socio-demographic information (age, sex, occupation, marital status, family type, living area, educational level etc) were taken. Also injury related question were included in this questionnaire like date of injury, cause of injury, date of admission and date of discharge.

Oxford Muscle Grade was used to measure motor score during admission and after completing rehabilitation program. Sensory score was measured sensory grading scale where 0=absent, 1=altered, 2=normal, NT=not testable. Impairment level was measured by American Spinal Injury association (ASIA) impairment scale.

Functional improvement level was measured by Modified Functional Independence Measure (FIM) scale which scored with 1-7 where 1=total assist and 7=complete independence. Functional activities including bed mobility(rolling, lying to sitting, sitting to lying, prone lying, sitting balance), lifting (lifting in wheelchair, lifting on bed, lifting forwards, lifting sideways, lifting backwards), transfer (wheelchair ↔ bed, high and low transfer), wheelchair skills (wheelie, up and down slops, rough ground, small steps),

standing (sit to stand, standing balance, standing table, tilt table), walking (flat surface, rough surface, steps or slopes) fitting brace.

3.9 Data collection procedure

After meeting inclusion and exclusion criteria the data collection procedure was conducted through assessing the patient, initial recoding and final recording. The researcher took experimental data with respect to the subject of the study. Data was collected during admission and after completing rehabilitation program by face to face interview where the researcher were providing a close ended questionnaire form. During the interview the researcher ensured the environment was quit for the participant, so they felt comfortable to talk with the researcher.

3.10 Intervention

Physiotherapist who were expert in treatment of spinal cord injury patient were involved in treatment of patients. The treatment protocol of this patients were- Passive, active-assisted, active and resistive exercises, range of motion exercise, strengthening exercise, stretching exercise, transferring (getting in and out of a wheelchair ,bed, car, shower/bath and onto and off a toilet), teaching wheelchair skills, hydrotherapy treatment, breathing exercise and chest clearance techniques, family and care giver education, home advice.

3.11 Data analysis

Statistical analysis was performed by using statistical package for social science (SPSS) version 20. Data analysis is the most vital aspect of research. The purpose of the data analysis was to find out the actual meaning of the information that is collected. The data was collected using Modified Functional Independence Measure (FIM) Scale for measuring the functional improvement level and motor score was measured by Oxford muscle grade and sensory score was measured by sensory grading scale and spinal cord impairment was measured by American Spinal Injury association (ASIA) impairment scale.

3.11.1 Statistical Test

Statistical analysis refers to the well-defined organization and interpretations of the data by systemic and mathematical procedure and rules.

Hypothesis Test

Wilcoxon Test

This test also known as Wilcoxon matched pair signed ranked test, is an alternative to the paired t test, when the assumption of normality or equality of variances is not meet. When there are just measures to be compared from the same case, and data are normally distributed or the sample size is large, we apply a paired t test. In this situation if the data is not normally distributed then use Wilcoxon test. Since, my study sample was 30 and it was not normally distributed so I use Wilcoxon signed rank test. Calculated z value is compared with table z value to find p value. If p< .05, we reject the null hypothesis. If otherwise, we cannot reject the null hypothesis and accept it.

Equation/Formula:

$$z = \frac{T - \frac{N(N+1)}{4}}{\sqrt{\frac{N(N+1)(2N+1)}{24}}}$$

Here,

T=Lowest value among positive and negative rank

N=Total number of the participants

Z=Value of the Wilcoxon matched pair signed rank test

Interpretation:

Calculated z value is compared with table z value to find p value. If p<.05, we reject null hypothesis. If otherwise, we cannot reject the null hypothesis and accept it.

Table 3.1 Outcome measurement (post-test – pre-test)

Variable	Wilcoxon signed rank test	Significant level
ASIA scale	-2.428	0.015
Motor score	-3.064	0.002
Sensory score	-4.493	0.000
Neurological level	-2.552	0.011
Functional	**Improvement**	**Measurement**
Stretching	-4.137	0.000
Active exercise	-4.179	0.000
Rolling	-5.062	0.000
Lying to sitting	-5.103	0.000
Prone lying	-5.103	0.000
Sitting balance	-5.062	0.000
Lifting in W/C	-5396	0.000
Lifting on bed	-5.396	0.000
Lifting forwards	-5.260	0.000
Lifting sideways	-5.260	0.000
Lifting backwards	-5.260	0.000
W/C to bed and bed to W/C	-5.260	0.000
High and Low transfer	-4.821	0.000
Wheeli	-2.692	0.007
Up and down slop	-5.061	0.000
Rough ground	-5.201	0.000
Small steps	-4.654	0.000
Sit to stand	-4.665	0.000
Standing balance	-3.438	0.001
Standing table	-3.075	0.002
Tilt table	-2.971	0.003
Flat surface	-3.020	0.003

Rough surface	-2.966	0.003
Steps/slopes	-2.842	0.004
Fitting brace	-2.971	0.003
Total FIM	-4.784	0.000

3.12 Ethical consideration

Researcher followed the Bangladesh Medical Research Council (BMRC) guide line & WHO research guideline. This protocol presentation was firstly submitted to the Institutional Review Board (IRB) of BHPI and initial permission was taken. Permission was taken from the Head of the Department of Physiotherapy, BHPI. Researcher maintained the confidentiality of the collected data from the individuals. The ethical consideration was obtained through an informed consent letter to the participant. Consent was obtained by providing each participant a clear description of the study purpose, the procedure involved in the study and also informing them that if they wish they could withdraw themselves any time from the study. Participant were explained about their role in the study and it was explained that there was no direct benefit from the study but in future, cases like them may would be benefited from it. Participants were also advised that they were free to decline answering any questions during interview. The necessary information had been kept secure place to also ensure confidentiality. They were also assured that it would not cause any harm. Then they signed the consent form.

3.13 Informed consent

Written consent (appendix) was given to all participants prior to completion of the questionnaire. The researcher explained to the participants about his or her role in this study and aim and objective of this study. The researcher received a written consent from every participants including signature. So the participant assured that they could understand about the consent from and their participation was on voluntary basic. The participants were informed clearly that their information would be kept confidential. The researcher assured the participants that the study would not be harmful to them. It was explained that there might not a direct benefit from the study for the participants but in the future cases like them might be get benefit from it. The participants had the rights to withdraw consent and discontinue participation at any time without prejudice to present or future care at the spinal cord injury (SCI) unit of CRP. Information from this study was anonymously coded to ensure confidentiality and was not personally identified in any publication containing the result of this study.

In this study a Quasi-experimental quantitative research design was chosen because the aims of the study were to know the rehabilitation outcome of spinal fixation to the paraplegic spinal cord injury patients. The socio-demographic information along with functional improvement level were measured by Functional Independence Measure (FIM) scale where 30 patients were taken as a sample from Center for the Rehabilitation of Paralysed (CRP), Savar, Dhaka-1343 those who completed rehabilitation services at Center for the Rehabilitation of Paralysed (CRP).

4.1 Age Groups:

The study was conducted with 30 participants. Among them 11-25 years were 46.7% (n= 14), 26-40 years were 33.30% (n= 10), 41-55 years were 20% (n= 6). Most of them were 11-25 years were 46.7% (n= 14) and 26-40 years were 33.30% (n= 10).
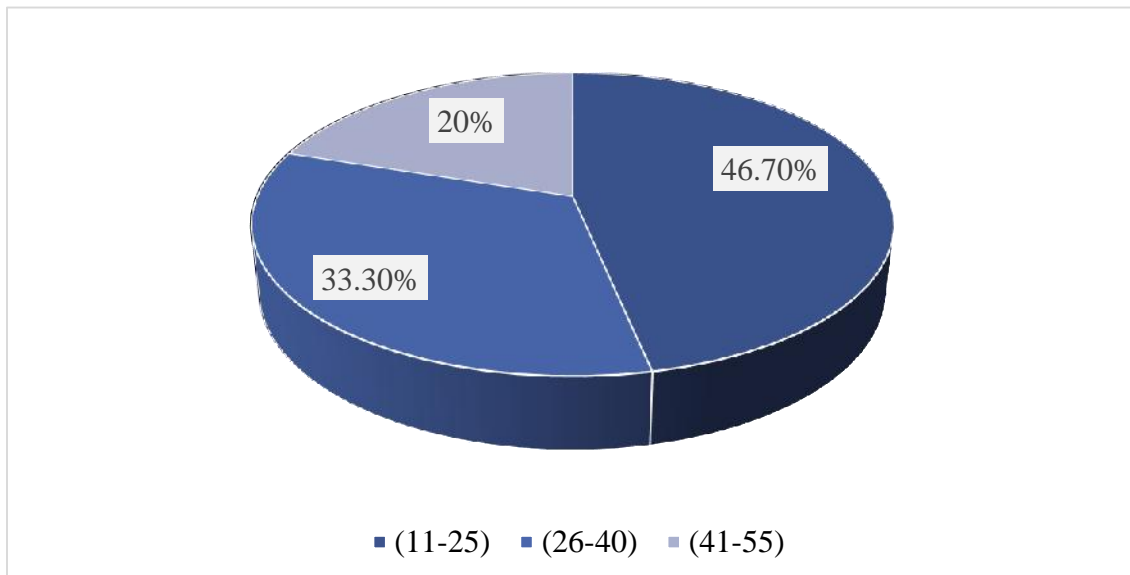
Figure -1: Age of the participants

4.2 Male & female ratio:

Among the 30 participants 90% (n=27) were male and 10% (n=3) were female. So male gender were most commonly affected by spinal cord injury than female.
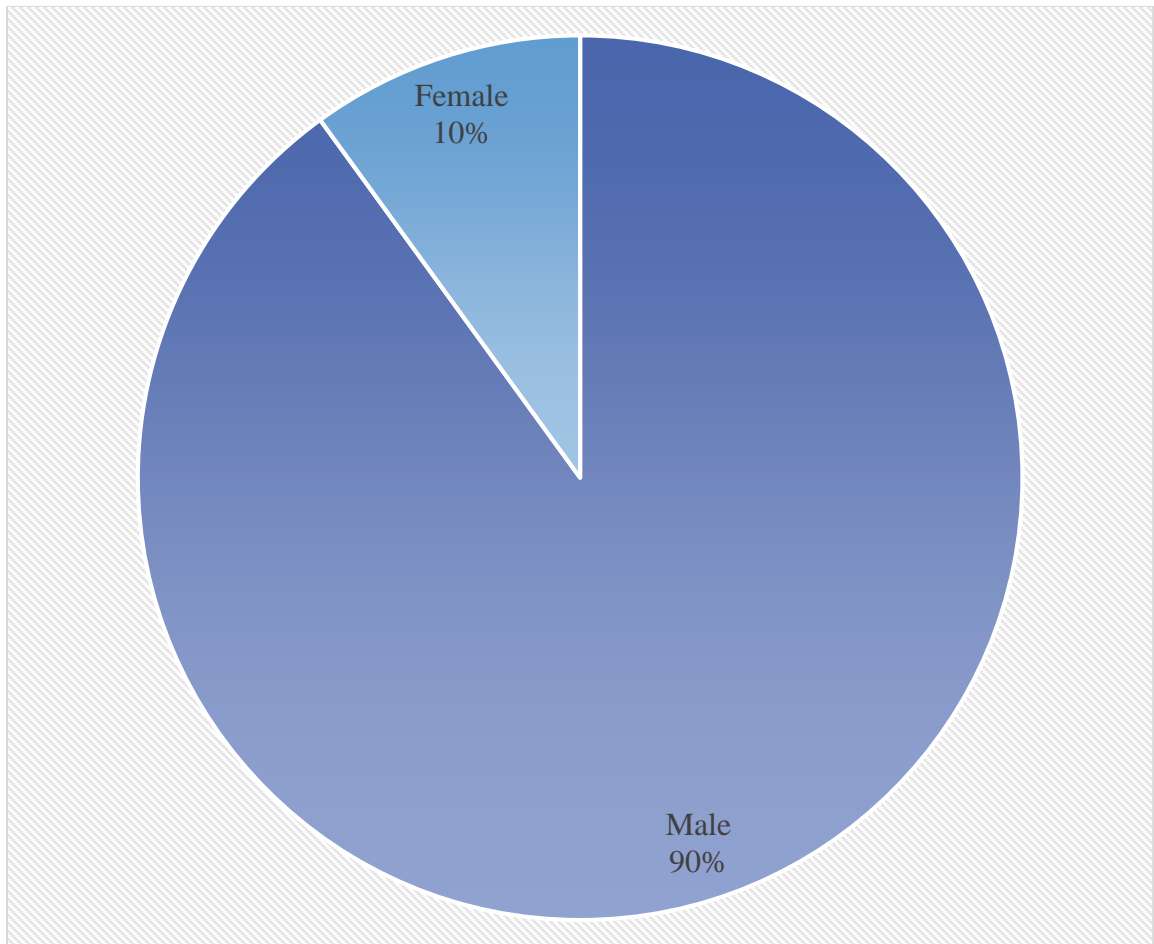
Figure-2: Male & female ratio of the participants

4.3 Educational level:

Among the 30 participants 16.7% (n= 5) were illiterate, 13.3% (n=4) were educate less than primary school, 23.3% (n=7) were completed primary school, 20.0% (n=6) were educate up to class 8, 20.0% (n=6) were SSC completed, 6.7% (n=2) were HSC completed and 0% (n=0) participants were graduation and masters completed.
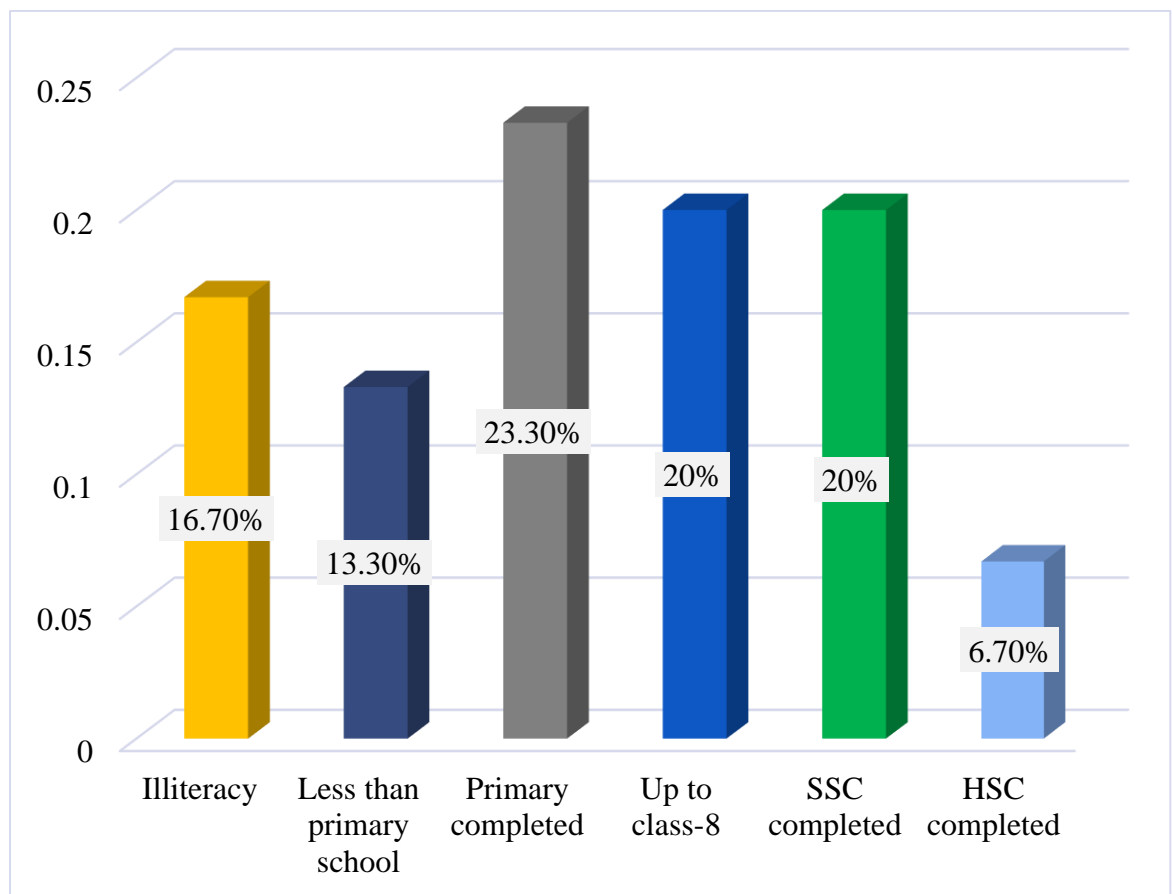
Figure -3: Educational level of the participants

4.4 Occupation:

Among the 30 participants 13.3% (n=4) were farmer, 3.3% (n=1) were day labourer, 16.7% (n=5) were service holder, 3.3% (n=1) were garment's worker, 20.0% (n=6) driver, 6.7% (n=2) were businessman, 6.7% (n=2) were housewife, 20.0% (n=6) were student, 6.7% (n=2) were electrician, 3.3% (n=1) were wood cutter.

Table -II: Occupation of the participants

Occupation	Number	Percentage (%)
Farmer	4	13.3%
Day labourer	1	3.3%
Service holder	5	16.7%
Garment's worker	1	3.3%
Driver	6	20.0%
Businessman	2	6.7%
Housewife	2	6.7%
Student	6	20.0%
Electrician	2	6.7%
Wood cutter	1	3.3%
Total	30	100

4.5 Marital Status:

Among the 30 participants 50% (n=15) were married and 50% (n=15) were unmarried.

50%   50%

■ Married   ■ Unmarried
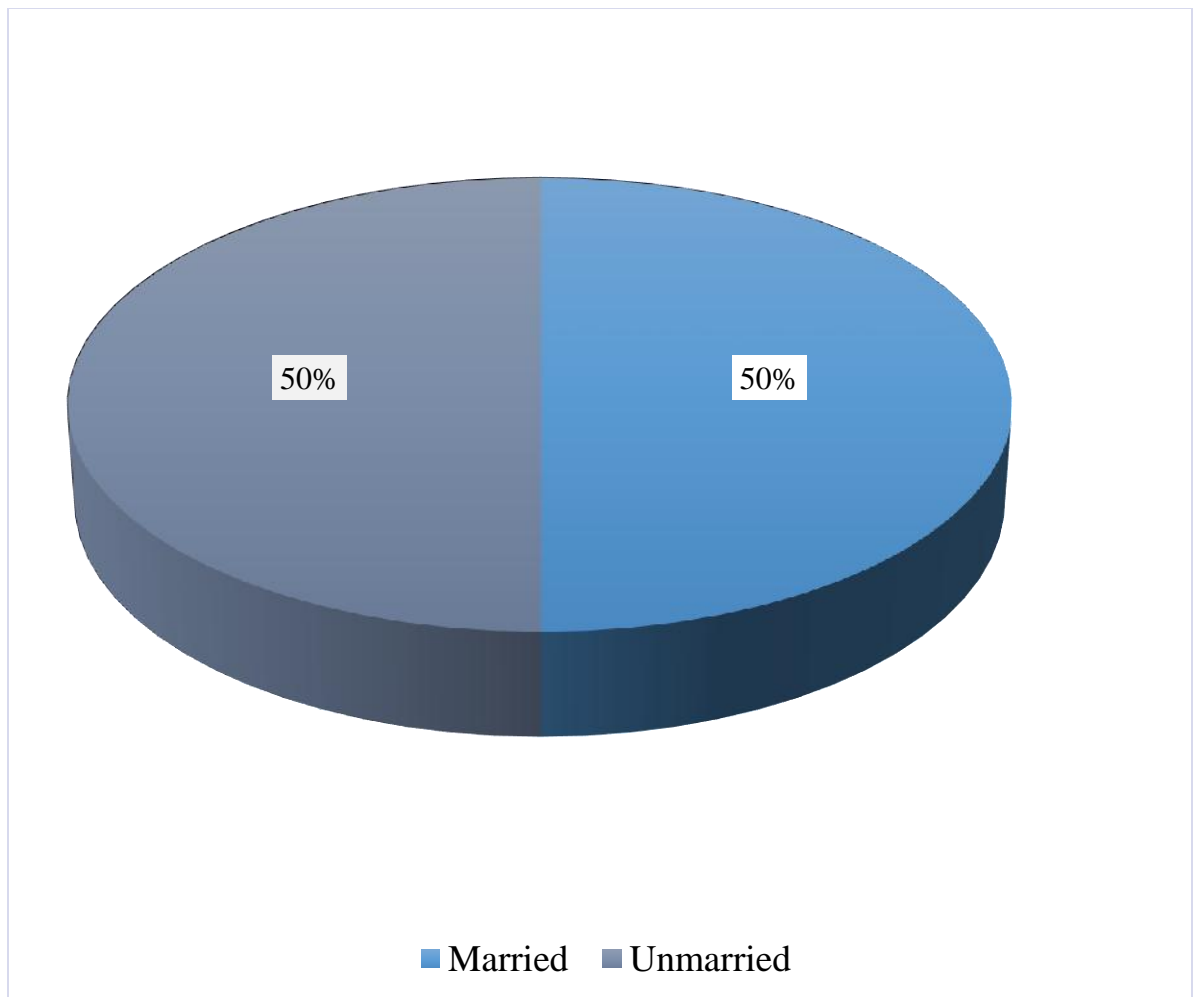
Figure -4: Marital status of the participants

4.6 Family type:

Among the 30 participants 93.3% (n=28) were nuclear family and 6.7% (n=2) were extended family.
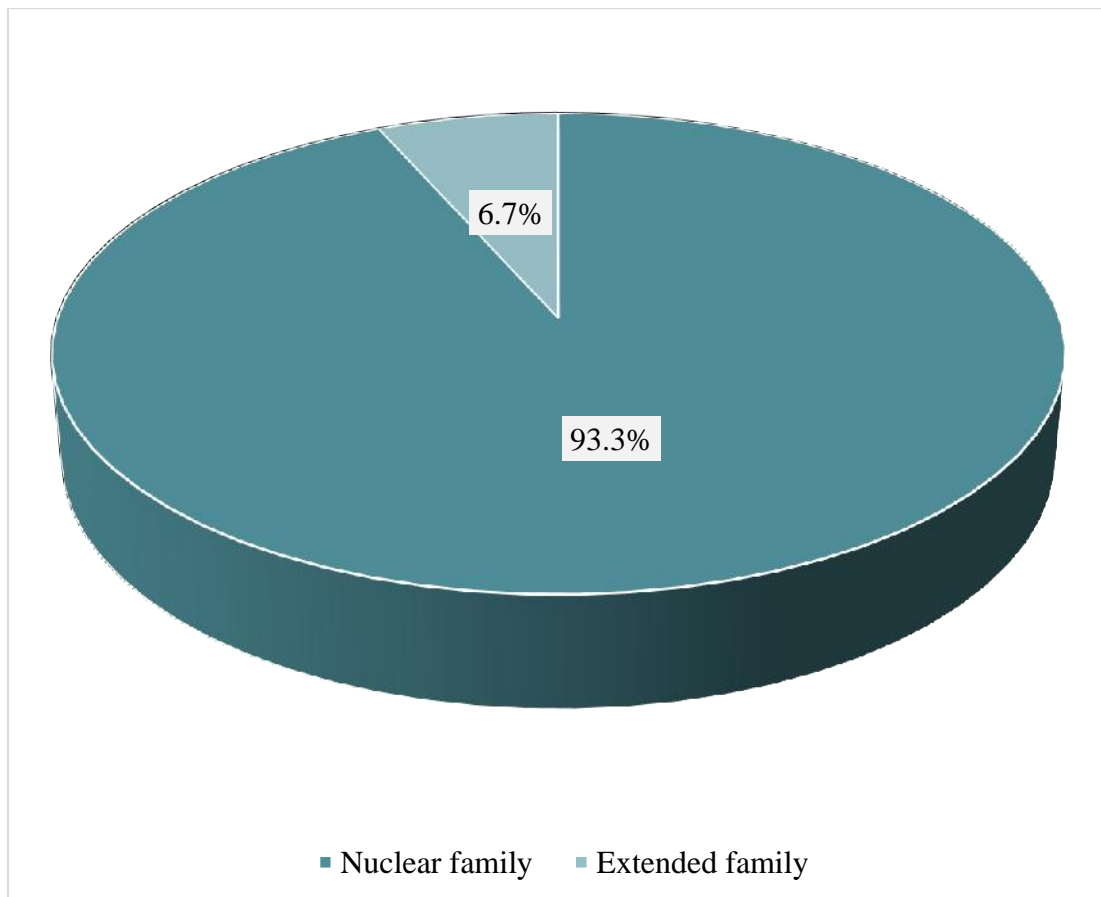
Figure -5: Family type of the participants

4.7 Residential area:

Among the 30 participants 86.7% (n=26) participants were live in the rural area, 6.7% (n=2) participants were live in semi-urban area and 6.7% (n=2) participants were live in the urban area. According to data view, the investigator could say that the frequency of residential area among the participants was highest in rural area than urban area.
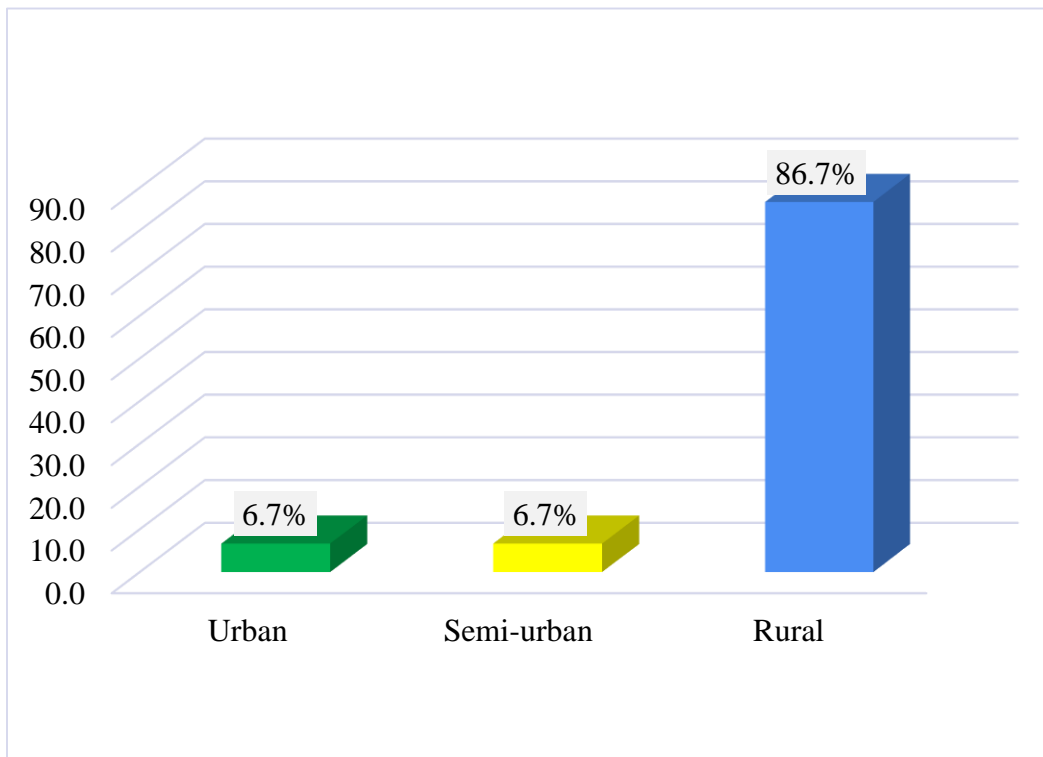
Figure -6: Residential area of the participants

4.8 Smoking habit:

Among the 30 participants none smoking percentage were 56.7% (n=17) and smoking percentage were 43.3% (n=13).
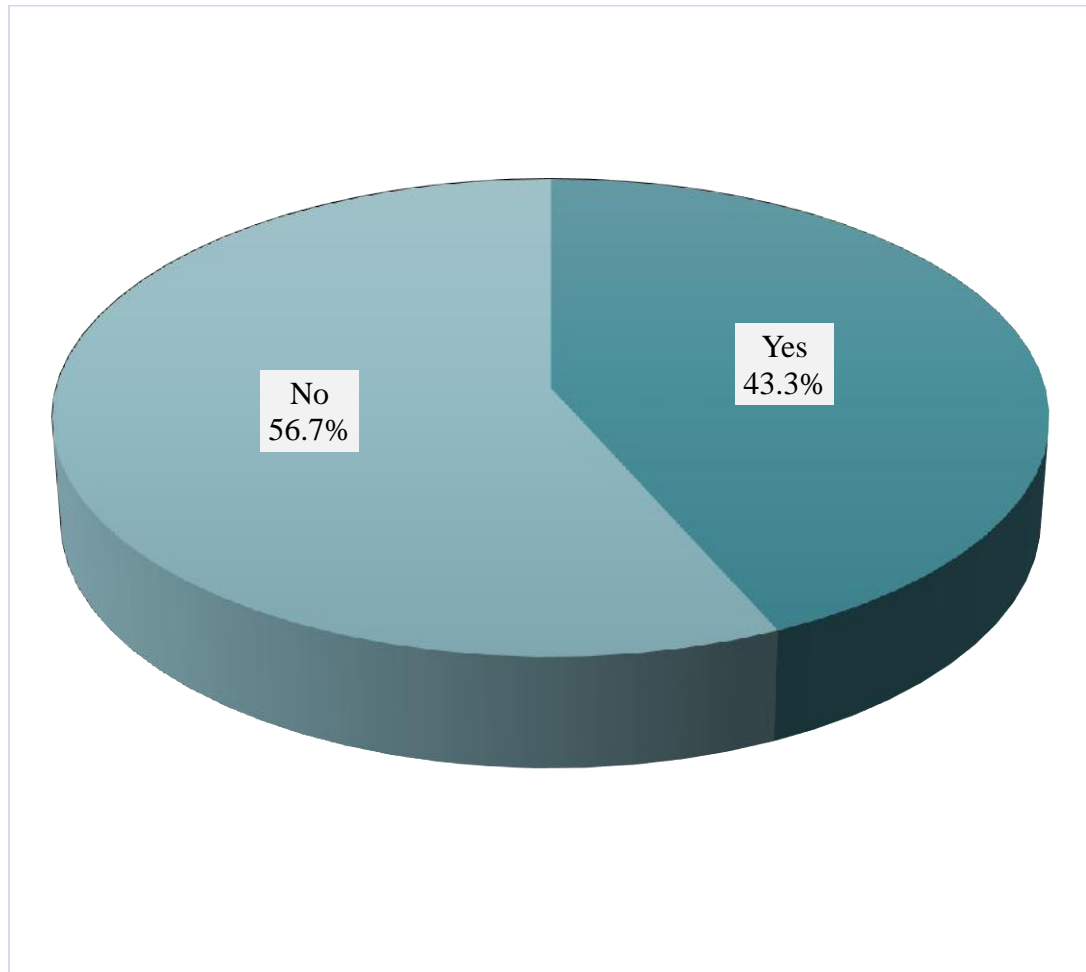
Figure -7: Smoking habits of the participants

4.9 Family income per month:

Among the 30 participants the family income per month between them 2000 – 6000 were 23.3% (n=7), 6000 – 10000 were 36.7% (n=11), 10000 – 14000 were 3.3% (n=1), 14000-18000 were 23.3% (n=7), 18000- 22000 were 13.3% (n=4).

Table- III: Family income of participants per months

Family income per month	Number	Percentage (%)
2000 – 6000	7	23.3%
6000 – 10000	11	36.7%
10000 – 14000	1	3.3%
14000-18000	7	23.3%
18000- 22000	4	13.3%
Total	30	100

4.10 Duration of injury:

Among the 30 participants the duration of injury between participants 8-18 weeks were 16.7% (n=5), 18-28 weeks were 46.7% (n=14), 28-38 weeks were 26.7% (n=8), 38-48 weeks were 10.0% (n=3).
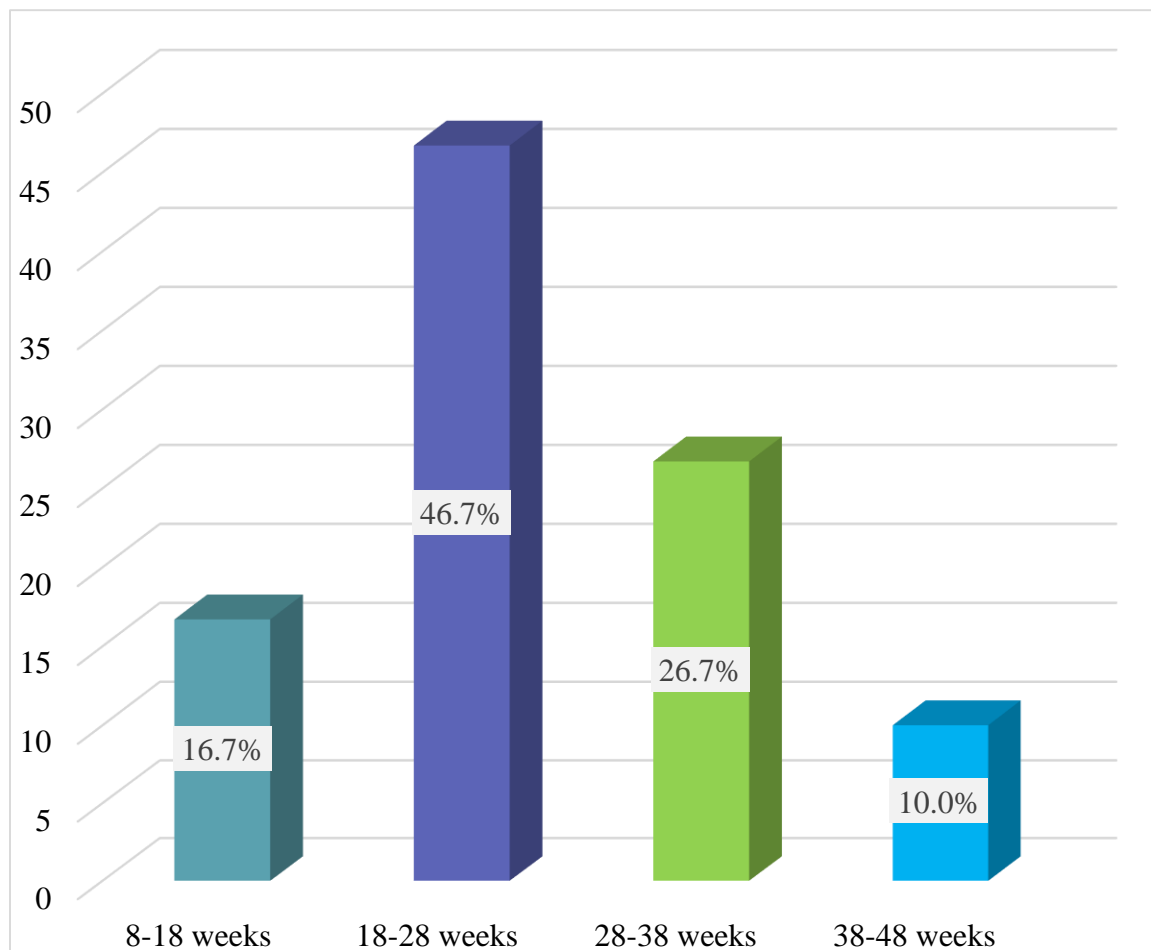
Figure- 8: Duration of injury of participants

4.11 Length of stay (LOS):

Among 30 participants the length of hospital stay of patients between 1-4 weeks were 60.0% (n=18), 4-8 weeks were 23.3% (n=7), 8-12 weeks were 13.3% (n=4) and 12-16 weeks were 3.3% (n=1).
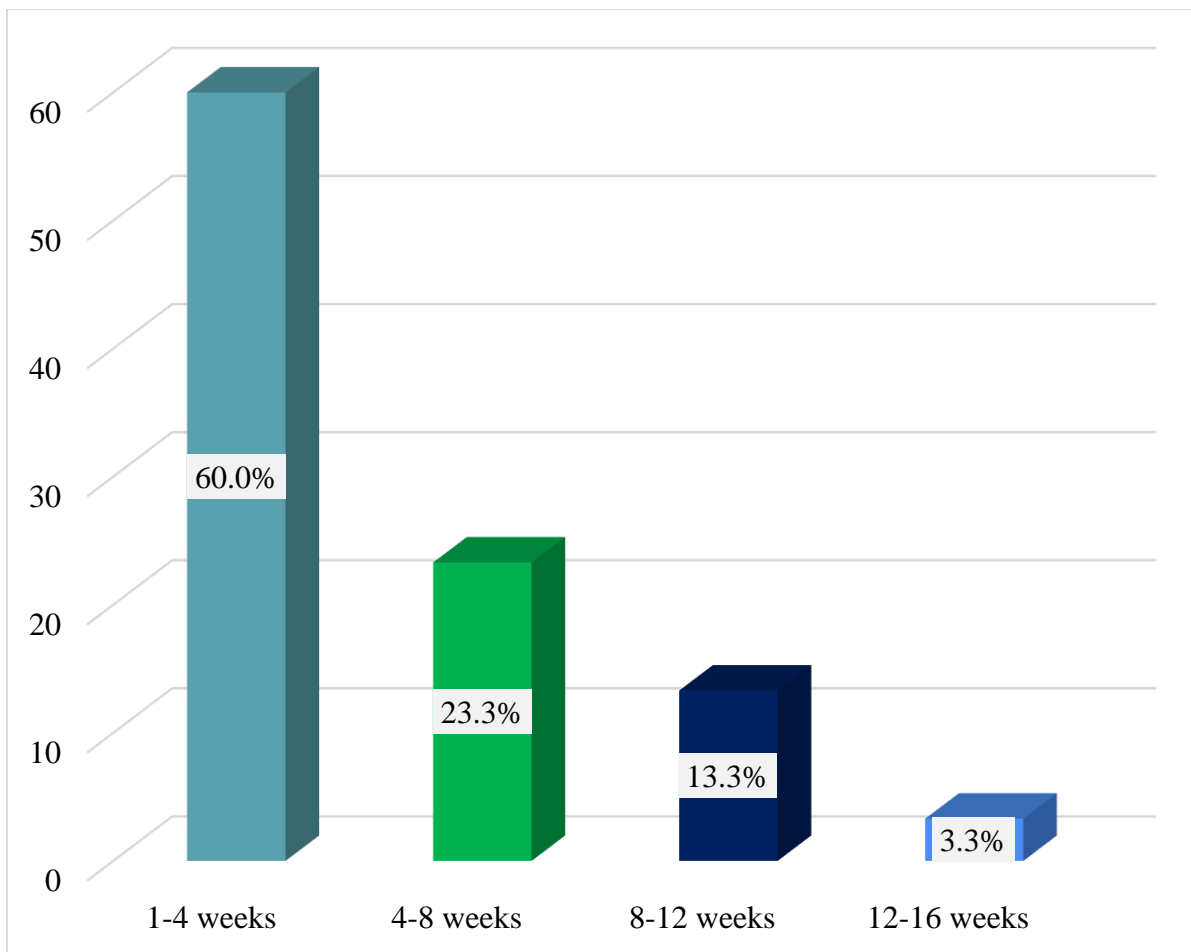
Figure -9: Length of stay (LOS)

4.12 Causes of injury:

Among the 30 participants 16.7% (n= 5) participants were injured by road traffic accident 63.3% (n= 19) participants were injured by fall from height, 13.3% (n=4) participants were injured by fall while carrying heavy load, 3.3% (n=1) participants were injured by motor cycle injury and 3.3% (n=1) participants were injured by electric shock.
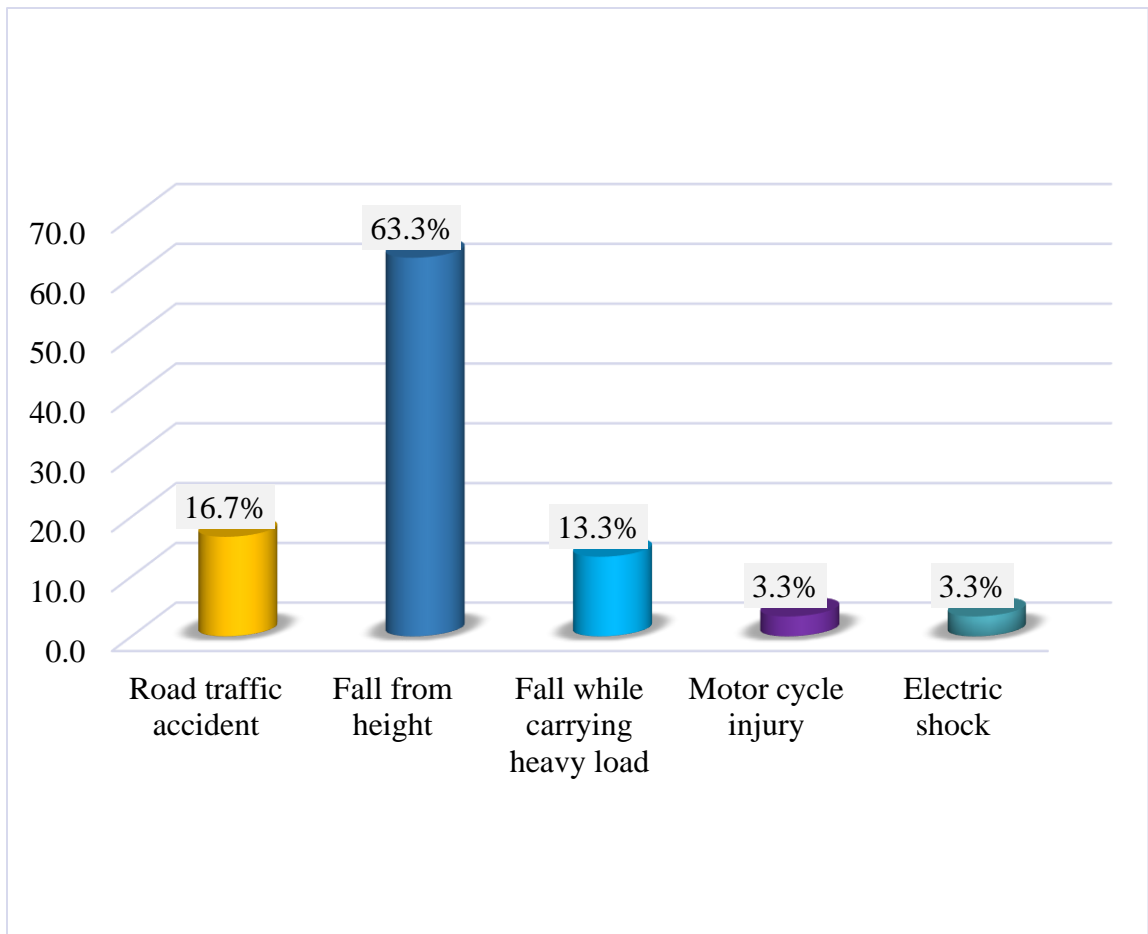
Figure -10: Cause of injury of the participants

4.13 Religion:

Among the 30 participants 86.7% (n= 26) participants were Islam, 13.3% (n= 4) participants were Hindu, and no Christian and Buddhist participants.
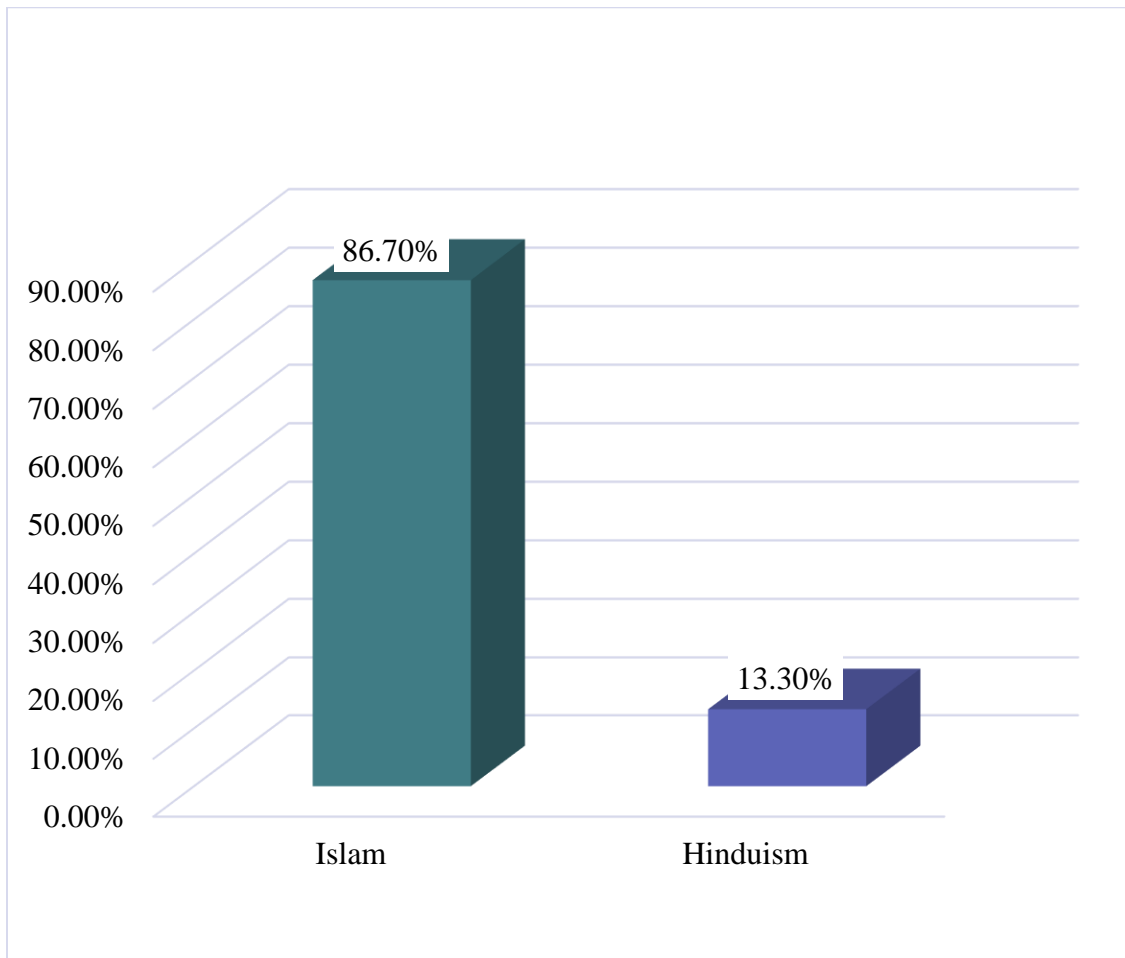
Figure -11: Religion of participants

4.14 Spinal cord injury (SCI) related information (post- test - pre -test)

4.14.1 ASIA scale during initial and discharge

The study found that, the comparison of participant's before (initial) and after (discharge) ASIS scale. The table's legend showed that any participants did not have degrade ASIA level after completing rehabilitation service with usual care. Among 30 participants most of the participants had ASIA scale- complete A before completing rehabilitation service combined with usual care compare with after completing rehabilitation service.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation ($Z= -2.428$, $p=0.015$).

4.14.2. Motor score during initial and discharge

The study found that, the comparison of participant's before (initial) and after (discharge) motor score. The table's legend showed that any participants did not have decreased motor score after completing rehabilitation service combined with usual care. 30 participants had lower motor score before completing rehabilitation service with usual care compare with after same treatment. Conversely, no participants had equal amount of motor score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service combined with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation ($Z= -3.064$, $p=0.002$).

4.14.3. Sensory Score

The study found that, the comparison of participant's before (initial) and after (discharge) sensory score. The table's legend showed that any participants did not have decreased sensory score after completing rehabilitation service combined with usual care. 30 participants had lower sensory score before completing rehabilitation service with usual care compare with after same treatment. Conversely, no participants had equal amount of sensory score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service combined with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation ($Z= -4.493$, $p=0.000$).

4.14.4. Neurological Level

The study described that, the comparison of participant's before (initial) and after (discharge) neurological level. The table's legend showed that any participants did not have degrade neurological level after completing rehabilitation service combined with usual care. 30 participants had degrade neurological level before completing rehabilitation service with usual care compare with after same treatment. Conversely, no participants had equal neurological level before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service combined with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation ($Z= -2.552$, $p=0.011$).

4.15 Functional Improvement Level Measurement (Post-test- Pre-test)

4.15.1. Stretching

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like stretching. The table's legend showed that any participants did not have decreased stretching score according to the functional independence measure (FIM) scale after completing rehabilitation service combine with usual care. 30 participants had lower stretching score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of stretching score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -4.137, p=0.000).

4.15.2. Active movements

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like active movements. The table's legend showed that any participants did not have decreased active movements score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower active movements score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of active movements score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord

injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -4.179, p=0.000).

4.15.3. Rolling

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like rolling. The table's legend showed that any participants did not have decreased rolling score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower rolling score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of rolling score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -5.062, p=0.000).

4.15.4. Lying to sitting and sitting

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like lying to sitting and sitting to lying. The table's legend showed that any participants did not have decreased lying to sitting and sitting to lying score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower lying to sitting and sitting to lying score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of lying to sitting and sitting to lying score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord

injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -5.103, p=0.000).

4.15.5. Prone lying

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like prone lying. The table's legend showed that any participants did not have decreased prone lying score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower prone lying score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of prone lying score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -5.103, p=0.000).

4.15.6. Sitting balance

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like sitting balance. The table's legend showed that any participants did not have decreased sitting balance score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower sitting balance score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of sitting balance score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord

injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -5.062, p=0.000).

4.15.7. Lifting in wheel Chair

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like lifting in wheel chair. The table's legend showed that any participants did not have decreased lifting in wheel chair score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower lifting in wheel chair score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of lifting in wheel chair score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -5.396, p=0.000).

4.15.8. Lifting on bed

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like lifting on bed. The table's legend showed that any participants did not have decreased lifting on bed score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower lifting on bed score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of lifting on bed score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord

injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -5.396, p=0.000).

4.15.9. Lifting forwards

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like lifting forwards. The table's legend showed that any participants did not have decreased lifting forwards score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower lifting forwards score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of lifting forwards score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -5.260, p=0.000).

4.15.10. Lifting sideways

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like lifting sideways. The table's legend showed that any participants did not have decreased lifting sideways score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower lifting sideways score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of lifting sideways score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord

injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -5.260, p=0.000).

4.15.11. Lifting backwards

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like lifting backwards. The table's legend showed that any participants did not have decreased lifting backwards score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower lifting backwards score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of lifting backwards score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -5.260, p=0.000).

4.15.12. Wheel chair to bed and bed

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like wheel chair to bed and bed to wheel chair. The table's legend showed that any participants did not have decreased prone lying score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower wheel chair to bed and bed to wheel chair score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of wheel chair to bed and bed to wheel chair score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care

treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -5.260, p=0.000).

4.15.13. High and low transfer

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like high and low transfer. The table's legend showed that any participants did not have decreased high and low transfer score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower high and low transfer score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of high and low transfer score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -4.821, p=0.000).

4.15.14. Wheeling

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like wheeling. The table's legend showed that any participants did not have decreased wheeling score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower wheeling score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of wheeling score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care

treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -2.692, p=0.007).

4.15.15. Up and down slop

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like up and down slop. The table's legend showed that any participants did not have decreased up and down slop score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower up and down slop score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of up and down slop score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -5.061, p=0.000).

4.15.16. Rough ground

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like rough ground. The table's legend showed that any participants did not have decreased rough ground score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower rough ground score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of rough ground score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care

treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -5.201, p=0.000).

4.15.17. Small steps

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like small steps. The table's legend showed that any participants did not have decreased small steps score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower small steps score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of small steps score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -4.654, p=0.000).

4.15.18. Sit to stand

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like sit to stand. The table's legend showed that any participants did not have decreased sit to stand score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower sit to stand score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of sit to stand score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care

treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -4,665, p=0.000).

4.15.19. Standing balance

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like standing balance. The table's legend showed that any participants did not have decreased standing balance score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower standing balance score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of standing balance score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -3.438, p=0.001).

4.15.20. Standing table

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like standing table. The table's legend showed that any participants did not have decreased standing table score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower standing table score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of standing table score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care

treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -3.075, p=0.002).

4.15.21. Tilt table

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like tilt table. The table's legend showed that any participants did not have decreased tilt table score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower tilt table score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of tilt table score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -2.971, p=0.003).

4.15.22. Flat surface

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like flat surface. The table's legend showed that any participants did not have decreased flat surface score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower flat surface score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of flat surface score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care

treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -3.020, p=0.003).

4.15.23. Rough surface

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like rough surface. The table's legend showed that any participants did not have decreased rough surface score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower rough surface score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of rough surface score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -2.966, p=0.003).

4.15.24. Steps

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like steps. The table's legend showed that any participants did not have decreased steps score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower steps score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of steps score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord

injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -2.842, p=0.004).

4.15.25. Fitting brace

The study found that, the comparison of participant's before (initial) and after (discharge) functional independent level like fitting brace. The table's legend showed that any participants did not have decreased fitting brace score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower fitting brace score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of fitting brace score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= -2.971, p=0.003).

4.15.26. Total functional Independence Measure

The study found that, the comparison of participant's before (initial) and after (discharge) total functional improvement level. The table's legend showed that any participants did not have decreased total functional improvement score according to the functional independence measure (FIM) scale after completing rehabilitation service combined with usual care. 30 participants had lower total functional improvement score before completing rehabilitation service combined with usual care compare with after same treatment. Conversely, no participants had equal amount of total functional improvement score before and after completing rehabilitation service with usual care.

By examining the final test statistics portion of the table by Wilcoxon signed- rank test it was discovered that if participants complete their rehabilitation service with usual care treatment course it showed a significant change in patients with paraplegic spinal cord injury among individuals with paraplegic spinal cord injury with spinal fixation (Z= - 4.784, p=0.000).

CHAPTER-V	DISCUSSION

The aim of the study was to measure the rehabilitation outcome of the SCI patients especially the patients of paraplegic spinal cord injury patients along with spinal fixation who were admitted and completed their rehabilitation from Centre for the Rehabilitation program of the Paralyzed (CRP). Although it was realized that the sample size was small; this study provides information about patients with spinal cord lesions with paraplegia along with spinal fixation only in our country. Total 30 patients were taken in this in study period. Measurement of rehabilitation outcomes is an integral part of any goal-orientated, multidisciplinary rehabilitation program and requires suitable assessment tools. The study population consisted of 27 males (90%) and 3 (10%) females. Their age ranged from 11 to 55 years with a mean age of the patients were 29.43 years with standard deviation (±11.64). The majority of the patients were aged between 11-25 years 46.7%. Most of the patients were young age. All 30 patients had traumatic spinal cord lesions with spinal fixation. SCI incidence increases year after year. Spinal cord injuries are highly disabling and concentrated in young adults, so they bring great pain to the affected individuals and their families (Yang et al., 2014). The age of peak incidence is typically between 15 and 30 years of age, patients with a disease duration of 18 years would only live to be between 33 and 48 years (Martins et al., 1998). National Spinal Cord Injury statistical centre found that males accounts for 82% of all spinal cord injuries and females for 18%. Male was predominantly higher than female. All studies showed a greater percentage of males with injuries compared to females. In Manitoba, the male-to-female ratio significantly decreased from the 1980s (12:1) to the 2000s (4.4:1) due to an increase in motor-vehicle-related injuries in females (Singh et al., 2014). Spinal cord injury mostly occurred in this age due to this age most of the people work outside to earn. In this study male female ratio was 8:1. It is higher in Grece 7:1 (Divanoglou & Levi, 2009) and Jordan 5:8:1 (Otom et al., 1997).

Study shows that among 30 participants 86.7% patients were live in the rural area, 6.7% patients were live in semi-urban area and 6.7% patients were live in the urban area. Their

most of them like 13.3% were farmer, 3.3% (n=1) were day labourer, 16.7% were service holder, 3.3% were garment's worker, 20.0% driver, 6.7% were businessman, 6.7% were housewife, 20.0% were student, 6.7% were electrician, 3.3%were wood cutter. The people of rural area are mostly poor and they are engage in risky works that may causing SCI. Day labourer was the common occupation where spinal cord injury seen. More than 80% population lives in villages and 65% of the total labour forces are employed in agriculture (Hossain, 2001). In this study it was found that 16.7% (n=5) participants were illiterate, 23.3% (n=7) were completed primary school, 20.0% (n=6) were educate up to class 8. Among all participants 86.7% (n=26) were Muslim and 13.3% (n=4) were Hindu. According to the religion, the majority were Buddhists 97.3%, Christian 1.3% and Muslim 1.3% (Tennakoon & de Zoysa, 2014).

Etiology of the spinal cord injury varies from region to region. According to the study the first most common cause of spinal cord injury is 63.3% were injured by fall from height and second most is that 16.7% were injured by road traffic accident. The predominant trauma mechanisms leading to the thoracolumbar fracture were motor vehicle accident and fall from height (Seibenga et al., 2007). A study conduct in Jordan, Otom et al.(1997) shows fall 21.2% & RTA 44%, in Iran Chabok et al. (2010) RTA 52% & fall 45.4%. But in India Singh et al. (2003) fall was 47% & RTA 34.78%.

In spinal cord injury most of the people fall into complete A, than subsequently incomplete B, incomplete C and incomplete D. One study shows that approximately 40% of patients with spinal cord injury (SCI) present with complete SCI, 40% with incomplete injury, and 20% with either no cord or only root lesions (Rizollo et al., 2000). On the other hand Islam et al. (2001) described that in Bangladesh about 44% patients had cervical lesion (mostly C5, C6 and C10), 27% had thoracic lesion, 29% had lumbar injury where Traumatic incidence rate is about 93% where tetraplegia and paraplegic were 46 and 54%, respectively. About 44% patients had all four limbs paralyzed, 43% had pressure sore and about 90% needed bladder function management through use of catheter.

The duration of injury has an affects on length of hospital stay. In study among 30 participants duration of injury were 46.7% (n=14) in 18-28 weeks, 26.7% (n=8) in 28-38

weeks, 16.7% (n=5) in 8-18 weeks and 10% (n=3) in 38-48 weeks where these 30 participants length of hospital stay were 60% (n=18) in 1-4 weeks, 23.3% (n=7) in 4-8 weeks, 13.3% (n=4) in 8-12 weeks and 3.3% (n=1) in 12-16 weeks. One study was performed to determine whether a patients days from the start of disability to the rehabilitation admission, duration of rehabilitation and complete hours of rehabilitation treatment predict client clinical performance. Days from condition on admission to regional rehabilitation hospital where 75% clients admission within 15 days. Clients who were admitted with 15 days from onset were 1.96 times (nearly twice as likely). Additional analysis was conducted to examine the group of participants who were admitted in 15 days or less. Discharge status and ethnicity were not statistically significant. There were no statistically significant variations with regard to severity, complete co-morbidities, or pain at admission or discharge in respondents who were admitted within 15 days or less. For clinical quality, the total number of hours of rehabilitation was significant (Cluster, 2012).

In this study shows that significant level of ASIA scale was (p= .015), motor and sensory outcome was significant and which was (p=.002) and (p= .000) and also in this study found that total functional improvement level was significant which was measured by FIM scale and analyzed by Wilcoxon test which shows that significant level during admission and also after completing their rehabilitation course along with proper physiotherapy. Curt et al. (1998) claimed that ambulatory capacity could be predicted by the ASIA motor score of the lower limbs ($p < .0001$). In patients with acute SCI, for the period 6 months post-trauma, the ASIA motor score increased significantly ($p < .05$), whereas the ASIA sensory scores ($p > 0.1$).

McKinley et al.(1999) differentiate the significant level between traumatic and non-traumatic SCI and found that injury characteristics revealed significantly more paraplegia and incomplete SCI within the non-traumatic SCI group ($p < .01$). Both non-traumatic and traumatic SCI individuals had significant FIM changes from rehabilitation admission to discharge ($p < .01$). Those with tetraplegia-incomplete non-traumatic SCI had significantly higher admission motor FIM scores and shorter rehabilitation length of stay than in the traumatic group ($p < .05$). Paraplegic-complete and paraplegic-incomplete

non-traumatic SCI subjects had lower discharge motor FIM scores, FIM change, and FIM efficiency than those with traumatic SCI.

Among 30 participants, they significantly improve their functional capabilities after completing rehabilitation program like rolling, lying to sitting, prone lying, sitting balance where significant value is (p=0.000). In study suggest that in the section of rolling, prone lying and sitting balance the goal is to become total independent (Somers, 1992). They also shows significant improvement in lifting in wheelchair and their significant value is (p=0.000). As in the section of lifting the goal was to be total independent (Atrice et al., 2001). In the section of transferring from wheelchair to bed and bed to wheelchair among 30 participants improve significantly. That means they could perform transferring from wheelchair to bed and bed to wheelchair total independently without any assistive device. As in the section of transferring from bed to wheelchair the goal is to gain total independent (Atrice et al., 2001). All participants became independent in wheelie and their significant value is (p=0.007). In wheelchair skills in rough ground (p=0.000). Atrice et al. (2001) claim in the section of wheelchair propelling in rough surfaces the goal is to gain total independence. In case of walking in flat surface most of the patient improve significantly where (p=0.003) and rough surface (p=0.003). Majority of the patient significant value of steps (0.004) and fitting brace (p=0.003). So it is said that all participants improve their functional capabilities after completing rehabilitation service along with additional care.

5.1. Limitation of the study

Complete accuracy is not being possible in any research so that some limitations may exist. Regarding this study, there were some limitations or barrier to consider the result of the study as follows.

- This study has limited sample size. Conveniently 30 outcome measurement form was chosen as a sample of the study. The sample size was too small and only took paraplegic spinal cord injury patients to represent the whole population of paraplegic spinal cord injury.

- There was no control group to compare.

- Therefore, the result does not generalize.

- Female participants were less in number compare to male participants.

- Time and resources were limited which have a great deal of impact on the study.

- Few researches have been done before on this topic. So there was little evidence to support the result of this project in the context of Bangladesh.

| CHAPTER-VII | CONCLUSION AND RECOMMENDATION |

Now-a-days spinal cord injury (SCI) is one of the most devastating disorders around the world that is followed by long and often unsuccessful recovery after trauma. Spinal cord injury (SCI) is an insult to the spinal cord. As a result of the injury, the functions performed by the spinal cord are interrupted at the distal level of the injury. A trauma to the spinal cord is a life changing event, which leaves most patients impaired or paralyzed throughout lifetime due to the limited capacity of the central nervous system to heal and the restricted number of therapeutic options until today. Although spinal cord injury is one of the most serious injuries that a person can survive, it is possible to return to a healthy, happy and productive life after even the most severe of cord injuries. Achieving this outcome, however, is a monumental task that requires the coordinated efforts of the spinal cord injured person, his or her family and a specialized multidisciplinary team of professionals. From the moment of injury onward, specialized care is essential for maximization of health as well as psychosocial and functional adaptation. After SCI, patients lose some extent of functional abilities. But it is very important to try to return their functional ability. It is very important to measure the function and independency of a spinal cord injured person after rehabilitation program which may be measure through functional independence measure (FIM). Early rehabilitation is required for patients with spinal cord injury. The aim of rehabilitation is to teach patients with SCI how to achieve an optimal independent and satisfying lifestyle in their own community. Fortunately, most patients go home after rehabilitation and a significant number achieve functional independence. The results of this study provided more insight into the rehabilitation outcome along with functional outcome of a group of patients with paraplegic spinal cord injury with spinal fixation.

The finding of the study was that among 30 participants 90% were male most of participants were 11-25 years 46.7%, all participants were traumatic SCI, 80% participants were complete A, 13.3% incomplete B, 3.3% were incomplete C, 3.3% were incomplete D. After completing rehabilitation along with usual care, program it is found

that all participants improve their ASIA scale, motor, sensory score, neurological level and functional outcome. Most of the participants improve their functional capacities significantly. The aim of this study provided more insight into the overall rehabilitation outcome of a group of patients with paraplegic spinal cord injury with spinal fixation. More research is needed to evaluate the rehabilitation program for these patients.

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মৌখিক অনুমতি পত্র/সম্মতি পত্র

(অংশগ্রহনকারীকে পড়ে শোনাতে হবে)

আসসালামুআলাইকুম,

আমার নাম তাহমিনা আক্তার সীমা, আমি এই গবেষণা প্রকল্পটি বাংলাদেশ হেলথ্ প্রফেশনস ইনস্টিটিউট(বিএইচপিআই)-এ পরিচালনা করছি যা আমার ৪র্থ বর্ষ বি এস সি ইন ফিজিওথেরাপী কোর্সের অধিভুক্ত। আমার গবেষণার শিরোনাম হল- "বাংলাদেশে অর্ধাঙ্গ পক্ষাঘাত গ্রস্থ রোগীদের মেরুরজ্জু স্থায়ীকরণদের ক্ষেত্রে পুর্ণবাসন ফলাফল"। আমি এই ক্ষেত্রে আপনাকে কিছু ব্যক্তিগত এবং আনুষঙ্গিক প্রশ্ন মেরুরজ্জু ক্ষতিগ্রস্থ সম্পর্কে করতে চাচ্ছি। এতে আনুমানিক ২০-৩০ মিনিট সময় নিবো।

আমি আপনাকে অনুগত করছি যে, এটা আমার অধ্যয়নের অংশ এবং যা অন্য কোন উদ্দেশ্যে ব্যবহার হবে না। গবেষক সরাসরি এই স্নায়ুজ্ঞান অধ্যয়নের সাথে অন্তর্ভুক্ত নয়। তাই এই গবেষণায় আপনার অংশগ্রহন বর্তমান ও ভবিষ্যৎ চিকিৎসায় কোন প্রকার প্রভাব ফেলবেনা। আপনি যে সব তথ্য প্রদান করবেন তার গোপনীয়তা বজায় থাকবে এবং আপনার প্রতিবেদনের ঘটনা প্রবাহে এটা নিশ্চিত করা হবে যে এই তথ্যের উৎস অপ্রকাশিত থাকবে।

এই অধ্যয়নে আপনার অংশগ্রহন স্বেচ্ছাপ্রণোদীত এবং আপনি যে কোন সময় এই অধ্যয়ন থেকে কোন নীতিবাচক ফলাফল ছাড়াই নিজেকে প্রত্যাহার করতে পারবেন। এছাড়াও কোন নির্দিষ্ট প্রশ্ন অপছন্দ হলে উত্তর না দেয়ার এবং সাক্ষাৎকারের সময় কোন উত্তর না দিতে চাওয়ার অধিকারও আপনার কাছে।

এই অধ্যয়নে অংশগ্রহণকারী হিসেবে যদি আপনার কোন প্রশ্ন থাকে তাহলে আপনি আমাকে অথবা /এবং মোহাম্মদ আনোয়ার হোসেন, সহকারী অধ্যাপক, ফিজিওথেরাপী বিভাগ, সি আর পি, সাভার, ঢাকা-১৩৪৩।

শুরু করার পূর্বে আপনার কোন প্রশ্ন আছে কি?

আমি আপনার অনুমতি নিয়ে এই সাক্ষাৎকার শুরু করতে যাচিছ।

হ্যাঁ ....

না ....

অংশগ্রহনকারীর সাক্ষর এবং তারিখ ....

সাক্ষাৎগ্রহণকারীর সাক্ষর এবং তারিখ ....

Assalamualaikum , my name is Tahmena Akter Seema , I am conducting this study for a B.Sc in Physiotherapy project study dissertation titled **"Rehabilitation outcome of spinal fixation to paraplegic spinal cord injury patients in Bangladesh"** under Bangladesh Health Professions Institute (BHPI) ,University of Dhaka. I would like to know about some personal and some other related Information regarding Spinal Cord Injury (SCI).You will perform some task which are mention in this form.This will take approximately 20-30 minutes.

I would like to inform you that is a purely academic study and will not be used for any other purpose. The researcher is not directly related with this area (spinal cord injury),so your participation in the research will have no impact on your present or future treatment in this area (SCI unit). All information provided by you will be treated as confidential and in the event of any report or publication it will be ensured that the source of information remains anonymous and also all information will be destroyed after completion of the study. Yours participation in this study is voluntary and you may withdraw yourself at any time during Study without any negative consequences.You also have the right not to answer a particular question that you don't like or do not want to answer during interview.

If you have any query about the study or your right as a participant, you may contact with me, researcher and /or Mohammad Anwar Hossain, associate professor and Head of the Dept. of physiotherapy ,CRP, Savar , Dhaka.

Do you have any question before I start ?

So, may I have your consent to proceed with the interview or work ?

Yes   □

No   □

Signature of the participant_____

Signature of the Interviewer_____

<center>প্রশ্নাবলী</center>

শিরোনামঃ বাংলাদেশে অর্ধাঙ্গ পক্ষাঘাত গ্রস্থ রোগীদের মেরুরজ্জু স্থায়ীকরণদের ক্ষেত্রে পুর্ণবাসন ফলাফল।

অধ্যায় ১ ঃ ব্যক্তিগত বিবরণ

১.১ অংশগ্রহণকারীর নাম ঃ

১.২ ঠিকানা ঃ

<u>বর্তমান ঠিকানা ঃ</u>

গ্রাম ঃ   পোস্ট অফিস ঃ

থানা ঃ   জেলা ঃ

<u>স্থায়ী ঠিকানা ঃ</u>

গ্রাম ঃ   পোস্ট অফিস ঃ

থানা ঃ   জেলা ঃ

১.৩ ফোন নম্বও ঃ

অংশগ্রহনকারীর ফোন নম্বর ঃ

নির্ভরশীল ব্যক্তির ফোন নম্বর ঃ

১.৪ সাক্ষাৎ এর তারিখ ঃ

অধ্যায় ২ ঃ আর্থ সামাজিক ও জনসংখ্যাতাত্ত্বিক তথ্য

২.১ বয়স	......................বছর
২.২ লিঙ্গ	১. পুরুষ ২. মহিলা
২.৩ শিক্ষাগত যোগ্যতা	১. অশিক্ষিত ২. প্রাথমিক শিক্ষা শেষ করে নি ৩. প্রাথমিক ৪.অষ্টম শ্রেণী পর্যন্ত ৫. মাধ্যমিক ৬.উচ্চ মাধ্যমিক ৭. স্নাতক ৮. স্নাতকোত্তর

২.৪ পেশা	১. কৃষক
	২. দিনমজুর
	৩. চাকুরীজীবী
	৪. গার্মেন্টস কর্মী
	৫. গাড়ি চালক
	৬. রিক্সা চালক
	৭. ব্যবসায়ী
	৮. কাজে অনিয়োজিত
	৯. গৃহিনী
	১০. শিক্ষক
	১১. ছাত্র
	১২.বিদ্যুতিক কাজে দক্ষ
	১৩.কাঠুরে
	১২. অন্যান্য ....
২.৫ বৈবাহিক অবস্থা	১. বিবাহিত
	২. অবিবাহিত
	৩. তালাকপ্রাপ্ত
	৪. বিধবা
২.৬ পরিবারের ধরণ	১. একক পরিবার
	২. যৌথ পরিবার

২.৭ পরিবারের সদস্য সংখ্যা	
২.৮ বসবাসের এলাকা	১. নগর ২. অর্ধ-নগর ৩. গ্রামীণ
২.৯ ধর্ম	১. ইসলাম ২. হিন্দু ৩. খ্রিষ্টান ৪. বৌদ্ধ ৫. অন্যান্য ....
২.১০ ধুমপান	১. হ্যাঁ ২. না
২.১১ পরিবারের মাসিক আয়	.... টাকা

অধ্যায় ৩ ঃ আহত সংক্রান্ত প্রশ্নাবলী

৩.১ আহত হওয়ার তারিখ	....
৩.২ ভর্তি হওয়ার তারিখ	....
৩.৩ নির্গমনের তারিখ	....
৩.৪ আহত হওয়ার কারণ	১. সড়ক দুর্ঘটনা ২. উপর থেকে পড়া ৩. ভারী কোন জিনিস বহনের সময় পড়ে যাওয়া ৪. অগভীর পানিতে ঝাঁপ দেয়া ৫. মোটর সাইকেল দুর্ঘটনা ৬. বন্দুকের গুলিতে আহত হওয়া ৭. ছুরিঘাতে আহত হওয়া ৮. শরীরের পিছনের দিকে কোন ভারী বস্তু পড়া ৯. বিদ্যুৎ তাড়িত হওয়া ৯. অন্যান্য ....

অধ্যায় ৪ ঃ ফলাফল মাপার ফরম

	প্রাথমিক	নির্গমন
মোট অঙ্গসচাঁলক হিসাব		
মোট সংবেদনশীলতার হিসাব		
কঙ্কালবত পর্যায়		
স্নায়ুবিক পর্যায়		
এ এস আই এস স্কেল		

কর্মদক্ষতা উন্নতির হিসাব (ফিম স্কেলের সাথে ১-৭ পর্যন্ত পূরণ করতে হবে)

	প্রাথমিক	নির্গমন
প্রসারিত করা		
সক্রিয় ব্যয়াম		
বিছানায় গতিশীলতা		
ঘূর্ণায়মান		
শোয়া থেকে বসা		
উপুড় হয়ে শোয়া		
বসার ভারসাম্য		
উত্তোলক		
হুইল চেয়ার উত্তোলক		
বিছানার উপর উত্তোলক		
সামনের দিকে উত্তোলক		
পাশের দিকে উত্তোলক		
পিছনের দিকে উত্তোলক		

হস্তান্তর		
হুইল চেয়ার থেকে বিছানায় এবং বিছানা থেকে হুইল চেয়ার		
উপরে এবং নিচে হস্তান্তর		
হুইল চেয়ারের দক্ষতা		
চক্রাকারে চালানো		
উঁচু এবং নিচু ঢাল		
অমসৃণ ভূমি		
ছোট পদক্ষেপ		
দাঁড়ানো		
বসা থেকে উঠা		
দাঁড়ানোর ভারসাম্য		
দাঁড়ানোর টেবিল		
কাত হওয়ার টেবিল		
হাঁটার ধরন		
সমান উপরিভাগ		
অমসৃণ উপরিভাগ		
পদক্ষেপ		
যথাযথ বন্ধনী		
মোট ফিম		

<u>**Questionnaire**</u>

Code no:

Title: Rehabilitation outcome of spinal fixation to paraplegic spinal cord injury patients in Bangladesh.

Part 1: Personal Details

1.1   Name of respondent:

1.2   Address:

Present Address:

Village: Post office:

Thana: District:

Permanent Address:

Village: Post office:

Thana: District:

1.3   Contact No:

Respondent's Contact no:

Dependent's Contact no:

1.4   Date of interview:

Part 2: Socio-Demographic Information

2.1 Age	…………………….. Years
2.2 Gender	1.Male 2. Female
2.3 Educational level	1.Illiteracy 2. Less than primary school 3. Primary completed 4.Up to class-8 5. SSC completed 6. HSC completed 7. Graduation completed 8. Masters completed

2.4 Occupation	1.Farmer
	2. Day laborer
	3. Service holder
	4. Garment's worker
	5. Driver
	6. Rickshaw puller
	7. Businessman
	8. Unemployed
	9. Housewife
	10. Teacher
	11. Student
	12.Electrician
	13.Wood cutter
	14. Others (specify)
2.5 Marital status	1.Married
	2.Unmarried
	3.Divorced
	4.Widow
2.6 Family type	1.Nuclear family
	2. Extended family
2.7 Number of family members	

2.8 Living area	1.Urban 2. Semi-urban 3. Rural
2.9 Religion	1.Islam 2. Hinduism 3. Christian 4. Buddhist 5. Others (specify) …………………………….
2.10 Smoking	1.Yes 2. No
2.11 Family income per month	……………………….Taka

Part 3: Injury Related Question

3.1 Date of injury	
3.2 Date of admission	
3.3 Date of discharge	
3.4 Causes of injury	1.Road traffic accident 2. Fall from height 3. Fall while carrying heavy load 4.Shallow diving 5. Motor cycle injury 6.Gunshot injury 7.Stabbing injury 8.Fall of heavy object on back 9.Electric shock 10. Others (specify)

Part 4: Outcome Measurement Form

	Initial	Discharge
Total motor score		
Total sensory score		
Skeletal level		
Neurological level		
ASIS scale		

Functional improvement scale (Filled with FIM Scale 1-7)		
	Initial	Discharge
Stretching		
Active exercise		
BED MOBILITY		
Rolling		
Lying to sitting		
Prone lying		
Sitting balance		
LIFTING		
Lifting in W/C		
Lifting on bed		
Lifting forwards		
Lifting sideways		
Lifting backwards		

TRANSFERS		
W/C to bed and bed to W/C		
High and low transfer		
W/C SKILLS		
Wheeli		
Up and down slop		
Rough ground		
Small steps		
STANDING		
Sit to stand		
Standing balance		
Standing table		
Tilt table		
WALKING GAIT		
Flat surface		
Rough surface		
Steps/slopes		
Fitting brace		
Total FIM		

April 16, 2019

To

The Head of the physiotherapy department

Center for the Rehabilitation of the Paralyzed (CRP,

Savar, Dhaka-1343

Subject: Prayer for seeking permission to collect data for research project.

Sir,

I respectfully to state that I am a student of 4th year B. Sc. (Hon's) in physiotherapy at Bangladesh Health Professions Injury (BHPI). In 4th year course module we have to do a research project. I have a chosen a research topic that is **"Rehabilitation outcome of spinal fixation to paraplegic spinal cord injury patients in Bangladesh"** This study is conducted under the supervision of Mohammad Anwar Hossain, Associate Professor and Head of the Dept. of Physiotherapy department, BHPI, CRP. It is a prospective study. For this reason I need permission for data collection of spinal cord injury unit of CRP.

I therefore pray and hope that, you would be kind enough to give me permission to collect data and complete the research project successfully from your department and oblige thereby.

Yours faithfully ,

Tahmena Akter seema

Tahmena Akter Seema

4th Year B.Sc (Hons) in Physiotherapy

Roll no – 21

BHPI, CRP, Savar, Dhaka.

Forwarded & Recommended

16.04.19
Prof. Md. Obaidul Haque
Head, Department of Physiotherapy,
BHPI, CRP. Savar, Dhaka-1343

Approved
29/04/19
Mohammad Anwar Hossain
Associate Professor & Head
Physiotherapy Dept., CRP
CRP-Chapain, Savar, Dhaka-1343

Ref: CRP-BHPI/IRB/09/19/1340   Date: 18/09/2019

To
Tahmena Akter Seema
B.Sc. in Physiotherapy
Session: 2014-15, Student ID: 112140253
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Subject: Approval of the thesis proposal **"Rehabilitation outcome of spinal fixation to the paraplegic spinal cord injury patients in Bangladesh"** by ethics committee.

Dear Tahmena Akter Seema,

Congratulations.
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application 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 and Bangla version)
3	Information sheet & consent form.

The study involves use of a questionnaire to explore rehabilitation outcome of spinal fixation to the paraplegic spinal cord injury patients in Bangladesh that may take 15 to 20 minutes to answer the questionnaire and there is 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 10.00 AM on 11th August, 2018 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

18th September,2019
The Chairman
Institutional Review Board (IRB)
Bangladesh Health Professions Institute (BHPI)
CRP-Savar, Dhaka-1343, Bangladesh

Subject: Application for review and ethical approval.

Respected Sir,

With due respect and humble submission to state that I am Tahmena Akter Seema, student of 4th Professional B.Sc. in Physiotherapy at Bangladesh Health Professions Institute (BHPI)- an academic institute of CRP under faculty of Medicine of University of Dhaka (DU).This is a 4(four) year full time course. Conducting thesis project is partial fulfillment of the requirement for the degree of B.Sc in physiotherapy. As I have to conduct a thesis entitled, **"Rehabilitation outcome of spinal fixation to the paraplegic spinal cord injury patients in Bangladesh"** under the supervision of Mohammad Anwar Hossain, Assistant Professor & Head, Department of the Physiotherapy , BHPI, CRP, Savar, Dhaka-1343, Bangladesh. The purpose of the study is to find out the rehabilitation outcome of spinal fixation to the paraplegic spinal cord injury patients. I would like to assure that anything of my study will not be harmful for the participants. Informed consent will be received from all participants,data will be kept confidential.

May I, therefore pray and hope that you would be kind enough to approve the thesis proposal and to start data collection. I can assure you that I will maintain all the requirements for study.

Sincerely,
Tahmena Akter Seema

Tahmena Akter Seema
4th professional B.Sc in Physiotherapy
Roll: 21, Session: 2014-15

BHPI,CRP,Savar,Dhaka-1343 ,Bangladesh

Recommendation from the thesis supervisor:

Mohammad Anwar Hossain

Assistant Professor & Head, Department of physiotherapy

BHPI,CRP,Savar, Dhaka-1343

Attachment: Thesis proposal including process and procedure for maintaining confidentiality, Questionnaire (English & Bangla version), Informed consent.

Treatment Protocol

1. Active exercise and active assisted exercise: 10 repetitions x 1set
2. Stretching exercise: 10 repetitions x 10-15 seconds hold x 1 set
3. Strengthening exercise: 10 repetitions x 1 set.
4. Bridging practice : 10 repetitions x 10-15 seconds hold x 1 set
5. Four point kneeling and half kneeling practice: 10 repetitions x 10 -15 seconds hold x 1 set.
6. Transferring practice (Bed to W/C and W/C to bed): 10 repetitions x 1 set

7. Home advice