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SHOULDER PROBLEMS AMONG PEOPLE WITH PARAPLEGIC SPINAL CORD INJURY

Nishat Tamanna Maliha

Bachelor of Science in Physiotherapy (B.Sc. PT)

DU Roll:814

Registration no: 6866

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BHPI, CRP, Savar, Dhaka-1343

Bangladesh Health Professions Institute (BHPI)

Department of Physiotherapy

CRP, Savar, Dhaka-1343

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We the undersigned certify that we have carefully read & recommend to the Faculty of Medicine, University of Dhaka, for the acceptance of this dissertation entitled

SHOULDER PROBLEMS AMONG PEOPLE WITH PARAPLEGIC SPINAL CORD INJURY

Submitted by **Nishat Tamanna Maliha,** for the partial fulfillment of the requirement for the degree of Bachelor of Science in Physiotherapy (B.Sc. PT).

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Md. Shofiqul Islam
Associate Professor & Head,
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka
Supervisor

…….....

Professor Md. Obaidul Haque
Vice Principal
BHPI, CRP, Savar, Dhaka

.....

Ehsanur Rahman
Associate Professor & MPT Coordinator
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka

.....

Md. Shofiqul Islam
Associate Professor & Head,
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka

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 Department of Physiotherapy, Bangladesh Health Professions Institute.

Signature: **Date:**

Nishat Tamanna Maliha

Bachelor of Science in Physiotherapy

(B.Sc. PT) Session: 2016-17

BHPI, CRP, Savar, Dhaka-1343

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List of Acronyms

AAOS	American Academy of Orthopedic Surgeons
ASIA	American Spinal Injury Association
ADL	Activity of Daily Living
BHPI	Bangladesh Health Professions Institute
BMRC	Bangladesh Medical and Research Council
CRP	Centre for the Rehabilitation of the Paralysed
DU	Dhaka University
GBD	Global Burden of Disease
IRB	Institutional Review Board
WUSPI	Wheelchair Users Pain Index
SCI	Spinal Cord Injury
SD	Standard Deviation
SPSS	Statistical Package for the Social Science
US	United states
WHO	World Health Organization

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Abstract

Purpose: To assess the shoulder problems among paraplegic SCI patients who are independently propelling wheelchair. ***Objectives:*** The objectives of this study were to evaluate the shoulder problems to find out association between shoulder problems and socio-demographic information of paraplegic SCI patients. ***Methods:*** The study design was cross-sectional. Total 60 samples were selected conveniently for this study from SCI Rehabilitation Unit of Physiotherapy Department at the Center for the Rehabilitation of the Paralysed (CRP), Savar, Dhaka. Data was collected by using structural questionnaire and Wheelchair Users Pain Index Scale from the participants and analyzed through Statistical package of Social Science (SPSS) Version 20, Microsoft Office Excel 2019, Microsoft Office word. ***Results:*** In this study most commonly, affected age were more than 41 years 18.3%(n=11). About 76.7%(n=14) female and 23.3%(n=46) male. Almost 23.3%(n=14) students were more affected. 63.3%(n=38) married, 36%(n=22) were unmarried, 92% were from nuclear family, 86.7%(n=52) lived in rural areas, 23.3%(n=14) participants had secondary education, 62.6%(n=72) had history of co-morbidity,76.7%(n=46) had no co-morbidities and 6%(n=4) had multiple co-morbidities. About 40(34.8%) participants felt pain daily. The investigator had not found the strong positive association between WUSPI scale and Socio-demographic factor because $p>0.05$ however, association among co-morbidities with WUSPI scale was statistically significant as P=0.021, association among limited activities with WUSPI scale was statistically significant as P=0.011, association among current shoulder pain with WUSPI scale statistically significant as P=0.015. ***Conclusion:*** The study results provided more insight about shoulder problems among people with paraplegic SCI. Awareness, proper positioning, rest, physiotherapy intervention can prevent the shoulder problems after SCI. Further research is needed to evaluate the rehabilitation for these patients.

Key words: *Paraplegic, Shoulder pain, Spinal Cord Injury, Wheelchair Users Pain Index scale.*

Word count: 9973

CHAPTER: I INTRODUCTION

1.1 Background

The term "SCI" stands for "spinal cord injury," which indicates any damage to the spinal cord or cauda equina caused by a fracture or dislocation of the vertebrae, with or without an associated visible cut or wound (Huang et al 2020). Spinal Cord injury is considered one of the biggest problems and catastrophic events related to the health of people. It is one of the major health problems of human societies leading to numerous physical and mental problems for disabled people and their families (Moghimian et al., 2015). According to the World health organization (WHO), 2013 the term ‘spinal cord injury refers to damage to the spinal cord resulting from trauma (e.g., a car crash) or from disease or degeneration (e.g., cancer) and it also stated that an estimated worldwide prevalence of spinal cord injury is between 250 000 and 500 000 people per year.

SCI is a condition with an annual incidence of 12.1–57.8 cases per million worldwide (Munce et al., 2013). Noonan et al., (2012) showed that the number of people living with Spinal Cord Injury in the United States 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 is from 10.4 per million per year to 29.7 per million per year (Moghimian et al., 2015).

In Australia, male population are more affected than female in non-traumatic SCI and the ratio is 197:169 and the prevalence of paraplegia is more about 269 per million than tetraplegia (98 per million) (New et al., 2013). The worldwide incidence of SCI is 10.4 and 83 per million per year and the mean age is 33 years old, male and female ratio is 3.8:1 and one- third of the patients are tetraplegic all over the world (Wyndaele & Wyndaele, 2006). And 2.5 million people live with SCI around the world (Oyinbo & C.A., 2011). In Asia the incidence rates of SCI are ranged from 12.06 to 61.6 per million and the average age is 26.8 to 56.6 years old, men are more vulnerable than

women also in traumatic spinal cord injury main causes are motor vehicle collisions (MVCs) and falls (Ning et al., 2012).

Although accurate statistics on the frequency of spinal cord injuries (SCI) in low-income nations like Bangladesh is unavailable, most experts in the field believe it to be as high as 70 per million. (International perspectives on spinal cord injury, 2013) (Elshahidi et al., 2018). Furthermore, in a developing country like Bangladesh, life expectancy of spinal cord injured persons is much lower than in a developed country (Razzak et al., 2011). SCI continues to be a major cause of disability throughout Asia as well as in Bangladesh (Islam et al., 2011).

An injury to the spinal cord is an event which can alter the course of a person's life, often resulting in a chronic physical deterioration and the need for continuous support to maintain a high level of health and well-being. The injury to the spinal cord is associated with a number of difficulties, including an increase in the risk of secondary diseases and mortality, a minimal professional and community integration, relationship-romantic commitment, and poor quality of life. These difficulties can all be challenging for patients to manage. Those diagnosed with SCI have an increased chance of developing mental health issues such as, depression which affects about 19-26% of people living with SCI, about 3 times more than the general population. Also, rates of anxiety, disturbance of post-traumatic stress (PTSD), abuse of support and other problems of mental health in the SCI tend two to be higher than those found in the general population (Macdonald et al., 2020).

The increasing number of automobile accidents and the spread of violence in the urban areas of metropolitan areas has brought about a rise in the incidence of trauma in the general population. Spinal injuries are less frequent than appendicular skeleton injuries, occurring in approximately 6% of the patients with multiple traumas, half of whom present spinal cord injury (Alves et al., 2012). In a complete lesion, the neurological assessment shows that the nerve below the level of injury is not intact whereas incomplete SCI presents some intactness of the spinal cord (Gibson, 2003).

However, depending on the limbs involved, an individual with SCI is identified either as tetraplegic or paraplegic. A person with tetraplegia has damage or loss of sensory or

motor function within the cervical segment which causes impairment of four limbs. On the other hand, a paraplegic SCI patient is unable to sense or move the lower segments as the injury involves within the thoracic, lumber or sacral segments of the spinal cord. The upper limb functions are spared but the lower limbs are affected with involvement of trunk and pelvis (Nas et al., 2015).

Regardless of the cause, a person with an injury to the spinal cord usually depended on a mobility device. Given the consideration of paraplegic wheelchair bounded individuals, the upper extremity along the shoulder complex is widely used for the completion of their activities and athletics. Due to this potential intense load in the upper extremities, musculoskeletal pain is a common complication in the spinal cord injured paraplegic wheelchair user (Samuelsson, K.A.M., 2004).

Among able-bodied patients, shoulder pain is the third most prevalent musculoskeletal complaint able-bodied people (after back and knee pain) and resulting in approximately $7 billion in annual direct costs in the United States. (Jain, N.B., 2010). For many individuals with spinal cord injury (SCI), independence depends on the integrity of their upper limbs. Unfortunately, activities like wheelchair propulsion and transfer place great demands on the bones, joints, and soft tissues of the upper limbs. These essential activities can hasten the aging process, leading to injury and pain. The impact of pain is considerable. In one of the largest studies on upper limb pain. A study found significant pain was present in 59 percent of individuals with tetraplegia and 41 percent of individuals with paraplegia (Sie et al., 1992).

The tasks most commonly associated with upper limb pain in individuals with SCI (e.g., work/school, transfers, outdoor wheeling, and driving) are the activities necessary for independence and community integration (Mercer et al., 2006). There are an estimated 1.6 million manual wheelchair users in the United States. At are ported 3.3% of that figure, spinal cord injury patient account for only a small proportion of those users. However, the National Spinal Cord Injury Statistical Center estimates that the prevalence of spinal cord injury in the US is approximately 276,000 with an annual incidence of about 12,500 cases (West et al., 2012).

1.2 Rationale

Spinal cord injury (SCI) is a catastrophic event which causes severe disability following trauma. The severity of the injury and where it occurred on the spinal cord both play a role in determining the symptoms that result from it. Loss of motor control and/or sensory function of the arms, legs, and/or body may be among the symptoms. This loss of function may be partial or complete. The most serious injuries to the spinal cord can affect bowel or bladder function, as well as breathing, heart rate, and blood pressure. Chronic pain affects the majority of patients who have suffered damage to their spinal cord. At the present time, Spinal cord injuries are the most common cause of disability across all developing and developed countries around the world, and the pace at which they are occurring is rapidly increasing day by day due to a general lack of awareness among people. As they are associated with a high risk of both morbidity and mortality, injuries that affect the spinal cord and are worsened by other forms of physical injury are a significant public health concern in Bangladesh.

Paraplegia is the most frequent type of spinal cord injury, and patients with this condition are mostly bound to a wheelchair in their day-to-day lives.Continuous propulsion can result in a variety of issues for people who rely on wheelchairs as their primary mode of transportation due to mobility restrictions. Pain in the upper extremities is the most frequently experienced symptom. The purpose of this study was to explore whether or not shoulder problems were associated with wheelchair propulsion.

After this study physiotherapist will get an idea about the shoulder problems which wheelchair users facing on a daily basis after SCI.In CRP a large number of people attend to get physiotherapy treatment due to spinal cord injury. With this study patients will also be benefited by gaining knowledge about his/her condition and will gain some information which is responsible for their quality of life. This study will be an attempt to find out the impact of wheelchair usage on shoulder problems of patients at rehabilitation stage in Bangladeshi perspective. Other health professionals will get update information on shoulder problems. The general public will benefit from this knowledge as well.

1.3 Research question

What are the shoulder problems among people with paraplegic spinal cord injury?

1.4 Aim of the study

The aim of the study is to determine the shoulder problems among people with paraplegic spinal cord injury who are independently propelling wheelchair.

1.5 Study objectives

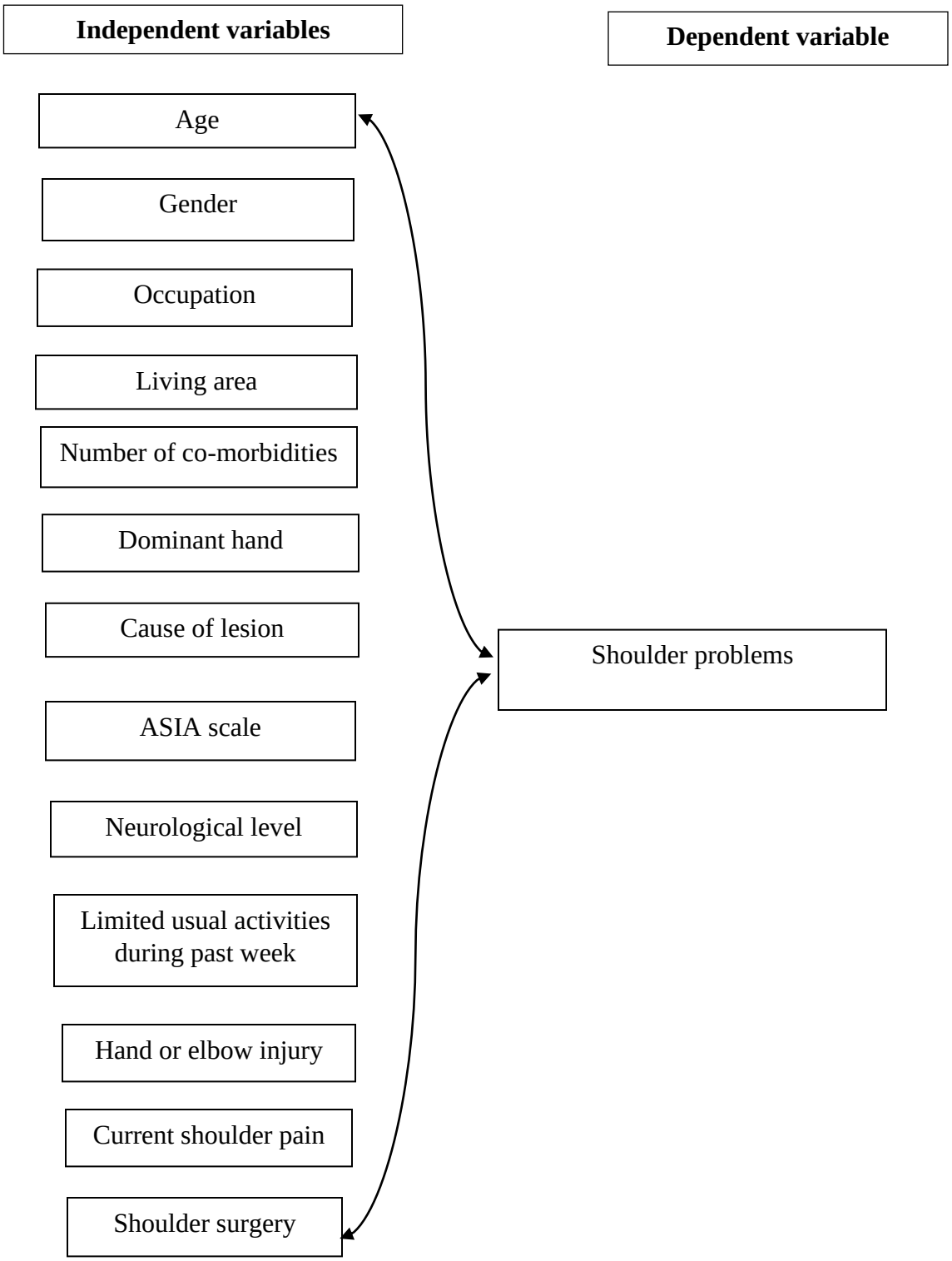
1.5.1 General objectives

To assess the shoulder problems among people with paraplegic spinal cord injury.

1.5.2 Specific objectives

- To explore socio-demographic factors of the participants.
- To identify the level of pain associated with manual wheelchair propulsion.
- To find out which age group is more affected during ambulation in wheelchair.
- To depict the association of pain with sociodemographic characteristics.

1.6 Conceptual Framework



1.7 Operational definition

Spinal cord injury

Any injury to the spinal cord whether traumatic or pathological is regarded as spinal cord injury.

Shoulder pain

Pain in or around the shoulder area is consider as shoulder pain.

Paraplegia

Impairment or loss of motor or sensory function / partial or complete paralysis of the lower half of the body including both legs, usually due to damage to the spinal cord in the thoracic or lumbar or sacral regions.

Tetraplegia

Tetraplegia is also known as Quadriplegia. It means paralysis of all four limbs, motor and/or sensory function in the cervical spinal segment is impaired or lost due to damage to that part of the spinal cord resulting in impaired or loss of function in the upper limbs, lower limbs, trunk, and pelvic organ.

Complete injury

Loss of sensation and motor function within the lowest sacral segment that causing bowel-bladder dysfunction.

Incomplete injury

Preservation of motor and sensory function below the level of injury that included the lowest sacral segment.

CHAPTER- II LITERATURE REVIEW

Spinal cord injury (SCI) is a type of physical disability, which is characterized by partial or complete damage of spinal cord and cauda equina resulting in loss of sensory, motor and autonomic function (Khan et al., 2019). It is not common as other injuries thus its physical and psychological consequence is dangerous. A significant proportion of individual with SCI result in neurologically complete and incomplete injury (Chen et al, 2013). Spinal cord injury (SCI) is a highly devastating in the life of an individual and requires a considerable coping process (Lude et al., 2014). Injury to the spinal cord which may leads to motor and/or sensory deficit and paralysis is known as spinal cord injury (Hagen et al.2015).

It is a sudden occurring condition that creates permanent change in sensation along with loss of voluntary motor functions below the level of injury. This can occur as a consequence of a medical illness or trauma resulting in over stretching the nerves, a bump, the bone of the vertebra pressing against the cord, a shock wave, electrocution, tumors, infection, poison, lack of oxygen (ischemia), cutting or tearing of the nerves (Spinal cord injury, 2021). In Bangladesh, 63% of SCI is caused by falling from a height (Hoque et al., 2012). Another common cause (18%), in Bangladesh Falling while carrying a heavy load on the head, usually resulting in tetraplegia (Razzak et al., 2011).

Traumatic SCI results from motor vehicle collisions (36.5%), falls (28.5%), violence (14.3%) and sports (9.2%) activities being leading causes. Since (2010), motor vehicle crashes account for 36.5% of reported SCI cases. For rehabilitation of people with traumatic SCI, have been concerned not only with degree of loss of function, but also with quality of life (Geyh et al, 2010). Non-traumatic SCI is less severe injury than the traumatic injury. Non-traumatic SCI almost have incomplete injuries, while traumatic injuries are slightly more likely to have to have incomplete injuries. Incomplete injuries are far better prognosis for neurologic improvement than complete injuries. Persons with traumatic SCI; persons with non-traumatic SCI are significantly more likely to have paraplegia than tetraplegia (Requejo, 2008). An estimate of the

incidence of non-traumatic as well as traumatic SCI is needed for adequate health care planning (Gurcay et al., 2010).

The most common cause of spinal cord trauma is the automotive accident, corresponding to more than half of the cases. Other causes include falls from heights (25%), firearm injuries (15%) and the practice of sports (10%). The most common spinal cord injury region is cervical, present in 50-64% of the patients; the lumbar region represents 20-24% of cases. After the spinal cord injury, a greater biomechanical load is deposited on the patient's upper limbs, since these follow-ups become indispensable for daily activities such as locomotion with walkers, wheelchairs or crutches. This overload can lead to muscle and joint pain, affecting, in increasing order, the shoulders, wrists, hands and elbows (Alves, 2012).

A spinal cord injury (SCI) results in a number of motor, sensory, and autonomic impairments. It predisposes individuals to multisystem dysfunction, leading to an increased likelihood of a range of related secondary complications (Tonack et al., 2008), defined as medical consequences that can cause functional limitations. Common secondary health complications after SCI include pressure ulcers, urinary tract infections, bowel problems, fractures, chronic pain, and depressive disorders (New et al., 2013). Persons with spinal cord injury (SCI) are likely to experience serious health problems associated with this condition. These secondary health conditions (SHCs) have been defined as "physical or psychological health conditions that are influence directly or indirectly by the presence of a disability or underlying physical impairment" (Jones et al., 2021).

The shoulder complex is a particularly sophisticated and fragile system. In the context of disability, and especially in manual wheelchair users, the upper body and shoulder complex are utilized in almost all tasks of both sports and activities of daily living. Therefore, appropriate functioning of the shoulder complex holds the utmost importance to upholding quality of life (QoL) for many individuals. The shoulder complex affords large amounts of mobility for the hands due to the functional nature of the structures involved. There is a fine interplay between mobility and stability; the shoulder complex must be mobile enough to allow a full range of motion but

simultaneously be stable enough to maintain sufficient integrity and to organize external forces. (Soo Hoo, 2019). Shoulder pain has become a common problem among the patients with paraplegia and has been reported in up to 67%. Moreover, this problem could also be associated with the increased use of the shoulder in paraplegic patients during their activities of daily living, such as transfers, wheelchair propulsion, and weight relief. Owing to the continuous overuse of the glenohumeral joint, the term ‘‘weight-bearing shoulder’’ was created (Akbar, M., 2011). People with paraplegia mostly rely on manual wheelchairs (WCs) for their mobility in the community. Mobility and safety in the community require proficiency in several WC skills (Hosseini, S.M et al., 2012). Athletes who compete in wheelchairs, in particular, experience frequent upper extremity soft tis sue injuries. Participation in wheelchair basketball, together with wheelchair track and road racing, accounts for the majority of reported soft-tissue injuries in athletes in wheelchair. (Curtis, KA et al., 1999).

Wheelchair propulsion as well as transfers are supposed to cause and increase upper extremity pain, such as shoulder pain in active wheelchair users (Samuelsson et al., 2004). There are many different mechanical causes of shoulder pain after spinal cord injury (SCI) such as stiffness, tight muscles, muscle tears (rotator cuff), overuse, biomechanical problems, disuse, impingement, inflammation, arthritis and excess weight bearing while strengthening (Alm et al., 2008). Wheelchair basketball, specifically, is characterized by intermittent high intensity activity for wheelchair propulsion as well as reaching overhead for shooting, passing, and rebounding. These actions put the shoulder at risk for overuse injury or impingement of the soft tissue structures below the acromion process as the player reaches over head. In addition, the constant stresses of wheelchair propulsion on the palmar surface of the hand often results in symptoms of carpal tunnel syndrome. (Curtis, KA et al., 1999).

The shoulder has been reported to be the joint most commonly associated with pain above the level of injury in individuals with paraplegia following spinal cord injury (SCI). The reported prevalence of shoulder pain in paraplegic individuals is high, usually between 30% and 70% (Samuelsson et al., 2004). Shoulder pain is common in patients with spinal cord injury, varying between 30% and 67% and occurs more often

in these patients than in able-bodied individuals. The main reason for shoulder pain seems to be overuse of the upper extremity during activities of daily living. (Akbar et al., 2010).

The etiology of shoulder pain in individuals with SCI may be partially a result of overload (overuse). The patient with SCI excessively overloads the upper limbs, especially the shoulders, using them more frequently and in a higher number of activities than people without SCI and those segments are used for performing transferences, wheelchair propulsion, locomotion with crutches and sport related activities. However, this functional demand on shoulder's joint may lead to a painful picture, interfering on these patient's daily activities. A study in Brazil investigated chronic pain incidence in 384 SCI carriers. From these, 75.6% referred pain in the upper limbs, limiting function and their independence. Among musculoskeletal complications in SCI patients, shoulder pain was the most relevant one, present in 48% of the 216 studied patients (Gianini et al., 2006).

The epidemiology of spinal cord injury is less often reported in adults as compared with children Without radiographic abnormality. The main thing is epidemiological characteristics, such as injury origin, injury level or severity, neurological scale and MRI feature were acquired. Day by day the young adult population increases, it is mostly important to set up an individualized evaluation system that is based on a nationally scaled epidemiological database. Based on epidemiological studies, it seems evident that manual wheelchair propulsion and wheelchair-related daily life activities cause a heavy load on the upper extremities, especially for persons with cervical spinal cord injury (SCI). Other suggested risk factors for the development of shoulder pain are the duration of injury, age (ie older people have a higher risk than younger people), higher body mass index (BMI) and wheelchair propulsion style (Van Drongelen et al., 2006).

Chronic overuse and injury during sports contribute to the development of upper extremity pain, which interferes with function in the long-term wheelchair user. Full-time wheelchair users depend on the integrity of their upper limbs for their daily

independence. These wheelchair users are not only prone to developing shoulder pain; they may not be able to rest an injury sufficiently to allow for it to heal without further strain and reinjury (Curtis, KA., 1999). The increased demand on the upper limbs during manual wheelchair use results in a high prevalence of shoulder pathology in people with spinal cord injury (SCI). Because individuals with SCI are dependent on their upper extremities for mobility and daily activities, shoulder dysfunction can present a devastating loss of independence and decreased quality of life (Requejo et al., 2008).

According to International Association for the Study of Pain (IASP), pain is "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage." Pain is an unpleasant sensation localized to a part of the body. It is often described in terms of a penetrating or tissue-destructive process (e.g.: Stabbing, burning, twisting, tearing, and squeezing) and or of a bodily or emotional reaction (e.g.: Terrifying, nauseating, and sickening. The most exhausting consequence after spinal cord injury (SCI) is pain. It imposes a major burden for the patients who have already suffered substantial emotional and physical trauma. Loss of function is considered the most significant issue for spinal cord injured patient. Pain has a direct bearing on the ability of those with such injuries to regain their optimal level of activity (Soo Hoo et al., 2019). The most common symptoms after spinal cord injury are pain which starts immediately after injury and continuing throughout the life.

Shoulder pain remains common among persons with SCI who use manual wheelchairs with the increasing amount of literature in the field, with reported occurrence ranging from 51% to 78%. Bayley et al found a 30% incidence of chronic, persistent shoulder pain during transfers in a cohort of 94 patients with paraplegia. Impingement syndrome with subacromial bursitis was the most common diagnosis in this group where shoulder pathology in persons with SCI is common. Bayley found that 65% of subjects with paraplegia who had signs and symptoms of impingement had tears of the rotator cuff. Escobedo et al found that 57% of persons with paraplegia had rotator cuff tears and found a significantly higher rate of rotator cuff tear in persons with paraplegia than in uninjured people (Boninger et al., 2001).

Shoulder pain (69.9%) reported pain at any site of the shoulder joint of the 93 participants. When stratified by the use of assistive mobility devices, shoulder pain was reported by 46.7% for motorized wheelchair users (Jain et al., 2010). Rotator cuff disease is the most common disease which correlates with age and duration of spinal cord injury, which underlines the theory of "wear and tear" in wheelchair dependent patients (Akbar et al., 2011). Individuals who use a wheelchair for mobility and have poorly innervated trunk muscles must rely on their upper extremities for stability and mobility. In the chronic stage after SCI, soft tissue structures are exposed to overuse in activities of daily living, for example, in wheelchair propulsion and transfer in which the shoulder becomes a weight-bearing joint. Sub acromial impingement with bursitis; tendinopathy; and tears of the rotator cuff (especially the supraspinatus), the biceps tendon, or both are the most common diagnoses of individuals with paraplegia suffering from chronic nociceptive shoulder pain (Brose et al., 2008).

Wrist pain following spinal cord injury is a common phenomenon in the patient with paraplegic wheel chair users those who use manual wheelchair in a much greater speed than normal or those who were participates in sports activity such as wheelchair basket-ball, wheelchair race or running the wheelchair in up and down. Wheelchair users with SCI who fall are at great risk of fractures, since they have an increased prevalence of osteoporosis. Loss of range of motion (known as a contracture) is probably the most common musculoskeletal problem following spinal cord injury (SCI). Range of motion is very important for seating, transferring, and other functional activities (Singh et al., 2021).

The causes of decreased range of motion are numerous, although the most common cause is staying in the same position for prolonged periods of time, such as sitting, decreasing flexibility; arthritis-people with joint problems commonly lose range of motion (Ginson , 2007). Wheelchairs are primary mobility devices for individuals with locomotive disabilities for whom ambulation is not possible or practical. More than half of individuals with amyotrophic lateral sclerosis, cerebral palsy, multiple sclerosis, multiple system atrophy, progressive supranuclear palsy, and spinal cord injury (SCI) rely on wheelchairs for mobility (Singh et al., 2021).

CHAPTER- III METHODOLOGY

3.1 Study design

A cross-sectional descriptive study was performed with structured questionnaires and interviews were conducted with persons who can independently propelling wheelchair and having paraplegic spinal cord injury (SCI). This study design was appropriate to find out the objectives. The data was collected all at the same time or within a short time frame.

This study aimed to find out the relationship between socio-demographic status & clinical variable with shoulder pain among the paraplegic wheelchair users. For this reason, the type study chosen was Cross-sectional study. In the case of the cross-sectional study, the most important advantage was it needs less time and it is also cheap as there was no follow up, fewer resources required running the study (Nagendrababu et al., 2020).

The defining characteristics of a cross-sectional study are that it can evaluate different population groups at a single point in time and the findings are drawn from whatever fits into the frame. It allows researchers to compare many different variables at the same time for example, we can look at age, gender, income, and educational status about walking (Victorson et al., 2015).

3.2 Study site

The selected study area was conducted in Spinal Cord Injury Unit of Physiotherapy Department at the Center for the Rehabilitation of the Paralysed (CRP), Savar, Dhaka. It is the only specialized rehabilitation Centre for spinal cord lesion in Bangladesh. It is a 100 bedded hospital situated in Savar, Dhaka. Founded in 1979, in response to desperate need for services with spinal cord lesion, the Centre for the Rehabilitation of the Paralysed (CRP) has evolved into an internationally recognized organization. It focuses on a holistic approach to rehabilitation, recognizing that all aspects of the

rehabilitation process are vital for its success including physical rehabilitation, psychological rehabilitation, and economic rehabilitation and planned discharge. Patients come from around the country through referral by different health facilities, health professionals and personal contacts.

3.3 Study population

A population refers to the entire group of people or items that meet the criteria set by the researcher. It conforms to some designated set of specifications that provide clear guidance as to which elements are to be included in the population and which are to be excluded.

To prepare a suitable description of a population it is essential to distinguish between the population for which the results are ideally required, the desired target population, and the population which is studied, the defined target population. An ideal situation, in which the researcher had complete control over the research environment, would lead to both of these populations containing the same elements. The people with paraplegic spinal cord injuries who had continued their rehabilitation program at the CRP spinal cord injury unit in Savar, Dhaka, were the target population.

3.4 Sampling technique

The study was conducted by using the convenience sampling methods because it was the easiest, cheapest and quicker method of sample selection. Through the convenience sampling procedure, it will be easy to get those subjects according to the criteria concerned with the study purpose.

3.5 Sample size

A sample is a group of subjects that will be selected from the population, who are used in a piece of research (Hicks, 2013). A sample is a smaller group taken from the population. Sometimes the sample size may be big and sometimes it may be small, depending on the population and the characteristics of the study.

When the sample frame is finite,

The equation of finite population correction in case of cross-sectional study is:

$$n = \frac{Z^2 Pq}{d^2}$$

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2}$$

$$=384.16$$

$$=384$$

Where,

n is the Population

Z= is the level of significance that corresponding to the 95% level of confidence that is

Z (confidence level) = 1.96

P= expected prevalence =50% (Geyh et al., 2010)

1-P = (1-0.5)

=0.5

And, d= Margin of error (0.05)

The actual sample size was n=384

As the study was performed as a part of a fourth professional academic research project, self-funding and data were collected from a single specialized hospital by considering the feasibility and time limitation 60 samples were selected conveniently.

3.6 Inclusion criteria

- Patient with paraplegic Spinal cord injury who are admitted in CRP
- Wheelchair bounded individuals
- Patients who can propel w/c for at least 1 month
- Patients willing to participate
- Age: 20-65 years
- Both male and female were included

3.7 Exclusion criteria

- Patients with mental retardation
- Patients with cognitive problems
- Tetraplegic patients
- Non-co-operative patients

3.8 Data collection tool

- Consent form
- Structured questionnaire
- Pen
- Notebook
- Paper
- Eraser

- Clip board

3.9 Measurement tools

Wheelchair users pain index scale (WUSPI).

The Wheelchair User's Shoulder Pain Index (WUSPI) was developed to measure shoulder pain in people who are wheelchair users. It is a short self-report questionnaire that is both simple and effective for calculating the functional value of shoulder pain in handicapped people. With regard to wheelchair transfers, wheelchair mobility, self-care, and general activities, the WUSPI focuses on activity limitation caused on by shoulder pain in four different subsections. The type or severity of discomfort felt during the activities, however, is not mentioned. It consists of 15 questions, with each item being assessed using a 10-point ordinal visual analog scale (VAS), with 0 representing no discomfort and 10 representing the worst pain.

3.10 Data collection

The questions will be asked in face-to-face interviews. It is useful because this technique ensures that the researcher will obtain all the information required, while at the same time it gives the participants freedom to respond and illustrate concepts.

Researcher took data from the paraplegic spinal cord injury patients who came at CRP for take Physiotherapy treatment or continuing their treatment was asked to participate in the study. Researcher developed a structured questionnaire after reviewing literature for asking to the participants. The data collection procedure had been performed after taking the consent of the participants. The researcher collected data from both male and female through individual interviewing. In the questionnaire, participant’s demographic information including age, sex, level of education, occupational history including types of job, health history including other injury and osteoarthritis related information was asked.

3.11 Data analysis procedure

Data were analyzed with the Statistical Package for Social Sciences (SPSS) Version 20 software. Data resolve numerically coded and captured in Microsoft Excel, using an SPSS 20 version software program. Microsoft Office Excel 2019 was used to decorate the table, bar graph, and pie charts. In the result section, all the value was formulated by descriptive statistics. SPSS is a comprehensive and flexible statistical analysis and data management solution.

3.12 Questionnaire

The questionnaire was developed under the advice and permission of the supervisor following certain guidelines structured questionnaire (Both open ended and close-ended questionnaire) are used for data collection.

3.13 Ethical consideration:

The researcher maintained some ethical considerations: The research proposal including methodology was submitted to the Institutional Review Board (IRB) of Bangladesh Health Professions Institute (BHPI) for oral presentation and defense was done in front of IRB. Then IRB approved the proposal. A researcher had followed the Helsinki guideline of the world medical association. This protocol presentation was first 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, CRP before data collection. Permission was taken from the In-Charge of SCI Unit, CRP for data collection from the patients. The researcher maintained the confidentiality of the collected data from the individuals. The researcher ensured the confidentially of participants and shared the information only with the research supervisor. All rights of the participants were reserved and the researcher was accountable to the participant to answer any type of study-related question. The participants would be informed before inviting participation in the study. 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. The necessary information had been kept secure place to ensure confidentiality. All kinds of confidentiality are highly maintained. They were also assured that it would not cause any harm. The researcher also ensured that the organization (CRP) was not hampered by the study. Then they signed the consent form.

3.14 Inform consent

Written consent (appendix) was given to all participants before the completion of the questionnaire. The researcher explained to the participants about the his or her role in this study and the aims and objectives of this study. In addition, they were informed that each interview can take 15-20 minutes for every participant. The researcher received written consent from every participant including signature. So, the participant assured that they could understand the consent form and their participation was voluntary. The researcher assured the participants that the study would not be harmful to them. The participants had the right 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 maintain the rights, dignity and ensure confidentiality. Parents or legal guidance needed during data collection procedure if minor participants (aged <18 years) were interviewed. Furthermore, the study was not personally identified in any publication containing the result of this study.

CHAPTER-IV RESULTS

All the relevant information was analyzed by SPSS V20 software. Data was presented by using the bar graphs, pie charts and tables.

4.1 Distribution of the participants according to Socio-demographic and injury related characteristics

4.1.1 Table.1: Sociodemographic characteristics

	Patients (n)	Percentage (%)
Age (in years)		
20-30	32	53.3
31-40	17	28.3
>40	11	18.3
Gender		
Male	46	76.7
Female	14	23.3
Marital status		
Married	38	63.3
Unmarried	22	36.7
Educational qualifications		
Illiterate	11	18.3
Primary	24	40.0
Secondary	6	10.0
Higher Secondary	14	23.3
Graduate	5	8.3

Occupation		
Farmer	7	11.7
Day laborer	11	18
Service holder	5	8.3
Garment/factory worker	6	10
Driver	2	3.3
Businessmen	5	8.3
Unemployed	2	3.3
Housewife	8	13.3
Student	14	23.3
Family		
Nuclear	55	91.7
Extended	5	8.3
Living area		
Urban	52	86.7
Rural	6	13.3
History of co-morbidity		
Diabetes	7	11.7
Asthma	1	1.7
Other	2	3.3
No history	46	76.7
Diabetes, Hypertension, Asthma	3	5
Diabetes, Asthma	1	1.7
Number of co-morbidities		
Single	10	16.7
Multiple	4	6.7
None	46	76.7

4.1.2. Distribution of age of the participants

Total 60 paraplegic patients were the participant of the study. In the case of age, Mean ± SD = 32.20±10.274 the most participant attended from 20-30 age group 53.3% (n=32). Other groups presented with 28.3% (n=17) in patients between 31-40 years of age and the group representing participants aged more than 41 years with 18.3% (n=11).

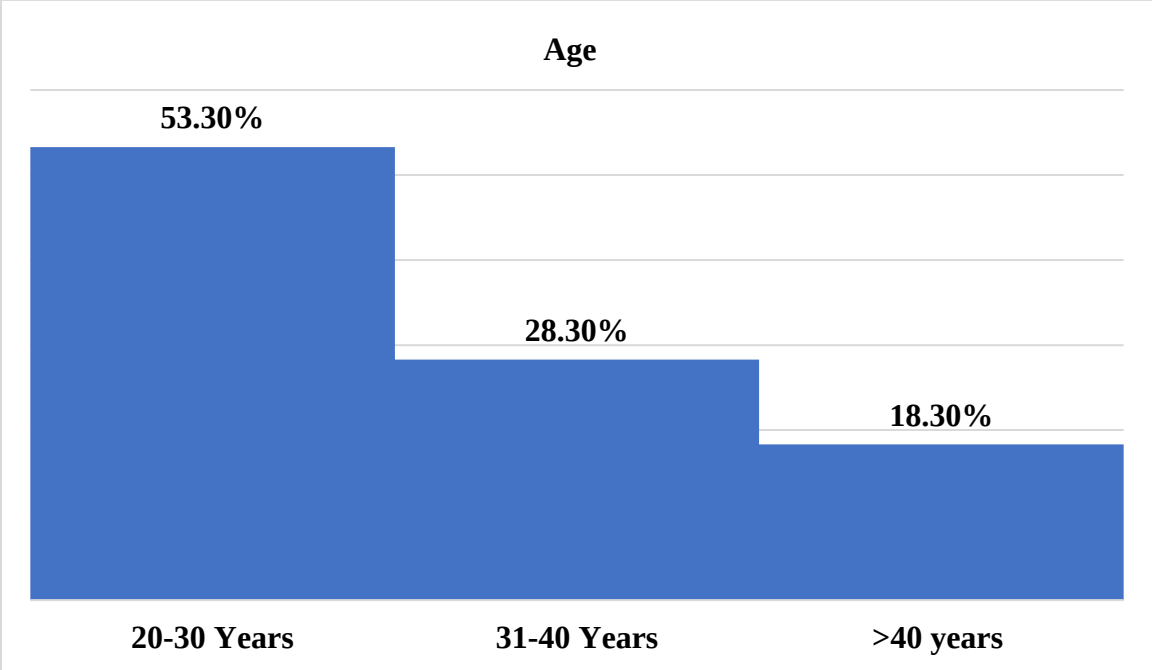


Figure-1: Distribution of age of the participants

4.1.3. Distribution of gender of the participants

Among 60 participants, male was predominant. Data showed 85%(n=51) was male and 15%(n=9) was female.

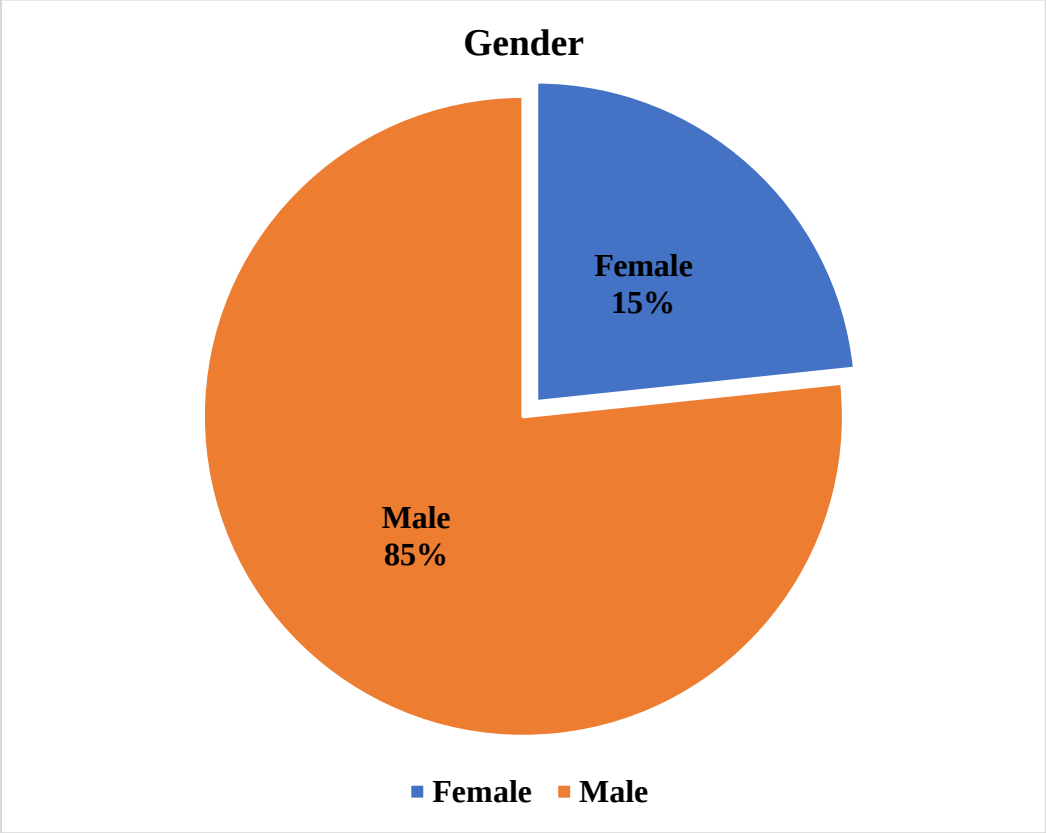


Figure-2: Distribution of participant's gender

4.1.4. Distribution of occupation of the participants

In this case, occupation of the participants the highest were present in student 23.3%(n=14). Other, groups showed that, 18.3%(n=11) were day laborer, 11.7%(n=7) were farmers,10%(n=6) were garments or factory worker, 8.3%(n=5) were service holder, 8.3%(n=5) were businessman, 3.3%(n=2) were driver and 3.3%(n=2) were unemployed.

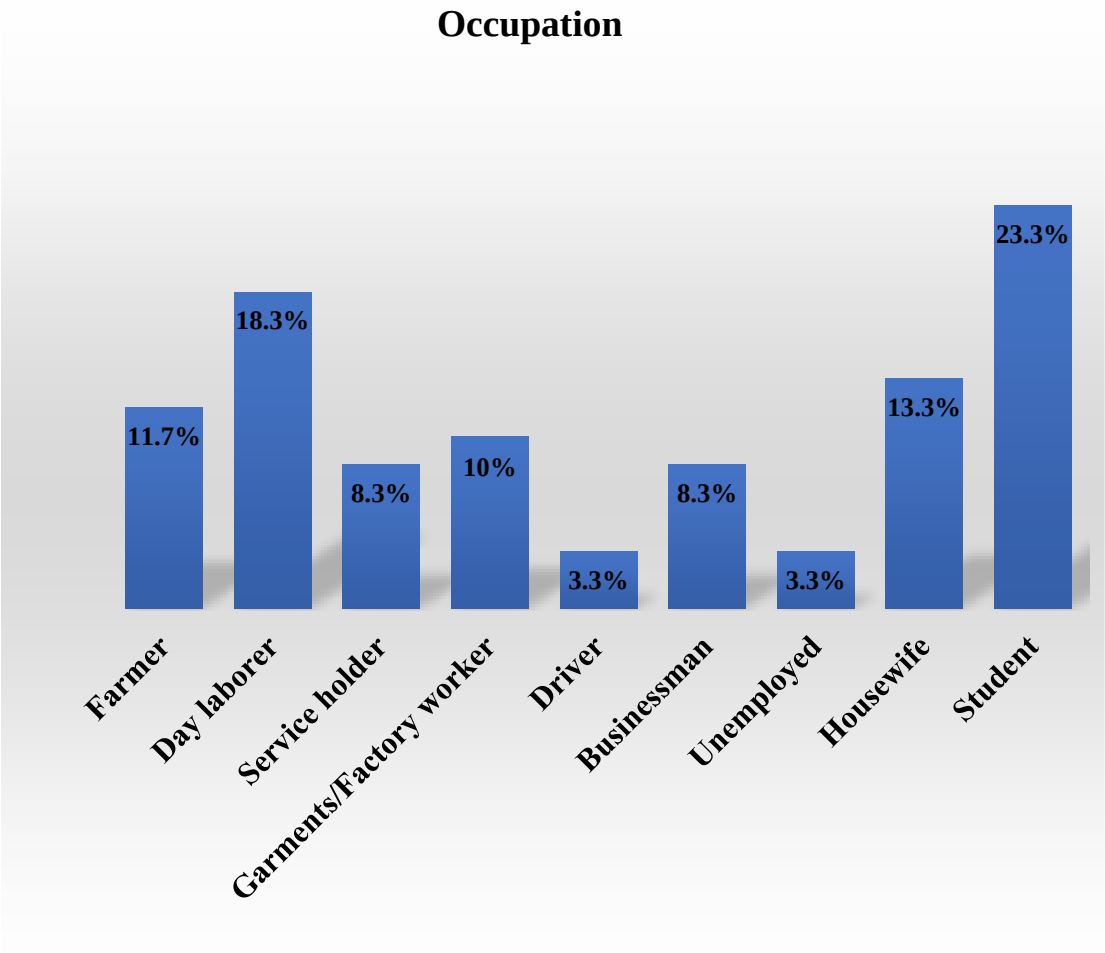


Figure-3: Distribution of patient's occupation

4.1.5 Distribution of participants marital status

Among 60 participants, most participants were married. Data showed, 63.3% (n=38) married, 36.7% (n=22) unmarried participants.

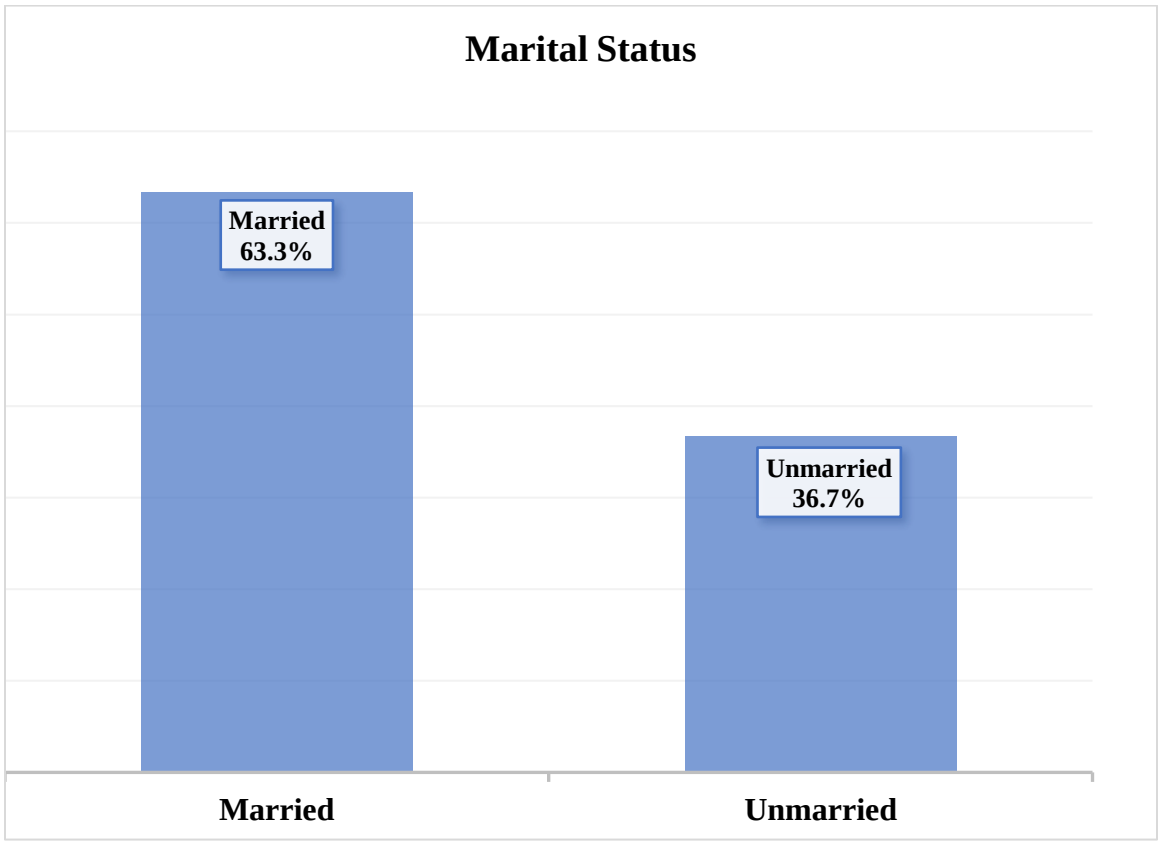


Figure-4: Distribution of the participants marital status

4.1.6 Distribution of participants family type

Among 60 participants, most participants were come from nuclear family. Data showed 91.7%(n=55) from nuclear family, 8.3 %(n=5) were from extended family.

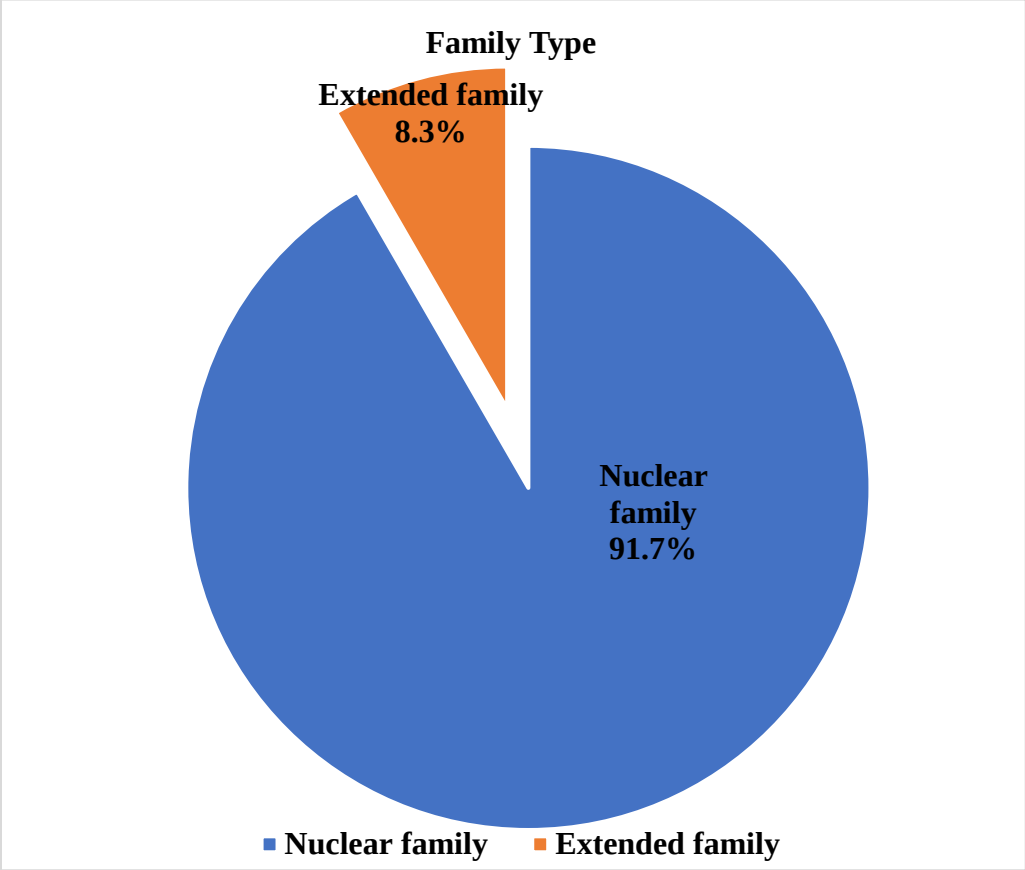


Figure-5: Distribution of the participants family type

4.1.7 Distribution living area of the participants

Above data showed that among 60 participants 86.7%(n=52) lived in rural areas, 13.3%(n=8) lived in urban areas.

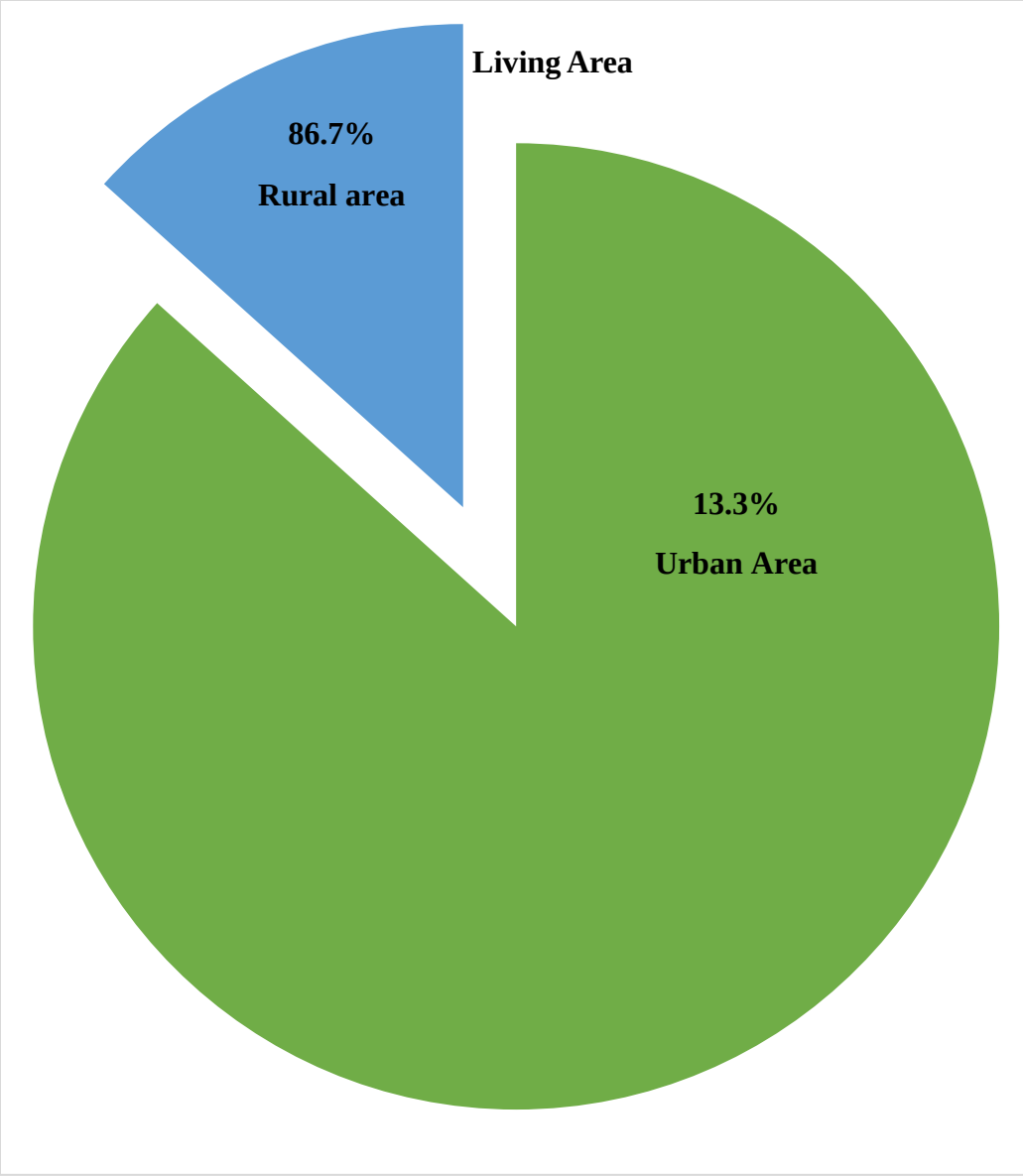


Figure-6: Distribution living area of the participants

4.1.8. Distribution of the participants educational qualifications

Among the participants, 18.3% (n=11) were illiterate,40%(n=24) had primary education, 10.0%(n=6) got secondary education, 23.3%(n=14) had higher secondary education and 8.3%(n=5) were graduated.

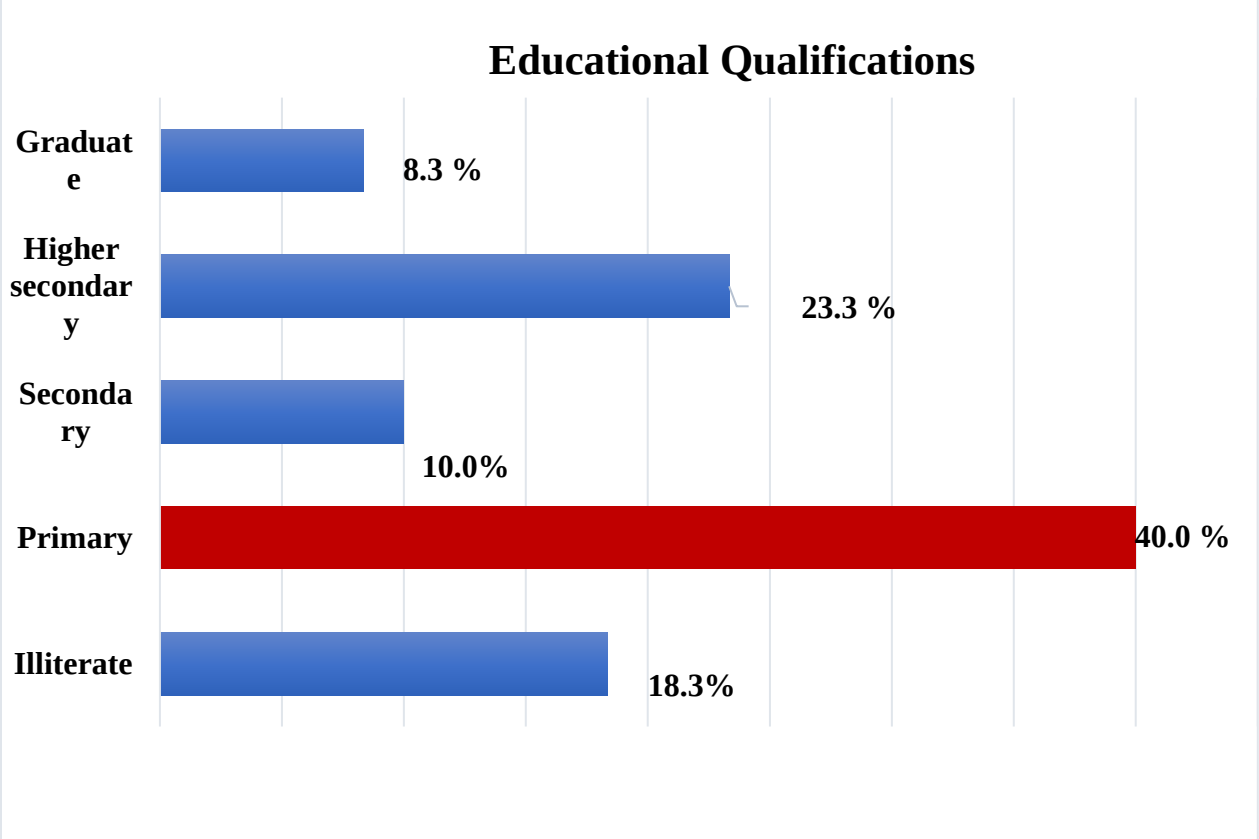


Figure-7: Distribution of the participants family type

4.1.9. Distribution history of the participants co-morbidity

Among 60 participants, most participants had no history of co-morbidity. Data showed that 76.7 %(n=46) had no history of co-morbidities, 13.3%(n=8) had diabetes, 3.3% (n=2) had hypertension, 3.3% (n=2) had diabetes, hypertension and asthma and 3.3% (n=2) had

diabetes and hypertension.

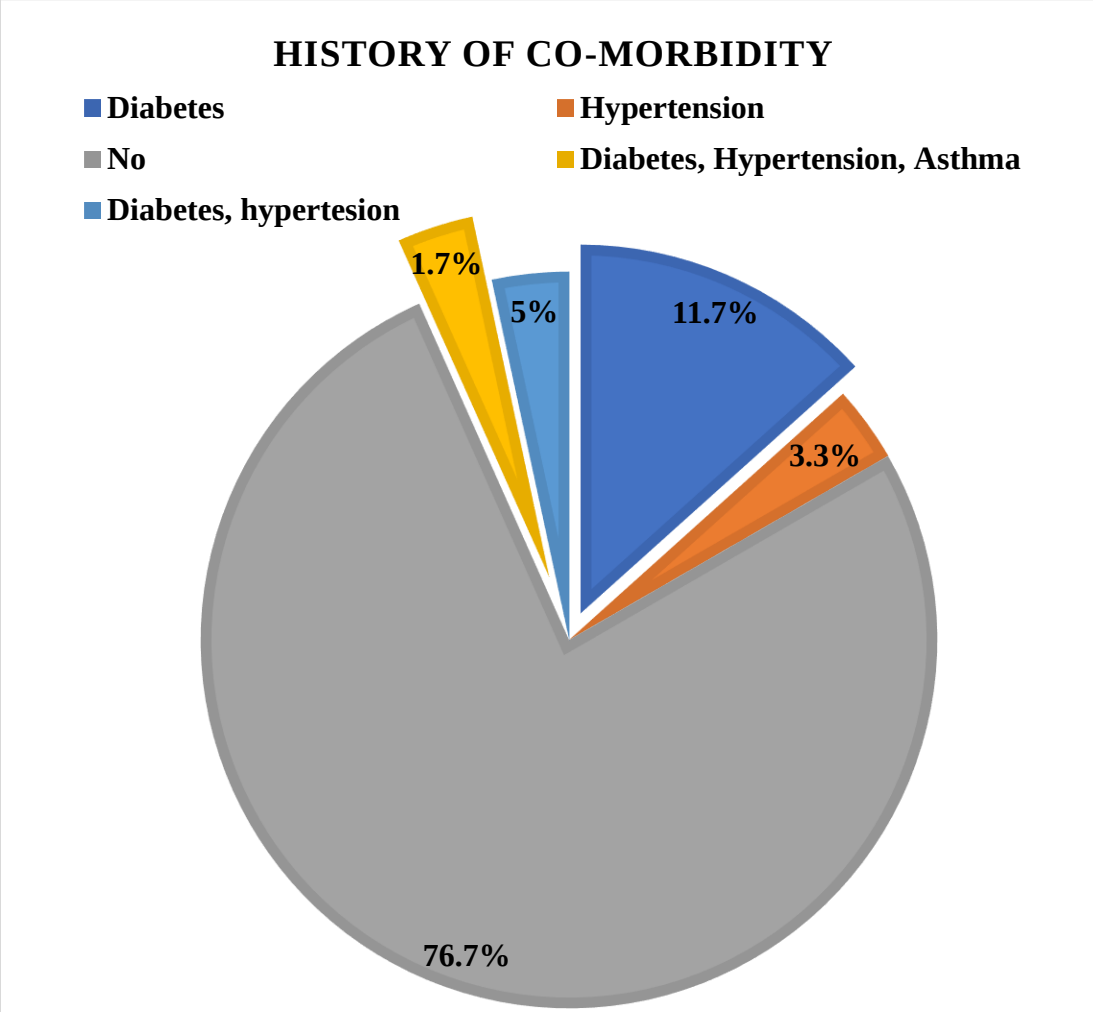


Figure-8: History of co-morbidity

4.1.10 Distribution of the participants number of co-morbidities

Among 60 participants, most participants had no co-morbidity. Data showed that 76.7% (n=46) had no co-morbidity ,16.7%(n=10) had single co-morbidity and 6.7%(n=4) had multiple number of co-morbidities.

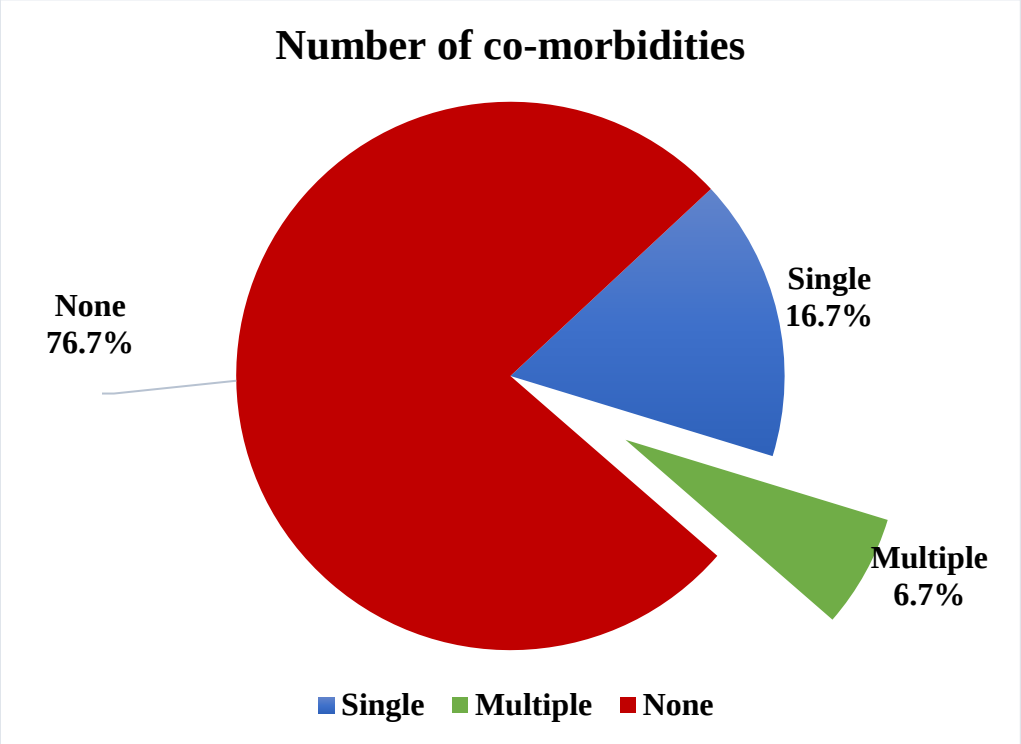


Figure-9: Number of co-morbidities

4.2.1 Table-2: Participants Related information

Variable	Frequency (%)
Dominant hand	
Right	57(95%)
Left	3(5%)
Cause of lesion	
Traumatic	54(90%)
Non-traumatic	6(10%)
Duration of injury in months (Mean ± SD=4.23±4.651)	
1 month	6(10.0%)
2 months	11(18.3%)
3 months	3(5.0%)
4 months	3(5.0%)
5 months	4(6.7%)
6 months	4(6.7%)
7 months	1(1.7%)
8 months	2(3.3%)
9 months	4(6.7%)
11 months	1(1.7%)
14 months	1(1.7%)
18 months	3(5.0%)
21 months	1(1.7%)
24 months	2(3.3%)
28 months	1(1.7%)
36 months	7(11.7%)

48 months	6(10.0%)
Duration of wheelchair use (months)	**Mean ± SD=** 9.60±9.535
Duration of wheelchair use per day	**Mean ± SD**=5.87±1.873

4.3.1 Table-3: Clinical history or injury related profile

Variable	Frequency (%)
ASIA impairment scale	
Complete A	45(75%)
Incomplete B	6(10.0%)
Incomplete C	2(3.3%)
Incomplete D	7(11.7%)
Neurological level in category	
Thoracic (T1-T12)	47(78.3%)
Lumbar (L1-L5)	12(20.0%)
Sacral (S1-S5)	1(1.7%)
Shoulder pain prior to wheelchair use	
No	53(88.3%)
Yes	7(11.7%)
Shoulder pain during the time you have used a wheelchair	
No	15(25%)
Yes	45(75.0%)
Shoulder surgery	
No	56(93.3%)
Yes	4(6.7%)

Do you currently have shoulder pain?	
No	2(3.3%)
Yes	58(96.7%)
Shoulder pain limit you from performing your usual activities during past week?	
Yes	57(95%)
No	3(5%)
Hand or elbow pain or injuries during the time you have a wheelchair	
Yes	6(10%)
No	54(90%)
Severity of shoulder pain in numerical pain rating scale	
0 (No pain)	3(5.0%)
1-3 (Mild pain)	16(26.7%)
4-6 (Moderate pain)	38(63.3%)
7-10 (Severe pain)	3(5.0%)

4.3.2 ASIA Impairment Scale

Among 60 participants, most participants were in complete A. Data showed 75%(n=45) were complete A, 11.7%(n=7) were incomplete D, 10.0% (n=6) were incomplete B and least participants had identified as incomplete C 3.3%(n=2).

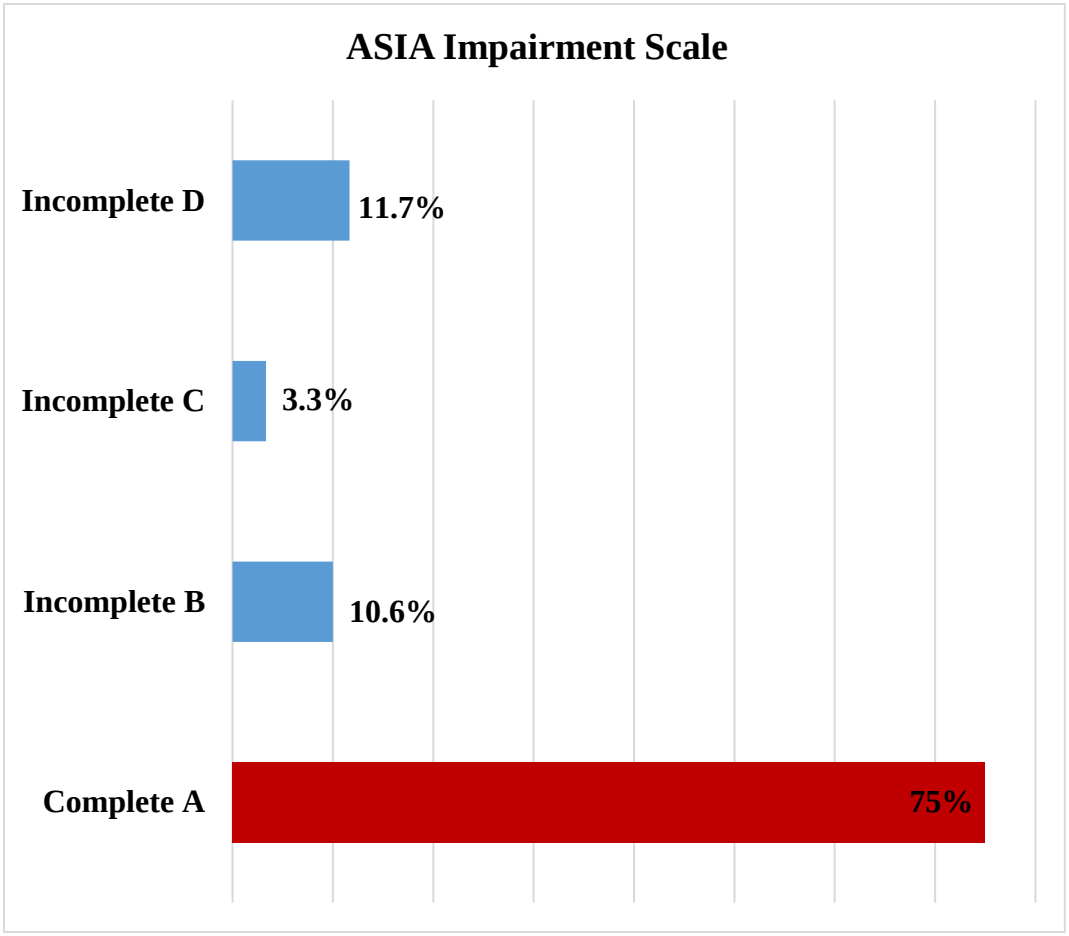


Figure-10: ASIA Impairment Scale

4.3.3 Skeletal level

Among 60 participants, most participants were thoracic level of injury. Data showed 60%(n=36) were thoracic level of injury and 40%(n=24) were lumbar level of injury.

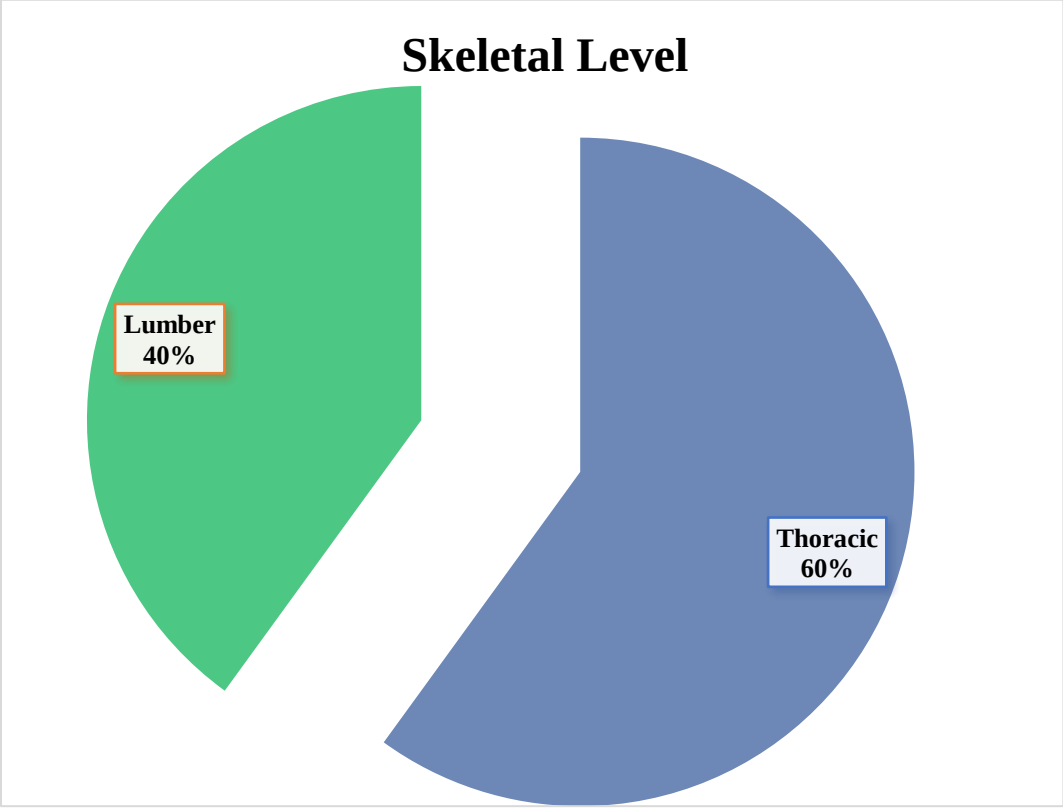


Figure-11: Skeletal level

4.3.4 Neurological level

Among 60 participants, most participants were thoracic level of injury. Data showed 78.3%(n=47) were thoracic level of injury and 20%(n=12) were lumbar level of injury and 1.7% (n=1.7%) were in sacral level.

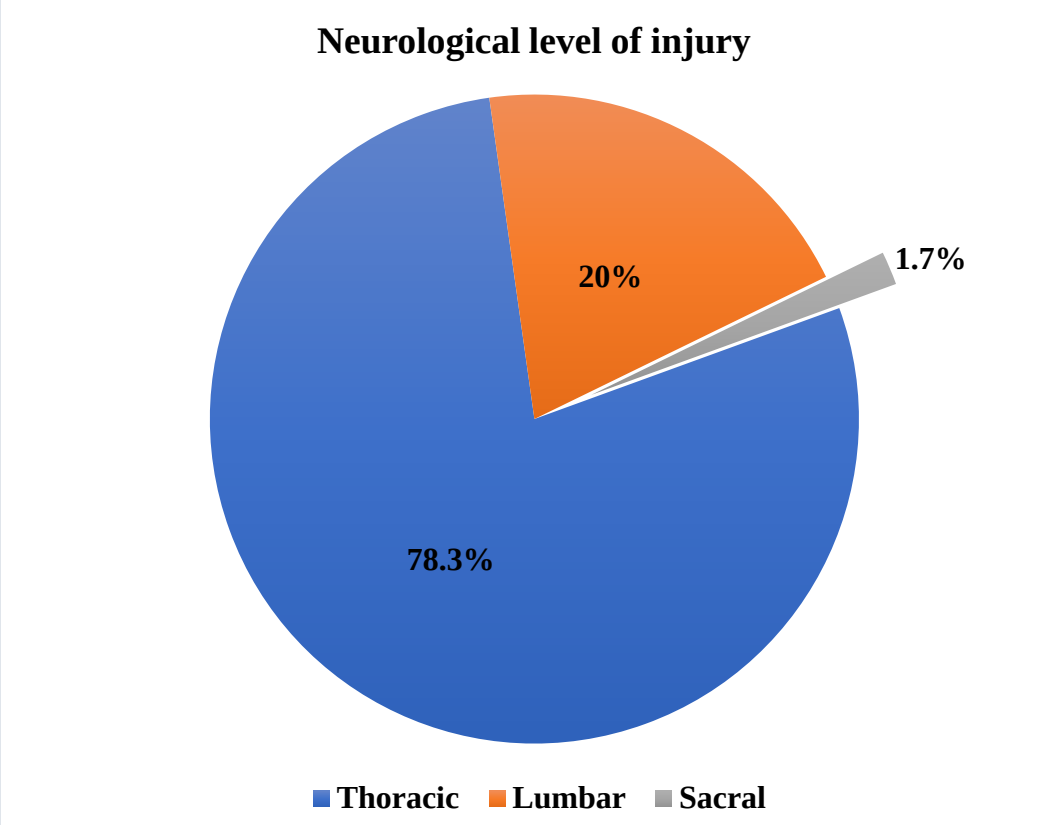


Figure-12: Neurological level of injury

4.3.2 Table-4: Wheelchair Users Pain Index Scale

Variables	0-0.4cm= no pain **n (%)**	0.5-4.4cm= mild pain **n (%)**	4.5-7.4cm= moderate pain **n (%)**	7.5-10cm= severe pain **n (%)**
Transferring from a bed to a wheelchair	26(43.3)	19(31.7)	13(21.7)	2(3.3)
Transferring from a wheelchair to a car	24(40)	31(51.7)	5(8.3)	-
Transferring from a wheelchair to the tub or shower	17(28.3)	40(66.7)	2(3.3)	1(1.7)
Loading wheelchair to a car	30(50)	24(40)	4(6.7)	2(3.3)
Pushing wheelchair for 10 minutes or more	4(6.7)	26(43.3)	24(40)	6(10)
Pushing up ramps or inclines outdoors	9(15)	28(46.7)	18(30)	5(8.3)
Lifting objects down from an overhead shelf	15(25)	37(61.7)	5(8.3)	3(5)

Putting on pants	19(31.7)	37(61.7)	1(1.7)	3(5)
Putting on a t-shirt or pullover	24(40)	34(56)	1(1.7)	1(1.7)
Putting on a button-down shirt	42(70)	18(30)	-	-
Washing your back	20(33.3)	35(58.3)	4(6.7)	1(1.7)
Usual daily activities at work or school	14(23.3)	33(55)	12(20)	1(1.7)
Driving	58(96.7)	2(3.3)	-	-
Performing household chores	5(8.3)	47(78.3)	8(12.3)	-
Sleeping	47(78.3)	12(20)	1(1.7)	-

4.3.3 Table-5: Active range of motion

Variables (AROM)		Mean ±SD
Shoulder flexion	**Right**	155.1333±18.21200
	Left	152.6667±22.04515
Shoulder extension	**Right**	54.2500±5.80948
	Left	55.0333±6.80719
Shoulder abduction	**Right**	156.4833±18.22597
	Left	157.0833±1878269
Shoulder adduction	**Right**	61.7500±7.29668
	Left	62.0000±7.60241
Shoulder medial rotation	**Right**	62.7000±7.58746
	Left	63.2500±7.20081
Shoulder lateral rotation	**Right**	70.9500±8.51206
	Left	70.8833±6.39410

Interquartile range (IQR):

The interquartile range is a measure of where the "middle fifty" is in a data set. Where a range is a measure of where the beginning and end are in a set, an interquartile range is a measure of where the bulk of the values lie. The interquartile range formula is the first quartile subtracted from the third quartile: IQR = Q3 – Q1

In depth analysis, the median active shoulder flexion for right side was 160 and IQR (151-165), median active shoulder flexion for left side was 160 and IQR (155-165), median active shoulder extension for right side was 54 and IQR (50-60), the median active shoulder extension for left side was 54 and IQR (50-60), median right active shoulder abduction was 165 and IQR (152-168), left median active shoulder abduction was 165 and IQR (151-169), right median active shoulder adduction was 60 and IQR (60-68), left median active shoulder adduction was 65 and IQR (56-65), right median active shoulder medial rotation was 65 and IQR (60-75), median active should medial

rotation was 65 and IQR (60-75), right median active shoulder lateral rotation was 73 and IQR (65-75), left median active shoulder lateral rotation was 73 and IQR (65-75).

4.4 Association socio-demographic and injury related information with wheelchair users pain index scale:

4.4.1: Table-6: Distribution of association among age groups with WUSPI scale

Test name: ONE Way ANOVA

		N	Mean ±SE	F	P value
Total score of WUSPI	20-30 year	32	25.625 ±0.79913	1.182	0.314
	31-40	17	27.4706±1.28371		
	>41	11	27.9091±1.94214		

Level of significant: P<0.05

Above table showed that among 60, participants with age group of more than 41 years had Mean ± SE of 27.9091±1.94214 which was the highest among the other age groups, and it denotes that this age group was vulnerable among the others. It also pointed out that among the association between age group and WUSPI scale were not statistically significant where, P= 0.314 & F=1.182.

4.4.2 Table-7: Distribution of association among gender with WUSPI scale:

Test name: Independent T-test

	t-value	df	P value
Male	0.240	58	0.812
Female			

Level of significant: P <0.05

This above table compares the means among male and female groups and presents with df= 58, t value of 0.240 and P value of 0. 812. It indicated that among the association between gender and WUSPI scale were statistically not significant. (P<0.05).

4.4.3 Table-8: Distribution of the association among occupation with WUSPI:

Test name: One way ANOVA

	N	Mean ±SE	F	P value
Farmer	7	29.7143±2.90086	1.384	0.226
Day laborer	11	23.9091±1.45511		
Service holder	5	23.0000±2.50998		
Garments/factory worker	6	29.1667±2.40023		
Driver	2	29.50000±1.50000		
Businessman	5	27.80000±2.49800		
Unemployed	2	27.0000±3.00000		
Housewife	8	26.1250±1.24553		
Student	14	26.5714±0.94179		

Level of significant: P<0.05

Above table showed that, among participants of 60 paraplegic wheelchair users, patients who were farmer showed the highest value of Mean ± S= 29.7143±2.90086. It denotes that, this group is the most vulnerable among the others. It also indicated that the association between occupation and WUSPI scale were statistically not significant. (P<0.05)

4.4.4. Table-9: Distribution of association among living area and WUSPI:

Test name: Independent T-test

	t value	df	P value
Rural	0.112	58	0.911
Urban			

Level of significant: P<0.05

Above data suggested that among 60 participants, respondent lived in rural area and urban areas presented with df=58, t=0.112 and P=0.911. It indicated that among the association between living area and WUSPI were not statistically significant. (P<0.05)

4.4.5 Table-10: Association of number of co-morbidities with sum of WUSPI:

Test name: ONE Way ANOVA

	N	Mean ± SE	F	P value
Single	10	26.8000±.1.28927	4.137	**0.021***
Multiple	4	33.2500±4.26956		
None	46	25.9348±.69254		

Level of significant: P<0.05

*** Significant**

**** Highly Significant**

Above table suggested that, among 60 participants, respondents with multiple co-morbidities had Mean ± SE= 33.2500±4.26956 which is the highest among the other groups. It denotes that, this group was the most vulnerable among the others. It also pointed out that the association among co-morbidities and WUSPI scale was statistically significant, where F= 4.137, P< 0.05

4.4.6 Table-11: Association of Dominant hand with WUSPI:

Test name: Independent T-test

	t	df	P value
Right	-1.96	58	**0.040***
Left			

Level of significant: P<0.05

*** Significant**

**** Highly Significant**

Above data suggested that among 60 participants, right-handed and left-handed participants presented with df=58, t= -1.96 and P=0.040. It indicated that among the association between dominant hand and WUSPI was statistically significant. (P<0.05)

4.4.7 Table-12: Association of cause of lesion with WUSPI:

Test name: Independent T-test

	t	df	P value
Traumatic	0.282	58	0.779
Non-traumatic			

Level of significant: P<0.05

* Significant

** Highly Significant

Above data presented with df =58, t=0.282 and P=0.779. It indicated that among the association between cause of lesion and WUSPI scale was not statistically significant. (P<0.05)

4.4.8 Table-13: Association of ASIA scale with WUSPI:

Test: One way ANOVA

	N	Mean ±SE	F	P value
Complete A	45	26.4889 ±0.80568	0.671	0.574
Incomplete B	6	26.5000±1.47761		
Incomplete C	2	31.5000±5.50000		
Incomplete D	6	25.7143±.1.49147		

Level of significant: P<0.05

Here, Incomplete C had the Mean ±SE=31.5000±5.50000 which is the highest among the other groups. It denotes that this group is vulnerable among others. It also pointed out that association among ASIA impairment scale with WUSPI was not significant. (P<0.05)

4.4.9: Table-14: Association of skeletal level with WUSPI

Test name: Independent T-test

	T value	**df**	**P value**
Thoracic level	-1.524	58	0.133
Lumbar level			

Level of Significant: P<0.05

Above table showed that t= -1.524, df=58, P=0.133. It also pointed out that among association between skeletal level and WUSPI were statistically not significant. (P<0.05)

4.4.10 Table-15: Association of neurological level with WUSPI:

Test: One way ANOVA

	N	Mean ±SE	F	P value
Thoracic level	47	26.5319±0.76695	0.014	0.986
Lumbar	12	26.7500±1.47260		
Sacral	1	26.0000±		

Level of Significant: P<0.05

Here, lumbar level had Mean ±SE=26.7500±1.47260 which is the highest among the other levels. It also denotes that this group is vulnerable among others. It also indicated that the association among neurological level and WUSPI is not statistically significant. (P<0.05)

4.4.11 Table-16: Association of limited usual activities during past week with WUSPI:

Test name: Independent T-test

	T value	df	P value
Yes	2.622	6.877	**0.011***
No			

Level of Significant: P<0.05

*** Significant**

**** Highly Significant**

Above table shows that, t= 2.622, df=6.877, P=0.011. It also pointed out that association between limitation of usual activities and WUSPI were statistically significant. (P<0.05)

4.4.12 Table-17: Association of hand or elbow injuries with WUSPI:

Test name: Independent T-test

	t	**df**	**P value**
Yes	0.801	58	0.426
No			

Level of Significant: P<0.05

Above table showed t=0.801, df=58 and P=0.426. It also pointed out that among the association between hand or elbow injuries and WUSPI scale was statistically not significant. (P<0.05)

4.4.13 Table-18: Association of current shoulder pain with WUSPI:

Test name: Independent T-test

	t	**df**	**P value**
Yes	-2.052	58	**0.015***
No			

Level of Significant: P <0.05

*** Significant**

**** Highly Significant**

Above data showed that t=-2.052, df=58 and P=0.015. It also indicated that among the association between current shoulder pain and WUSPI scale were statistically significant. (P<0.05)

4.4.14 Table-19: Association of shoulder surgery with WUSPI:

Test name: Independent T-test

	t	df	P value
Yes	-2.493	58	**0.016****
No			

Level of Significant: P <0.05

*** Significant**

**** Highly Significant**

Here, t=-2.493, df=58 and p value=0.016. It also pointed out that among the association between shoulder surgery and WUSPI scale were statistically significant. (P<0.05)

CHAPTER-V DISCUSSION

This is a cross sectional study. The main objective of the study was to determine the shoulder problems among paraplegic spinal cord injury patients who are independently propelling wheelchair. This was achieved by surveying total 60 paraplegic Spinal cord injury patients who data were collected from the SCI patients from CRP who are independently propelling wheelchair. Convenience sampling was done to select samples.

Among the respondent the highest percentage of the respondents were between the age 20-30 years 53.3% (n=33), 28.3% (n=17) participants in between 31-40 years, 23.33% (n=14) participants were from more than 41 years. As a result, the largest sample is made up of participants between the ages of 20-30years, while the smallest sample is made up of participants between the ages more than 41 years. Out of the participant the mean age of the participants was 32.20±10.274 years.

A study by (Akbar et al., 2011) reported that, 71% of paraplegic patients reported having shoulder pain. Divergent results were found in a study of 28 patients with paraplegia who were a mean age of 35 years and had a mean wheelchair dependency of 11.5 years. All patients underwent MR tomography, radiographs, and a clinical examination: 36% of the patients had shoulder pain. A rotator cuff tear was found in only one patient, which could be explained by the significantly younger age and time after injury in this group of patients (Boninger et al., 2001).

In this study data showed that male participants 76.7% (n=46) and female participants 23.3% (n=16). Male were predominantly higher than female which means most of the injured participants of this study were male following injury.

In this study occupational level of the participants 11.7%(n=7) were farmer, 18%(n=11) were day laborer, 8.3%(n=5) were service holder, 10%(n=6) were garments worker, 3.3%(n=2) were driver, 8.3%(n=5) were businessman, 3.3%(n=2) were unemployed, 13.3%(n=8) were housewife, 23.3%(n=13) were students. Among 115 participants, most participants were married. Data showed that 63.3%(n=38) were

married, 36.7%(n=22) were unmarried, 92%(n=55) were nuclear family, 8%(n=5) were extended family, 86.7%(n=52) lived in rural areas, 13.3%(n=8) lived in urban areas.

Among 60 participants, 18.3%(n=11) were illiterate, 40%(n=24) participants had primary education, 10.0%(n=6) participants got secondary education, 23.3%(n=14) were higher secondary education, 8.3%(n=5) were graduated. Here, most of the patients are not properly educated. So, levels of consciousness of these people are very low.

According to Samuelsson, KAM., et al 2004, out of all respondents, 21 had had shoulder pain during the last month. In total, 24% of those subjects having current shoulder pain had experienced shoulder pain before their SCI in relation to 9% of those with no current shoulder pain. Out of the 21, 15 subjects (71%) with shoulder pain agreed to further examination. Two individuals were excluded from the examined group, while one subject had additional diseases and could not be examined properly and one subject had no shoulder pain at the time for examination. Thus, the final examined subject group consisted of 13 individuals with current shoulder pain. The highest pain intensities were found for the activities; 'load wheelchair into a car' (M = 6.772.7 cm), followed by 'pushing up ramps or inclines outdoor' (M = 5.772.8 cm) and 'usual daily activities at work or school' (M =5.573.2 cm). Mean value for all subjects according to average WUSPI score was 4.172.6 cm, with a range from 0.4 to 6.6 cm. According to this study, highest pain intensities were found for the activities including transferring from wheelchair to car, pushing up ramps or inclines outdoors, lifting objects down from an overhead shelf and putting on pants.

In this study data showed that the association of different variables with Socio-demographic and other factors. The association among co-morbidities with WUSPI scale was statistically significant as P=0.021, association among limited activities with WUSPI scale was statistically significant as P=0.011, association among current shoulder pain with WUSPI scale statistically significant as P=0.015.

According to Bossuyt et al., 2017 the adjusted prevalence of shoulder pain was 35.8% (95% CI: 33.4–38.3). Multivariable regression analysis revealed higher odds of shoulder pain in females as compared to males (odds ratio: 1.89; 95% CI: 1.44–2.47), and when spasticity (1.36; 1.00–1.85) and contractures (2.47; 1.91–3.19) were apparent. Individuals with complete paraplegia (1.62; 1.13–2.32) or any tetraplegia (complete: 1.63; 1.01–2.62; incomplete: 1.82; 1.30–2.56) showed higher odds of shoulder pain compared to those with incomplete paraplegia.

Another investigation revealed that shoulder pain influenced the kinematics of arm joints (Brose et al., 2008) with those with shoulder pain having a kinematic movement pattern with lower acceleration magnitudes than those without pain. In the context of our analysis, it is maintained that individuals with shoulder pain adopt a smoother arm motion pattern to reduce momentary discomfort at the shoulder during wheelchair propulsion.

McCasland et al., 2006 found about 70% of the TSCI respondents in the study reported shoulder pain. Tetraplegic respondents reported higher intensity of shoulder pain and also greater likelihood of pain with increased activities than their paraplegic counterparts. Interestingly, the intensity of shoulder pain was inversely related to duration of injury, contrary to the findings reported by Sie et al., 1992. However, this paradox was also observed by Curtis., et al 1999 who hypothesized that older tetraplegic respondents were more likely not to perform strenuous activities, so omission of such tasks made them less likely to report having shoulder pain.

Another study characterized the upper extremity joint kinematics of wheelchair athletes performing exercises commonly prescribed as part of ECPs. The results show that particular positions during cross-training exercises may put wheelchair athletes at increased risk for upper extremity injury. These findings are concerning for individuals with paraplegia given that their upper extremities are utilized repetitively for mobility and weight-bearing ADLs such as transfers. Wheelchair users are already at greater risk for upper extremity overuse injuries which can have a detrimental effect on their quality of life (Jain, et al 2010)

Brose et al., 2008found that overuse and muscular imbalance of the shoulder complex seem to be viable factors affecting wheelchair athletes. From biomechanical modeling studies the repetitive nature of hand rim propulsion and the high biomechanical loads are thought to be causes that lead to overuse type injuries. High glenohumeral joint contact forces during hand rim propulsion have been measured during wheelchair propulsion. The high peak muscle force in supraspinatus, infraspinatus and biceps during the push phase, the start and end of recovery phase may lead to fatigue of the rotator cuff. Supraspinatus and infraspinatus both make up components of the rotator cuff.

The excessive fatigue of these muscles has been hypothesized to lead this musculature to decrease their function of counteracting extreme superior humeral head translation. This excessive superior translation of the humeral head occurs in conjunction with a decrease in subacromial space which has been associated with subacromial pain syndrome (Hobson, D.A. & Tooms, R.E., 1992).

Moreover, many of these activities vary between paraplegic patients and the walking population. To be mobile, paraplegic patients must perform tasks that highly stress the shoulder, such as wheelchair propulsion and transfers. They often perform weight-relief transfers to relieve their buttocks from the body weight. For these reasons, the term ‘‘weight-bearing shoulder’’ was created by Bayley et al., 1992. The upper extremity is also often used in performing overhead tasks while sitting, which produces an upward translation of the humeral head and causes an impingement of the subacromial structures against the acromion (Akbar et al., 2011).

Limitation of the study

Every study has its own set of limitations. Despite the researcher's best efforts, there were limitations and obstructions in the current study. The following are some of the study's limitations**:** As the research was self-funding the sample size was too small to generalize the findings. The study was conducted during a short period of time, thus all factors related to SCI may have gone unnoticed. Because the research was conducted in a specific area of the Centre for the Rehabilitation of the Paralysed (CRP) in the Spinal Cord Injury (SCI) unit, it is possible that the results do not represent the entire population of people living with SCI in Bangladesh because many individuals from the population do not come to CRP for treatment. As a result, the findings of this study cannot be applied to the entire Bangladesh. Another significant limitation was time and resources, both of which had a significant impact on the study and on the ability to generalize the findings to a larger population. Due to the short study period, an adequate number of samples could not be gathered for the study. So, in order to ensure the generalizability of this study, the researcher strongly advised including SCI patients from the community or from throughout Bangladesh in future research.

CHAPTER-VI CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Shoulder pain is one of the most common complaints among people who use wheelchairs. There are many potential risk factors for shoulder pain within that population that are up for debate. Some of these risk factors include underlying anatomy, increased loading forces, overuse, age, duration of wheelchair usage, trunk control, and athletic activity. The participants in this study were a total of 60. The objective of this study was to investigate the prevalence of shoulder problems among individuals with a paraplegic spinal cord injury who independently propel their wheelchairs. Proper identification of etiology of shoulder pain with a thorough history and physical examination is important for management purposes. The treatment can be challenging because it is often impossible to completely rest from the tasks which are increasing the issue. This is because the use of the upper extremities is important for normal life activities such as movement and transfers. So, addition of a shoulder maintenance strengthening program that focuses on strengthening the adductors, external rotators, and scapular retractors is essential for preventing shoulder injuries and ensuring that the shoulder muscles are well-balanced. According to the study, the age group more than 41 years is the most susceptible to shoulder pain. The WUSPI scale and the socio-demographic characteristics were not found to have a significant positive relationship, according to the observations of the researcher. Modifying activities that are done on a daily basis in order to reduce the risk factors involved is a key method for avoiding shoulder pain and the related difficulties. The researcher suggested that paying attention to one's posture while at work could lower the incidence of shoulders problems. The provision of health care in Bangladesh is still in the process of being improved, and there is much more work to be done before it can help people who are suffering from debilitating conditions such as spinal cord injury. Patients who participate in therapeutic activities at home and receive regular physiotherapy will have a reduction in their symptoms, which will allow them to better cope with the situation and improve their ability to engage in activities of daily living.

6.2 Recommendation

The goal of the study was to evaluate paraplegia wheelchair user patients with shoulder pain, and the purpose of the study was to develop a suggestion based on the setting in which the study was done. Despite several limitations, the researcher found some further steps that could be implemented to improve the outcome of future research.

It is recommended to study a big sample size to ensure the research's generalizability.

Only paraplegia wheelchair user patients who were seen at CRP were included in this study to illustrate the features of shoulder pain. However, due to a lack of resources, the investigator was unable to recruit a large number of participants, and hence the results cannot be applied across Bangladesh.

As a result, it is strongly advised that the sample size and region of sample selection be expanded for future research in order to generalize the findings to all paraplegic wheelchair users in Bangladesh.

Furthermore, because there is an unbalanced ratio of male and female participants, it is advised that future research take all participants into account when comparing gender among paraplegic wheelchair users.

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APPENDIX-A

Inform consent

Assalamu Alaikum,

I am Nishat Tamanna Maliha, 4th year BSc in physiotherapy student. I am conducting this thesis as per the requirement of my study module. The Thesis titled "**Shoulder problems among people with paraplegic spinal cord injury"** by ethics committee.

The study aim is to gain in-depth insight and understandings from people with Spinal Cord Injury in order to understand their own experiences and perspectives on shoulder problem due to wheelchair propulsion by ethics committee. To find out that I need to ask several questions to the participants. The entire session will take approximately 20-30 minutes.

I would like to also inform you that this is a purely academic study and will not be used for any other purpose. Your participation in the research will have no impact on your present or future treatment. All information provided by you will be kept confidential and in the event of any report or publication, it will be ensured that the source of information remains secret. Yours participation in this study is voluntary and you may withdraw yourself at any time during this study without any negative questions. You also have the right not to answer a particular question that you don't like or do not want to answer during interview. Your participation will be voluntary therefore any type of remuneration will not be provided. No additional intervention will be provided. If you have any queries about the study, you may contact me mob no- and/or my research supervisor, Md. Shofiqul Islam, Associate Professor of Physiotherapy Department, Bangladesh Health Professions Institute (BHPI), CRP-Savar, Dhaka-1343.

So, may I have your consent to proceed with the interview? Yes / No

Signature and date of the Participant …….

Signature and date of the Interviewer ……

Signature and date of the Researcher …….

APPENDIX-B

সম্মতিপত্র

(অংশগ্রহনকারীকে পড়ে শোনাতে হবে)

আস্সালামুআলাইকুম/নমস্কার,

আমার নাম নিশাত তামান্না মালিহা, আমি এই গবেষণা প্রকল্পটি বাংলাদেশ হেলথ প্রফেশন ইনস্টিটিউট (বি এইচ পি আই) এ পরিচালনা করছি যা আমার ৪র্থ বর্ষ বি. এসসি ইন ফিজিওথেরাপী কোর্সের অধিভক্ত। আমার গবেষণার শিরোনাম "প্যারাপ্লেজিক স্পাইনাল কর্ড ইনজুরিতে আক্রান্ত ব্যক্তিদের মধ্যে কাঁধের সমস্যা আক্রান্ত" আমি এক্ষেত্রে আপনার কিছু ব্যক্তিগত এবং মেরুরজ্জ ক্ষতিগ্রস্থতা সম্পর্কে আনুষাঙ্গিক প্রশ্ন করতে চাচ্ছি। এতে আনুমানিক ২০-৩০ মিনিট সময় নিবো।

আমি আপনাকে অনুগত করছি যে,এটা আমার অধ্যয়নের অংশ এবং যা অন্যকোন উদ্দেশ্যে ব্যবহার হবে না।গবেষক সরাসরি এই স্নায়ুজ্ঞান অধ্যায়নের সাথে অন্তর্ভুক্ত নয়।তাই এই গবেষনায় আপনার অংশগ্রহণ 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 নেতিবাচক 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 আছে।

এই অধ্যয়নে অংশগ্রহণকারী হিসেবে যদি আপনার কোন প্রশ্ন থাকে তাহলে আপনি আমাকে অথবা /এবং মোঃ সফিকুল ইসলাম, সহযোগী অধ্যাপক এবং ফিজিওথেরাপি বিভাগের প্রধান, সিআরপি, সাভার, ঢাকা-১৩৪৩-তে যোগাযোগ করতে পারেন। সাক্ষাৎকার শুরু করার আগে আপনার কি কোন প্রশ্ন আছে?

আমি আপনার অনুমতি নিয়ে এই সাক্ষাৎকার শুরু করতে যাচ্ছি।

হ্যাঁ... ☐

না... ☐

১। অংশগ্রহনকারীর স্বাক্ষর.....।

২।সাক্ষাৎগ্রহনকারীর স্বাক্ষর.....।

৩। গবেষক এর সাক্ষর.....।

APPENDIX-C

English Questionnaire

Title: "Shoulder problems among people with paraplegic spinal cord injury"

A: Personal details

Questions	Response
1. Patient Id no.:	
2. Name of Participant:	
3. Address:	Village/ House no……. Post office……. Police Station……..… District……..... Other ……
4. Contact number:	
5. Date of interview:	

B: Socio-demographic information:

Questions	Responses
1. **Age:**	…. Years

2. **Gender:**	☐ 1= Male ☐ 2= Female
3. **Occupation:**	☐ 1= Farmer ☐ 2= Day laborer ☐ 3= Service holder ☐ 4= Garments/ Factory worker ☐ 5= Driver ☐ 6= Businessman ☐ 7= Unemployed ☐ 8= Housewife ☐ 9= Student ☐ 10= Other (Specify).....
4. **Monthly income**	…… BDT
5. **Marital status:**	☐ 1= Married ☐ 2= Unmarried ☐ 3 = Widow ☐ 4 = Divorce ☐ 5=Separated
6. **Family type:**	☐ 1= Nuclear family ☐ 2= Extended family
7. **Living area**	☐ 1= Rural ☐ 2= Urban
8. **Educational qualification:**	☐ 1 = Illiterate ☐ 2= Primary ☐ 3=Secondary ☐ 4= Higher secondary ☐ 5= Graduate ☐ 6= Post Graduate
9. **Monthly expenditure to deal with current situation:**	…….. Taka
10. **9. Comorbidity**	☐ Diabetes mellitus ☐ Stroke ☐ Heart disease ☐ Asthma ☐ Thyroid ☐ Others (specify)

11. **Number of comorbidities**	☐ 1= Single ☐ 2= Multiple

C: Participants Related Information

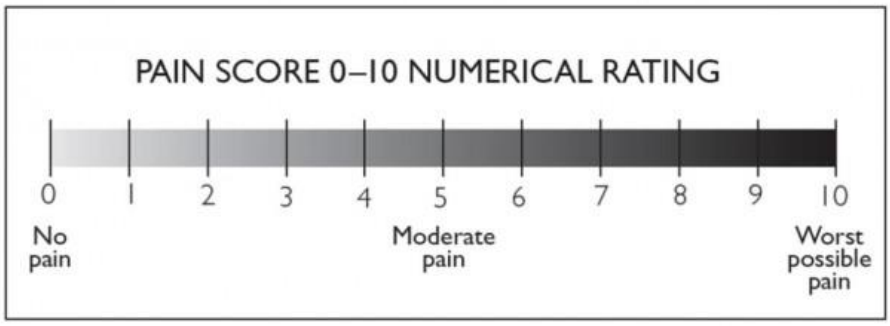
Questions	**Responses**
1. Dominant Hand	☐ 1= Right ☐ 2= Left
2. Weight:	…….kg
3. Cause of spinal cord injury	☐ Traumatic ☐ Non-traumatic
4. Duration of injury	☐ months
5. Duration of manual wheelchair usage	
6. What is the frequency of your wheelchair transfer per day?	

D: Medical history:

Questions	**Responses**
1. ASIA	
2. Skeletal level	
3. Neurological level	
4. Did you have shoulder pain prior to wheelchair use? If yes, which shoulder(s)?	
5. Have you had shoulder pain during the time you have used? If yes, which shoulder(s)?	

6. Have you had shoulder surgery? If yes, which shoulder(s)?	
7. Do you currently have shoulder pain?	
8. Have you sought medical attention for a shoulder problem? if yes, who did you see?	1. Physician 2. Physical Therapist 3. Chiropractor 4. Other:
9. Circle all of the following you have used to relieve shoulder pain:	1. Ice 2. Heat 3. Exercise 4. Medication 5. Rest 6. None 7. Other:
10. Has shoulder pain limited you from performing your usual activities during the past week?	1= Yes 2= No
11. Have you experienced hand or elbow pain or injuries during the time you have used a wheelchair?	1= Yes 2= No

E: Numerical Pain Rating Scale

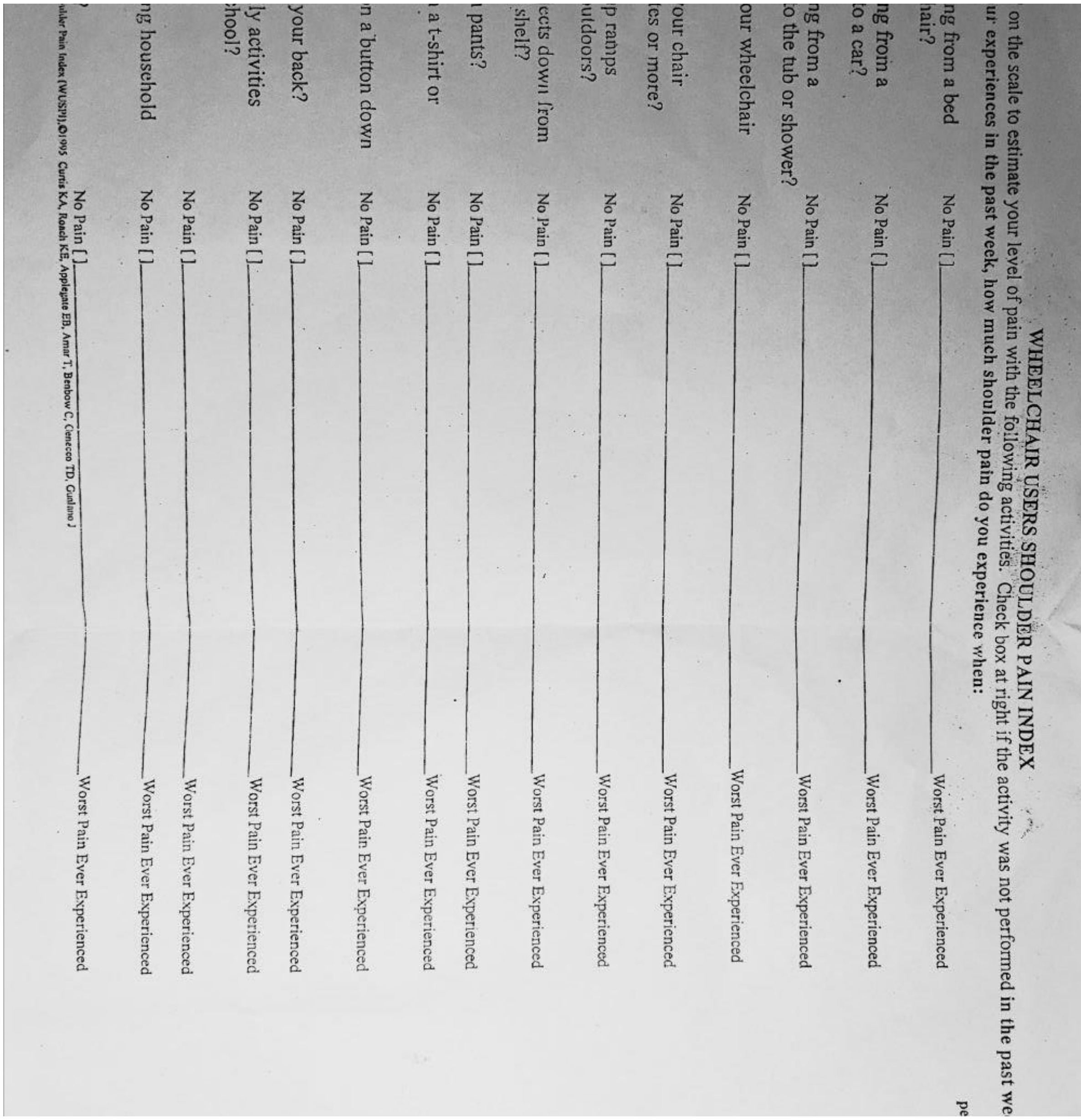
Questions	Responses
1. What is the severity of pain on Numerical Pain Rating scale?	

F: **Shoulder joint range of motion**

Active movement	Normal range	Right	Left
1. Flexion	0-180		
2. Extension	0-60		
3. Abduction	0-180		
4. Adduction	50-75		
5. Medial rotation	0-70		
6. Lateral rotation	0-90		

*American Academy of Orthopedic Surgeon (1965)

G: Wheelchair Users Pain Index Scale



WHEELCHAIR USERS SHOULDER PAIN INDEX

on the scale to estimate your level of pain with the following activities. Check box at right if the activity was not performed in the past we
ur experiences in the past week, how much shoulder pain do you experience when:

pe

ng from a bed hair?	No Pain [ ]		Worst Pain Ever Experienced
ng from a to a car?	No Pain [ ]		Worst Pain Ever Experienced
ng from a to the tub or shower?	No Pain [ ]		Worst Pain Ever Experienced
our wheelchair	No Pain [ ]		Worst Pain Ever Experienced
our chair tes or more?	No Pain [ ]		Worst Pain Ever Experienced
p ramps utdoors?	No Pain [ ]		Worst Pain Ever Experienced
ects down from shelf?	No Pain [ ]		Worst Pain Ever Experienced
pants?	No Pain [ ]		Worst Pain Ever Experienced
a t-shirt or	No Pain [ ]		Worst Pain Ever Experienced
n a button down	No Pain [ ]		Worst Pain Ever Experienced
your back?	No Pain [ ]		Worst Pain Ever Experienced
ly activities hool?	No Pain [ ]		Worst Pain Ever Experienced
	No Pain [ ]		Worst Pain Ever Experienced
ng household	No Pain [ ]		Worst Pain Ever Experienced
?	No Pain [ ]		Worst Pain Ever Experienced

ulder Pain Index (WUSPI),©1995 Curtis KA, Roach KE, Applegate EB, Amar T, Benbow C, Genecco TD, Gualano J

APPENDIX-D

বাংলা প্রশ্নপ্রত্র

"প্যারাপ্লেজিক স্পাইনাল কর্ড ইনজুরিতে আক্রান্ত ব্যক্তিদের মধ্যে কাঁধের সমস্যা "

ক) ব্যক্তিগত তথ্যঃ

প্রশ্ন	প্রতিক্রিয়া
১. আইডি নংঃ	
২. রোগীর নামঃ	
৩. ঠিকানাঃ	গ্রাম / বাসা নংঃ পোস্ট অফিস: থানাঃ জেলা: অন্যান্যঃ
৪. মোবাইল নাম্বারঃ	
৫. তারিখঃ	

খ) আর্থ-সামাজিক প্রশ্নাবলী:

প্রশ্ন	**প্রতিক্রিয়া**
১। বয়স	.....বছর
২। লিঙ্গ	☐ ১= মহিলা ☐ ২= পুরুষ
৩। পেশা	☐ ১= কৃষক ☐ ২= দিনমজুর ☐ ৩= চাকুরীজীবী ☐ ৪= গার্মেন্টস / ফ্যাক্টরি ওয়ার্কার ☐ ৫= ড্রাইভার ☐ ৬= ব্যবসায়ী ☐ ৭= বেকার ☐ ৮= গৃহিণী ☐ ৯= শিক্ষার্থী ☐ ১০= অন্যান্য (উল্ল্যেখ করুন) .....
৪। মাসিক আয়	.....টাকা
৫। বৈবাহিক অবস্থা	☐ ১= বিবাহিত ☐ ২= অবিবাহিত ☐ ৩ = বিধবা ☐ ৪ = তালাকপ্রাপ্ত ☐ ৫ = বিচ্ছিন্ন
৬। পরিবারের ধরণ	☐ ১ = একক পরিবার ☐ ২= যৌথ পরিবার
৭। বসবাসের এলাকা	☐ ১ = গ্রাম ☐ ২ = শহর
৮। শিক্ষাগত যোগ্যতা	☐ ১ = অশিক্ষিত

	☐ ২= প্রাথমিক ☐ ৩ =মাধ্যমিক ☐ ৪ = উচ্চ মাধ্যমিক ☐ ৫ = স্নাতক ☐ ৬ = স্নাতকোত্তর
৯। বর্তমান পরিস্থিতির সাথে খাপ খাওয়াতে মাসিক ব্যয়	.....টাকা
১০।কো-মরবিডিটি বা অনেক রোগ একসাথে হওয়ার তথ্য	☐ ডায়াবেটিস্ট ☐ স্টোক ☐ হৃদরোগ ☐ হাঁপানি ☐ থাইরয়েড ☐ অন্যান্য (উল্লেখ করুন).....
১১। কো-মরবিডিটির সংখ্যা	☐ ১ = একটি ☐ ২ = একাধিক

গ) অংশগ্রহণকারী সম্পর্কিত তথ্য

প্রশ্ন	**প্রতিক্রিয়া**
১। প্রধান হাত	☐ ১= ডান ☐ ২= বাম
২। ওজন	.....কেজি
৩। মেরুরজ্জু আঘাতের কারণ	☐ ১=আঘাতজনিত ☐ ২= আঘাতজনিত নয়
৪। আঘাতের সময়সীমা	☐ মাস

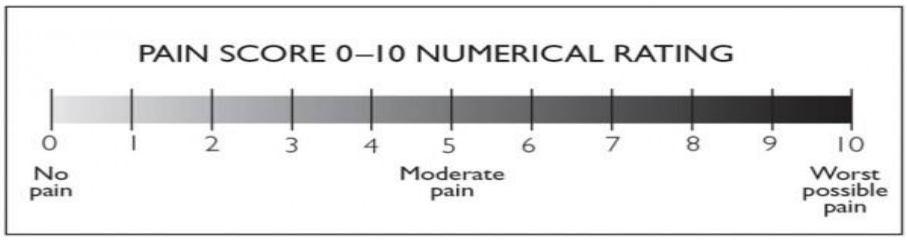
৫। হস্তচালিত হুইলচেয়ার ব্যবহারের সময়সীমা	
৬। প্রতিদিন আপনার কতবার হুইলচেয়ার ব্যবহার করা হয় ?	

ঘ) রোগীর চিকিৎসা সংক্রান্ত তথ্য

প্রশ্ন	**প্রতিক্রিয়া**
১ । এশিয়া	
২। স্কেলেটাল লেভেল	
৩। নিউরলজিক্যাল লেভেল	
৪। হুইলচেয়ার ব্যবহারের পুর্বে আপনার কাধে ব্যথা ছিল?	১= হ্যাঁ ২= না
৫। হুইলচেয়ার ব্যবহারের সময় কাধে ব্যথা ছিল ?	১= হ্যাঁ ২= না
৬। কাধে কোন অস্ত্রপ্রচার করা হয়েছিল? ?	১= হ্যাঁ ২= না
৭। আপনার এখন কাধে ব্যথা আছে ? ?	১= হ্যাঁ ২= না
৮। কাধে ব্যথার জন্য কোন চিকিৎসা ব্যবস্থা গ্রহন করেছিলেন ? যদি হ্যা হয়, কোন ব্যবস্থা টি গ্রহন করেছিলেন ?	১= ডাক্তার ২= ফিজিওথেরাপি ৩= ক্রাইওপেক্টর ৪= অন্যান্য্
৯। কাধের ব্যথা উপশমের জন্য যেটি ব্যবহার করেছিলেন সেটি গোল করুন	১=বরফ ২=গরম ৩=ব্যায়াম ৪= ওষুধ ৫= বিশ্রাম ৬= কোনটিই নয় ৭= অন্যান্য

১০। কাধের ব্যথার জন্য গত সপ্তাহে আপনার প্রত্যাহিক কাজে ব্যঘাত ঘটেছিল ?	১= হ্যা ২= না
১১। হুইলচেয়ার ব্যবহারের সময় আপনি হাত বা কনুই এ আঘাত পেয়েছিলেন ?	১= হ্যা ২= না

ঙ। নিউমেরিকাল পেইন রেটিং স্কেলঃ

প্রশ্ন	**প্রতিক্রিয়া**
১। নিউমেরিকাল পেইন রেটিং স্কেলে আপনার ব্যথার তীব্রতা কত ?	

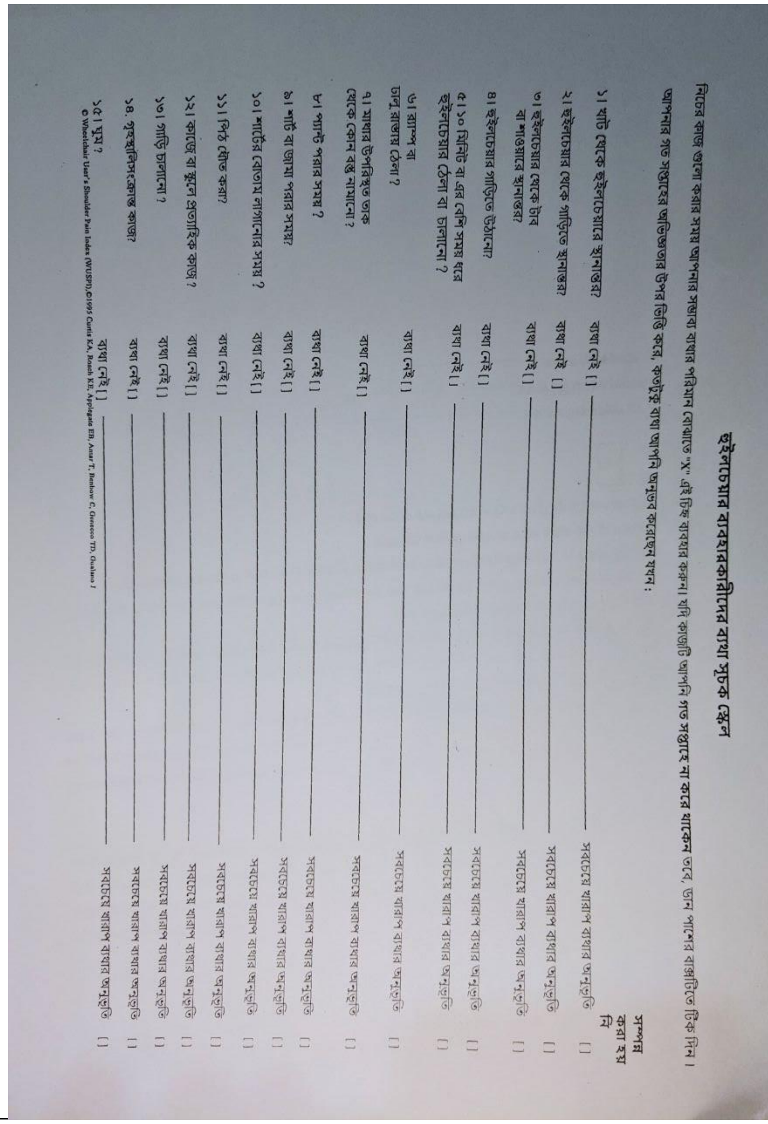
চ) কাঁধ জয়েন্টের রেন্জ অব মোশন

সক্রিয় নড়াচড়া	নরমাল রেন্জ	রোগীর প্রতিক্রিয়া	
		ডান	বাম
১. ফ্লেকশন	০-১৮০		
২. এক্সটেনশন	০-৬০		
৩. এবডাকশন	০-১৮০		
৪. এডাকশন	৫০-৭৫		
৫. মিডিয়াল রোটেশন	০-৭০		
৬. লেটেরাল রোটেশন	০-৯০		

*আমেরিকান একাডেমী অব অর্থোপেডিক সার্জন (১৯৬৫)

APPENDEX-E

ছ) হুইলচেয়ার ব্যবহারকারীর পেইন ইনডেক্স স্কেল



হুইলচেয়ার ব্যবহারকারীদের ব্যথা সূচক স্কেল

নিচের কাজ গুলো করার সময় আপনার সম্ভাব্য ব্যথার পরিমান বোঝাতে "X" এই চিহ্ন ব্যবহার করুন। যদি কাজটি আপনি **গত সপ্তাহে না করে থাকেন** তবে, ডান পাশের বাক্সটিতে টিক দিন।

আপনার গত সপ্তাহের অভিজ্ঞতার উপর ভিত্তি করে, কতটুকু ব্যথা আপনি অনুভব করেছেন যখন :

				সম্পন্ন করা হয় নি
১। খাট থেকে হুইলচেয়ারে স্থানান্তর?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
২। হুইলচেয়ার থেকে গাড়িতে স্থানান্তর?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
৩। হুইলচেয়ার থেকে টাব বা শাওয়ারে স্থানান্তর?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
৪। হুইলচেয়ার গাড়িতে উঠানো?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
৫। ১০ মিনিট বা এর বেশি সময় ধরে হুইলচেয়ার ঠেলা বা চালানো ?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
৬। র‍্যাম্প বা ঢালু রাস্তায় ঠেলা ?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
৭। মাথার উপরিস্থত তাক থেকে কোন বস্তু নামানো ?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
৮। প্যান্ট পরার সময় ?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
৯। শার্ট বা জামা পরার সময়?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
১০। শার্টের বোতাম লাগানোর সময় ?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
১১। পিঠ ধৌত করা?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
১২। কাজে বা স্কুলে প্রত্যাহিক কাজ ?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
১৩। গাড়ি চালানো ?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
১৪. গৃহস্থালিসংক্রান্ত কাজ?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]
১৫। ঘুম ?	ব্যথা নেই [ ]	______	সবচেয়ে খারাপ ব্যথার অনুভূতি	[ ]

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

Ref: CRP/BHPI/IRB/03/2022/581

Date: 06/03/2022

Nishat Tamanna Maliha
4th Year B.Sc. in Physiotherapy
Session: 2016 – 2017
BHPI, CRP, Savar, Dhaka- 1343, Bangladesh

Subject: Approval of the research project proposal **"Shoulder problems among people with paraplegic spinal cord injury who are independently propelling wheelchair"** by ethics committee.

Dear Nishat Tamanna Maliha,
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 and Md. Shofiqul Islam as thesis supervisor. The Following documents have been reviewed and approved:

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

The purpose of the study is to gain in-depth insight and understandings from people with Spinal Cord Injury in order to understand their own experiences and perspectives on shoulder problem due to wheelchair propulsion. Since the study involves questionnaire that takes maximum 20- 30 minutes and have no likelihood of any harm to the participants, the members of the Ethics committee approved the study to be conducted in the presented form at the meeting held at 09:00 AM on October 12, 2021 at BHPI (30thIRB Meeting).

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

APPENDIX-F

Permission letter

Date:13-03-2022

The Head of Department

Department of Physiotherapy

Centre for the Rehabilitation of the Paralysed (CRP)

Chapain, Savar, Dhaka-1343.

Through: Head, Department of Physiotherapy, BHPI

Subject: Seeking permission for data collection of 4th year physiotherapy research project.

Respected Sir,

With due respect and humble submission to state that I am Nishat Tamanna Maliha, student of 4th Professional B.Sc. in Physiotherapy at Bangladesh Health Professions Institute (BHPI). The ethical committee has approved my research project entitled on **"Shoulder problems among people with paraplegic spinal cord injury who are independently propelling wheelchair"** under the supervision of Md. Shofiqul Islam, Associate Professor & Head, department of physiotherapy, CRP, Savar, Dhaka-1343, Bangladesh. Conducting this research project is partial fulfillment of the requirement for the degree of B.Sc. in Physiotherapy. I want to collect data for my research project from the patients of spinal cord injury unit, department of Physiotherapy, CRP, Savar, Dhaka. So, I need permission for data collection from the spinal cord injury unit of Physiotherapy department of CRP, Savar, Dhaka. I would like to assure that anything of my study will not be harmful for the participants.

May I, therefore pray and hope that you would be kind enough to grant my application & give me permission for data collection and oblige thereby.

Yours obediently,

Nishat Tamanna Maliha

Nishat Tamanna Maliha

4th professional B.Sc. in Physiotherapy

Roll: 15, Session: 2016-17, ID No: 112160337

Bangladesh Health Professions Institute (BHPI)

(An academic Institute of CRP)

CRP, Chapain, Savar, Dhaka-1343.

Forwarded & Recommended

Shofiq

13.03.22

Md. Shofiqul Islam
Associate Professor & Head
Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343

Approved

13/03/22

APPENDIX-H

The Chairman
Institutional Review Board (IRB)
Bangladesh Health Professions Institute (BHPI), CRP
Savar, Dhaka-1343, Bangladesh.

Subject: Application for review and ethical approval.

Dear sir,

With due respect, I am Nishat Tamanna Maliha, student of final year B.Sc. in Physiotherapy program at Bangladesh Health Professions Institute (BHPI) the academic institute of Centre for the Rehabilitation of the Paralysed (CRP) under the Faculty of Medicine,University of Dhaka.As per the course curriculum, I have to conduct a research project entitled "**Shoulder problems among people with paraplegic spinal cord injury who are independently propelling wheelchair**" under the supervision of Md. Shofiqul Islam, Associate Professor & Head, Department of Physiotherapy, BHPI.

The purpose of the study is to gain in-depth insight and understandings from people with spinal cord injury in order to understand their own experiences and perspectives on shoulder problem due to wheelchair propulsion. The study involves face-to-face interview by using questionnaire to explore the perception of people with spinal cord injury who are independently propelling wheelchair at CRP hospitals in Savar that may take 20 to 30 minutes to fill in the questionnaire and there is no likelihood of any harm to the participants. Data collectors will receiveinformed consent from all participants andthe collected data will be kept confidential.

Therefore, I look forward to having your kind approval for the research project and to start data collection. I can also assure you that I will maintain all the requirements for study.

Sincerely,

Nishat Tamanna

Nishat Tamanna Maliha
Final Year B.Sc. in Physiotherapy
Session: 2016 – 2017,
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Thesis presentation date: 12th October 2021

Shofiq

Head of Department
B.Sc. in Physiotherapy, BHPI.

Md. Shofiqul Islam
Associate Professor & Head
Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343

Recommendation from the Supervisor

Shofiq

Md. Shofiqul Islam
Associate Professor & Head
Department of Physiotherapy, BHPI.

Kathleen A. Curtis, PT, Ph.D.
kacurtis@utep.edu

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SCORING INSTRUCTIONS
WHEELCHAIR USER'S SHOULDER PAIN INDEX
(WUSPI)

Thank you for your interest in the WUSPI, the Wheelchair User's Shoulder Pain Index. Enclosed is a copy of the instrument as we are currently using it.

RAW WUSPI SCORE:

Measure the length of each 10 cm line from left to right to the point where the subject indicates an "X". The total score is calculated by taking the sum of all 15 item scores. Note the number of items completed. (There is an option for the respondent to check "not performed")

PERFORMANCE-CORRECTED WUSPI SCORE (PC-WUSPI)

Divide the RAW WUSPI SCORE (see above) by the number of items completed. Multiply this result by 15. This is the PC-WUSPI SCORE which accommodates for individuals who do not perform certain functions (such as individuals with tetraplegia) or for part-time wheelchair users (such as those who use the wheelchair only for sports participation).

I would appreciate a copy of the results of any study you do with the WUSPI so that I can keep an ongoing log of instrument use.

If you have any questions, please don't hesitate to contact me at the above address.

Best wishes with your work.

Sincerely,

Kathleen A. Curtis, P.T., Ph.D.