



Faculty of Medicine

University of Dhaka

**PILATE'S METHOD FOR PARAPLEGIC SPINAL CORD
INJURY PATIENTS DURING REHABILITATION**

By

Fabiha Alam

Master of Science in Physiotherapy

Registration no: 2512

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Session: 2018-2019



Department of Physiotherapy

Bangladesh Health Professions Institute (BHPI)

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We the undersigned certify that we have carefully read and recommended to the Faculty of Medicine, University of Dhaka, for acceptance of this thesis entitled, **“PILATE’S METHOD FOR PARAPLEGIC SPINAL CORD INJURY PATIENTS DURING REHABILITATION”**, submitted by Fabiha Alam for the partial fulfillment of the requirements for the degree of Master of Science in Physiotherapy.

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Declaration Form

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Acknowledgement

First of all, I am grateful to almighty Allah for enabling me to complete this thesis. I am extremely grateful to my honorable and praiseworthy Supervisor Prof. Dr. Md. Forhad Hossain Sir for his excellent guidance from the very beginning to winding up of this study.

I am very much thankful to my data collectors, intern, SCI unit all staffs, incharge and Mohammad Anwar Hossain sir for their cordial support and permission for data collection at SCI. I am also indebted to Prof. Obaidul Haque, Md. Shofiqul Islam, Ehsanur Rahman and Mohammad Anwar Hossain, Associate Professor, Dept. of Physiotherapy and also other faculty members for sharing their precious knowledge that enabled me to fine-tune various aspects concerning this study.

I want to remember all of my classmates and also thanks to Eshika Shaha, Sabrina Zaman, two students with the feeling of gratitude for their inspiration and extending helpful hands in different situations throughout this study. I am very grateful to Librarian of BHPI for her support and other staffs for providing resources.

In fact, no amount of thanks is enough to acknowledge the role played by the study participants in making this dream a reality.

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List of Abbreviations or Symbols

ASIA	American Spinal Cord Injury Association
BBS	Berg Balance Scale
BHPI	Bangladesh Health Professions Institute
CRP	Centre for the Rehabilitation of the Paralysed
CTRI	Clinical Trials Registry- India
DTFM	Deep transverse friction massage
FIM	Functional independence Measurement
GTFM	Gentle transverse friction massage
ICS	International Continence Society
MUI	Mixed Urinary Incontinence
PFMT	pelvic floor muscle training
RCT	Randomized Clinical Trial
SCI	Spinal Cord Injury
SCIM	Spinal Cord Independence Measure scale
SCL	Spinal Cord Lesion
SE	Stabilization Exercise
SIP	Sickness Impact profile
SPSS	Statistical Package for Social Sciences
UI	Urinary Incontinence
WE	Walking Exercise
WHO	World Health Organization

Abstract

Spinal Cord Injury is a devastating injury which causes various types of health related problems. It also affect daily life activities and also they suffered by depression where female SCI patients are more vulnerable. To improve paraplegic patient's strength, core muscle strengthening is most important and core stability exercises improve the hip and trunk muscle strength, endurance and the ability to maintain pelvic & spinal alignment. Pilate's method is the exercise program which helps to improve core muscles strength, flexibility of muscles, improve balance and overall functions of patients. **Objectives:** To assess the effectiveness of Pilates method on balance, flexibility, pelvic floor & core muscles strength and function in the paraplegic SCI patients. **Methodology:** The study was a quantitative exploration of RCT. Pilate's method combined with conventional physiotherapy applied to the trial group and only conventional physiotherapy and Strengthening program for control group. Where 70 participants with paraplegic were recruited and a hospital randomization was used for group allocation and patient selection. SCIM scale, BBS and Sit & Reach Test was used for measurement of functional independence, Balance and flexibility. Between groups analysis was calculated by Mann-Whitney U-test and flexibility by unpaired t test. Within group was analyzed by Wilcoxon signed rank test. **Results:** Both groups were similar in baseline characteristics. Overall SCIM score was (.007), which indicated p values were less than 0.05, there was a significant difference between the Pilates exercise and conventional physiotherapy exercises. The treatment may be applied to improve functional independence on the basis of data which were used. In the BBS score, p values was (.813) was greater than 0.05, so the test for balance level was not significant. The study used 8 weeks of treatment to improve the balance and it seems to be that if the treatment period increased then the results may vary. The Wilcoxon test Z score (5.027) and a p value (.000) for subtotal SCIM score for trial group and also Z score (5.165) and a p value (.000) for the control group. Z score (5.173) and a p value (.000) for BBS scale within the experimental group. And also this result shows that Z score (5.174) and a p value (.000) for BBS scale score within the control group. So this result indicated that there was a significant difference between before and after balance levels at significant level 5%. But when we compare between groups, we can expect better result from the experimental group as because of treatment protocol. At the observed t value (.634) has a p value of (.528) at experimental group, so no significant difference in the effect of the Pilates exercise in flexibility. **Conclusions:** Pilates exercise with conventional physiotherapy was effective than only conventional physiotherapy but there was also a positive effect in within group analysis at before & after Pilates exercise with conventional physiotherapy as well as only conventional physiotherapy. There was no statistically positive effect on balance and flexibility level at between group analyses.

Key Word: *Pilate's method, incomplete paraplegic SCI, independence level.*

1.1 Background

The effect of Spinal cord injury is a widespread and devastating. It affects sensory, motor function loss as well as loss of bladder bowel control and also sexual function. It also affect daily life activities and also they suffered by depression. Among them female SCI patients are more vulnerable (Sipski, 1991). With other complications urinary incontinence and weak pelvic floor muscle and core muscles are more common on SCI patients. In physiological structure of female gynecological organ it is most complex coordination between bladder, urethra, pelvic muscles and surrounding tissues (Norton, & Brubaker, 2006). Pelvic floor muscle training is an essential conservative physiotherapy treatment to improve pelvic floor muscle strength, endurance and coordination. The Pilates method or training helps to improve whole body integration, strength specially it improves pelvic stability, mobility and body alignment. It helps to increase pelvic floor muscle significant strength which helps to reduce urinary incontinence and other gynecological complications (Gomes et al., 2018). Literature stated that most of the cases were 18-30 years age people who suffered by spinal cord injury. Among them mechanical cause are less than traumatic cause and about 60% were suffered for traumatic injury (McDonald, & Sadowsky, 2002).

Spinal cord injury patients were mostly suffered by paralysis which have widespread consequence on functioning, bladder problem, respiratory & cardiovascular with sexual function. It also affected the social interaction, participation and communication. As a result people with spinal cord injury required full rehabilitation not only medical care. During rehabilitation time all other exercises Pilates exercises helps to improve the overall function of SCI patients. To improve overall function it needs to be included all other health professionals and especially physiotherapists' plays a vital role to improve the functions of paraplegics SCI patients (Harvey, 2016). Spinal Cord Lesion (SCL) is a one kind of injury which causes various type of health related functional problems. This functional ability depends on the level of lesion. The higher the lesion are more responsible for reduce the functional level depends on level of lesion. Higher lesion level injured patient are more vulnerable and it also reduce

their functional outcome and physical capacity (Janssen, Dallmeijer, Veeger, & Woude, 2002). On the other hand personal and injury related factors also modified these components. When this physical capacity decrease it also has a negative impact on health related status and also more possibility for the risk of complications (Haisma et al., 2006). SCI patient's rehabilitation mainly focuses on functional independence which depends on level of injury. During rehabilitation stage health professionals try to reduce or prevention the complications. As the consequence of injury people with SCI have less physical capacity. Physical exercise may contribute to improve their functional status during rehabilitation stage (Haisma et al., 2008).

Various types of measurement tools are used for evaluation the measurement of the ability level of performance. As for example FIM scale, Barthel Index, Sickness Impact profile (SIP) etc (Dalmeijer & Woude, 2001). In Barthel Index mainly focuses on daily activities like bathing, feeding, dressing, grooming etc (Collin, Wade, Davies, & Horne, 1988). On the other hand FIM scale also focuses on body care, sphincter control, transfers etc (Silva et al., 2012). But the Sickness impact profile measures mainly health related changes at first used in 1976 and revised version was used from 1981. This sickness impact profile measures health related changes in behavior which associated with carrying out of person's daily activity (Post, Bruin, Witte, & Screijvers, 1996). For the long time follow up FIM was used to assess the daily activities. FIM scale consists of six areas of daily living function. As like as self care, sphincter control, mobility, locomotion communication and social cognition. Every item was evaluated by a seven point scale which assesses the independency of function. This total score estimated disability, safety and also dependency to others or any devices or technologies (Somers, 2001). Finally The SCIM which was used for demonstrated specially the changes based on neurological involvement and helped to find out full functional independency in case of SCI patients (Itzkovich et al., 2007).

To build up SCI patients especially paraplegic patients strength, strengthening exercises was so much important. Among the strengthening programme core strengthening was most of the important part. Core stability exercises improve the hip and trunk muscle strength, endurance and the ability to maintain pelvic & spinal alignment. Pilate's method is the exercise program which helps to improve core muscles strength, flexibility of muscles, improve balance and overall functions of

patients (Yu, & Lee, 2012). Pilates exercise was originally developed by Joseph H. Pilates in the early 1900's. Pilates exercise emphasizes core strength and stability. It strengthens, tones, improves posture, enhancing muscle flexibility and balance. The Pilates programme lasted 8-12 weeks where, all exercises repeated 10 times each, guided with verbal and tactile commands (Anderson, & Spector, 2000).

In worldwide more than 200 million people who suffered by incontinence. It occurs during middle age and associated with quality of life where core muscle strengthening plays a vital role. Female were more vulnerable than male due to the body structure and exposure. Core muscle strengthening improves their overall function and daily quality of life. Pilates helps to improve their core muscles strength and helps to solve their incontinence problem (Norton, & Brubaker, 2006), On the other hand the sexual issues are very much concerning matter especially for female spinal cord injuries patients. For this important issue it's very much important to build up the strength of core muscles and sexual functions where Pilate's method helps to strength the area of core muscles and improve the sexual function (Gerhart, Johnson, & Whiteneck, 1992). Pilates exercises helps to improve the whole body movement including breathing, concentration, centering precision and rhythm. Joseph Pilates stated that this set of corrective exercises promoted voluntary control over the body; improve the effective posture and also stabilizing core muscles during movement especially dynamic movement. Pilates specially improve physical health as well as psychological health and motor functions which improve the whole functions of paraplegic spinal cord injury patients (Mazzarino, Wajswelner, & Morris, 2015). Pelvic floor muscle training with Pilate's method improved urinary control by increasing strength, endurance, and coordination of pelvic floor muscles. Pilate's method consists of training against resistance, integration, and flexibility. Pilate's method may produce significant improvements in the pelvic floor muscles strength. This exercise helps to contract the core muscle group which is important to the prevention and maintenance of urinary incontinency and improve the intra abdominal muscle strength and stabilize trunk muscles (Gomes, et al., 2018).

1.2 Justification

Centre for the Rehabilitation of the Paralysed (CRP) is a Non Government Organization which is running this service since 1994. Despite the availability of this expensive Physiotherapy service scope; there was no attempt that had been taken to find out the effectiveness of specific methods. Inspired from the existing literature which claimed to have effectiveness of Pilates method and from the Gap that has been identified, the Interest and scope of a study have been created, aiming to find out the effectiveness of Pilates method on balance, flexibility, pelvic floor & core muscles strength and function in the paraplegic SCI patients at CRP. In our country and social context not only patients of spinal cord injury patient but also all patients are faces some social barriers and challenges to do physical activity. So in later stage they face difficulty in their health related functional status. Among them SCI patients are more vulnerable for physical activity. My intention is to find out and determine to assess the effectiveness of Pilate's method on balance, flexibility, pelvic floor & core muscles strength and function in the paraplegic SCI patients at CRP during rehabilitation stage. The Spinal Cord Independence Measure (SCIM) scale, Berg Balance Scale (BBS) and Sit & Reach Test is used for evaluation of the effectiveness of function, flexibility and balance. My study mainly focuses these issues in case of SCI patient's especially paraplegic patients. I also want to determine the relationship among other countries study and also find out the effectiveness of dosage and treatment procedures. As a result patients become more benefited and our professional services and quality of treatment will be increased.

1.3 Research Question/Hypothesis

Pilate's method is more effective than conventional supervised Physiotherapy alone.

- Null hypothesis (*H₀*): There was no difference between two groups.
- Alternative hypothesis (*H_a*): Pilate's method along with conventional physiotherapy was more effective than conventional physiotherapy alone.

1.4 Objective of the Study

To find out the effectiveness of Pilates method on balance, flexibility, pelvic floor & core muscles strength and function in the paraplegic SCI patients at CRP.

1.5 Specific Objective

- To explore the Socio-economic condition of participants.
- To find out the changes in different group and also within group.
- To determine the effectiveness of Pilates exercises during rehabilitation for paraplegic.
- To establish scope and interest for the further interest of good quality research in this field.
- To explore the effectiveness in our country context with the variation of treatment dosages.

1.6 Operational definition

Pilate's method: Pilate's method developed by Joseph H. Pilates. It was introduced at United States in 1923. Pilate's method helped to improve pelvic floor muscle strength and overall function, balance and daily activity. This Method was used for rehabilitation, fitness and also flexibility. It was done usually 3 times in week or 5 times in a week and continued for 3 months to 4 months (La Touche, Escalante, & Linares, 2008).

Incomplete paraplegic SCI: Paraplegia is impairment in motor or sensory function of the lower extremities. According to ASIA impairment scale Incomplete B: Incomplete Sensory, but not motor function is preserved below the neurological level of injury, includes the sacral segments S4-S5. Incomplete C: Incomplete, motor function is preserved below the neurological level of injury, but more than half of the key muscles below the level have a muscle grade less than 3. Incomplete D: Incomplete, motor function is preserved below the neurological level of injury, and at least half of the key muscles below the level have a muscle grade or more. Incomplete E: Normal, motor and sensory functions are normal (Choi, Lee, & Kim, 2013).

Independence level: Independence level of SCI was measured by Spinal Cord Independence Measurement (SCIM) scale, The SCIM was developed for three specific areas of function of SCI patients. They are self-care (feeding, grooming, bathing, and dressing), respiration and sphincter management, and a patient's mobility abilities (bed and transfers and indoors/outdoors). On the other hand, the SCIM can also be used to help guide clinicians in determining treatment goals and objectives for patients with a SCI (Catz et al., 1997). The SCIM I and II were both found to be valid and reliable therefore, the SCIM III was developed in 2002 as an international version of the prior forms and it was digned to encompass patients in every walk of life, regardless of their culture (Catz et al., 1997).

Traumatic or non traumatic cause may lead to spinal cord injury and the consequences of SCI, sensory, motor and autonomic function loss (Kutty, 2012). More higher the level of injury may cause more loss of function. Individual SCI patient's physical capacity depends on lesion level, age and also level on activity (Janssen et al., 2002). SCI is a devastating injury which affects daily activities (Haisma et al., 2008). There is clear information from previous study that level of lesion indicates the outcome of physical capacity of an individual patient (Kutty, 2012). Physical exercises play a vital role for SCI rehabilitation. The main focus of this rehabilitation is to reach maximum level of functional ability and independency (Dalmeijer & Woude, 2001). This type of special rehabilitation program must be focused on patient center rehabilitation service. Which also comprehensive and engage the empowerment of people with SCI, follow up care to help their functional status and quality of life also (Wolfe, Hsieh, & Mehta, 2010). Rehabilitation professionals play a vital role for functional Independency of SCI patients (Haisma et al., 2008).

Physical capacity is the combination of the ability of a person's respiratory system, cardiovascular system and musculoskeletal system to reach optimum level of activity like as power output, oxygen uptake muscle strength and respiratory function etc (Haisma et al., 2006). During rehabilitation it focuses also wheelchair skills and ADL training also. It helps to prevention and reduction of complications. On the other hand rehabilitation process also included muscle strength and endurance training (Haisma et al., 2008). To develop or design a standard and effective aerobic exercise and physical activity program for SCI patients is so much challenging (Zoeller et al., 2005). There is a good relationship among quality life and rehabilitation process of a person with SCI. This quality of life mainly depends on a patient physical fitness, social, psychological and overall satisfaction of whole rehabilitation process and outcome (Manns & Chad, 1999).

Pelvic floor was the combination of muscles, ligaments, and fascia which was the underneath the pelvis. Pelvic floor muscles can occur voluntary contraction ability of muscles group which created upward movement of the perineum and intravaginal pressure. In case of urinary incontinence where pelvic floor muscles were weak than it

more vulnerable position and its prevalence rate was one among nine women (Ferla, Paiva, Darki, & Vieira, 2016). It affected more in female than male. It was estimated that 25–45% of women of different ages was affected due to involuntary urine loss and where 9 to 39% of female was affected whose age was more than 60 years. They suffered, on daily urinary leakage problems. More common incontinence was stress incontinence (Fritel et al., 2015).

Urinary incontinence was the one of important issues and complications which araised after spinal cord injuries. Conservative management for incontinence and organ prolapsed mainly focused on lifestyle interventions, physiotherapy rather than medication and surgery. Lifestyle modifications included weight loss, pelvic floor muscle training and core muscles strengthening as well as bladder training (Dumoulin et al., 2016). Another most important impact of SCI was the sexual functions of both male and female. It caused both physical and emotional difficulties. In case of female SCI faced more sufferings due to it affected the whole gynecological cycle like menstruation cycle, pregnancy and as well as sexual functions (Sipski, 1991). Among all other complications urinary incontinence was the most irritable conditions which affected mostly the quality of life of SCI patients. Most of the time surgical interventions were not so much effective than behavioral and therapeutic exercises. Advanced age, obesity, bladder dysfunction may affect patients and most of the time 6.3% to 52% cases were failure after surgery. In case of theses SCI patient's pelvic floor exercises may increases and coordinated continence level and improve lifestyle (Gomes et al., 2018).

On the other hand in case of SCI surgical management was now more common in acute medical care. As well as to maintain blood pressure, circulation, respiration, bladder and bowel management, psychological distress relevance was played vital role during rehabilitation stage. In this stage physiotherapy had a prominent role to management of SCI patients. Some secondary complications like musculoskeletal problems also managed by physiotherapists. Physiotherapy must be started as soon as possible when the patient was medically stable. Rehabilitation program should be included with multidisciplinary approach and patient centered approach. The main aim of rehabilitation was the patient productive life that cans a SCI patient may lead a functional healthy life (Harvey, 2016). Women's health was a major and important issue that focused on whole world. Among them, female SCI patients also played an

important role than male. Female were the focused person who were served nation with their reproduction ability. SCI with female were more sufferer than male because of gynecological conditions and social barriers in this case physiotherapy management especially pelvic floor muscles activity (Jackson, & Wadley, 1999).

Pilate's method helped to improve pelvic floor muscle strength and overall function, balance and daily activity. This Pilates method developed by Joseph H. Pilates. It was introduced at United States in 1923. This Method was well known and it was used for rehabilitation, fitness and also flexibility. It was done usually 3 times in week or 5 times in a week and continued for 3 months to 4 months (La Touche, Escalante, & Linares, 2008). This method based on movement and which included breathing, concentration, centering, precision and rhythm. It also stimulated body awareness, recruitment muscles and body alignment. This method focused on adequate posture, body voluntary control and stabilization of core muscles during dynamic movements. In case of women Pilates specially helped to improve physical health strength with psychological health (Mazzarino, Wajswelner, & Morris, 2015). An important issue was the sexual issue which was a confidential and careless issue for all female and especially for SCI patients. Now days it was a concerning issue and focused issue for SCI. In case of hospital they also faced hesitation when discussed about this issue. They faced a sexual problems and fertility problems after SCI. During rehabilitation stages core muscles strengthening, pelvic floor muscle strengthening and Pilates method helps to improve their pelvic floor muscles strength and abdominal muscles strength. It helps the pregnancy and delivery process. Among the SCI patients 47% had vaginal delivery and 49% had cesarean surgery. The women with SCI 69% were satisfied their sexual life. But they were carried spasticity and other issues. In rehabilitation stage these pelvic floor exercises and other exercises with counseling helped them to improve and maintain their conjugal life (Charlifue et al., 1992). Urinary incontinence was more common complication of female especially in SCI female. Two main types of incontinence were occurred in female patients. To modify the problems and improvement the situation pelvic floor strengthening had a great effort. These physiological exercises also helped for prevention of the condition and also maintain quality of life of female SCI patients (Norton, & Brubaker, 2006). This incontinence problem was more prominent and frequent during pregnancy. This prevalence was about 30% at the first trimester of pregnancy. It had a greater risk

during postpartum stage (Woodley et al., 2017). Pelvic floor muscle training included repeated voluntary contractions of pelvic floor muscles. It also dependent on the frequency, intensity and the progression of exercise and also dependent on the duration of the training period. It included usually three times in a week and continued for several weeks and approximately it continued for 8-12 weeks. This exercises was provided by health professionals specially physiotherapists. It was very much effective for women especially during pregnancy to prevention of urine leakage. Physiotherapy supervision had a great roll for greater outcome (Woodley et al., 2017).

Urinary incontinence was the involuntary leakage of urine where stress incontinence was more common than urge incontinence. Women were more vulnerable than men and prevalence showed that it varied from 10% to 40%. The most affected age was 50 to 70 (Di Benedetto, Coidessa, & Floris, 2008). Urinary tract infection was the most common condition which specially affected the quality of life and it also affected the significant health costs. During pregnancy and spinal cord injury patients were more vulnerable female. It affected about 30-50% where pelvic floor muscle training played effective role as a treatment of this condition (Fritel et al., 2015). In case of spinal cord injury incontinence problem was the one of most common problems. Physiotherapy treatment had a greater role to control this problem. Physiotherapy treatment included bladed management, sphincter and pelvic floor muscles strengthening and increases the integrity of bulbo spinal muscles and also improves the activity of lumbo sacral (Shafik & Shafik, 2003). Modern Pilates exercises which involved breathing and pelvic floor muscle contraction. Pilates exercise provided the improvement of pelvic muscle strength for incontinence patients specially women. They observed that the combination of voluntary pelvic floor strengthening with pilates method was more effective in urinary incontence case (Dias et al., 2018). Inconenence was the common problems among spinal cord injury patient. More common was the stress incontenece and overactive bladder which showed a positive effectiveness of pelvic floor muscle strengthening exercise and Pilates exercises (Vasquez, et al., 2015). Urinary incontinence was assessed by pad test and a bladder diary. Incontinence was measured after 24 hours and then it compared with exercises group patients. Pelvic floor muscle strength was performed and trained by physiotherapist (Santa Mina et al., 2015). Incontinence was a more common condition which affected more in women and also affected the quality of life and increased the

cost of health service. Pregnancy, any type of injury especially spinal cord injury and also pregnancy and postpartum cases where 30-50% were more affected women. Pelvic floor muscle strengthening was more effective treatment (Fritel et al., 2015).

The Pilates method which improved core muscles control, also improved the conditioning level of all muscle group. Practice of Pilate's exercises especially for women may improve the functional level of pelvic floor muscles. It also beneficial for women who lead sedentary life (Ferla, Paiva, Darki, & Vieira 2016). Male pelvic floor muscled also have various function. They also supported abdominals content. Breathing, maintain urinary continence function, improve local blood supply during sexual intercourse. So pelvic floor muscle training improves the pelvic floor functions in case of male (Dorey, 2005). This treatment length was varied from three to twelve weeks. It also focused on home exercise programmed. This programmed also dependent on the quality of life of patients and patients need. Pelvic floor muscles were weak than it was not work properly and effectively during the time of prostrate blockage and also urinary leakage (Dorey, 2005). But there was no clear or significant proved that pelvic floor muscle may reduce the leakage problem. It was more responsible to support the pelvic floor muscles, strengthen pelvic floor muscles and improve functional activities. Urinary incontinence was more common on male who had weak pelvic floor muscle. They also suffered in erectile dysfunction conditions. If the pelvic floor muscles were stronger than it had a significant improvement role for post prostatectomy patients and also incontinence patients. It's very much important for male not only female to maintain their pelvic floor strength and function by pelvic floor exercise and training. Pelvic floor exercises were the first line treatment not only for incontinence but also erectile dysfunction (Dorey, 2005).

Not only urinary incontinence but also pelvic organ prolapsed, pelvic floor dysfunction was more common among female than male. Kegal exercise as well as pelvic floor muscles training with Pilates method were more effective for strengthen pelvic floor muscles to prevention of pelvic floor dysfunction, organ prolapsed and also incontinence problem . Pilates based exercises or Pilates method were more preventive method for pelvic floor dysfunction and also effective for pelvic reconstruction surgery (Culligan et al., 2010). Haylen et al., (2010) said in his study that during coughing or laughing stress urinary incontinence (SUI) is involuntary urine leakage upon physical exertion. Its prevalence varied at 10–39%. Mixed urinary

incontinence (MUI) was urine leakage had a prevalence of 7.5–25% (Dumoulin, Hay-Smith and Mac Habee-Seguin, 2014). In a recent review, pelvic floor muscle training (PFMT) has been found to improve UI symptoms in all types of incontinence (Dumoulin et al., 2014).

Exercise can improve back extension strength, mobility, endurance, and functional disability. Various exercises, such as lumbar stabilization exercise (SE), motor control exercise, core exercise, lumbar flexion exercise, walking exercise (WE), and bracing exercise, have been proposed to mitigate chronic LBP. These exercises focus on lumbar stabilization and core strengthening (Geneen et al., 2017). In a case-control study by Lee et al., (2016) said that lumbar SE is primarily aimed at improving neuromuscular control, strength, and endurance of the muscles, which are considered to be central to the maintenance of dynamic spinal and trunk stability. It is considered as a safe exercise with the advantages of having multiple stages, as well as cost-effectiveness. Each individual has different lumbar muscular strengths, and therefore, lumbar SE programs should be individualized, comprising of various postures with varying intensities to maximize therapeutic benefit to a particular individual.

Kegal exercise was one of effective pelvic floor muscle training to improve the incontinence conditions for women. They reported that pelvic floor muscle training helped to improve urinary incontinence in case of 84% patients. For this reason PFM training was the first priority among other treatment of urinary incontinence prevention. It was effective for both conditions of stress and urge incontinence (Bo, 2004). Spinal cord injury caused a significant burden not only personal life, family life but also social life. It had a negative impact on society among the all spinal cord injury traumatic SCI were more common. They reported that among 10 to 83 people per million were affected in worldwide (Noonan et al., 2012). According to International Continence Society (ICS) defined that any involuntary leakage of urine as known as urinary incontinence which was more prominent among women than men. It had also a negative impact on their daily life and also their quality of life (Di Benedetto, Coidessa & Floris, 2008).

Now a day's urinary incontinence with pelvic floor organ prolapsed was a highly prevalent conditions for women. Kegal exercise played a vital role to minimize and prevent of this problems. Not only kegal exercise but also pelvic floor muscle training

may improve the conditions of female with urinary incontinence. Pilate's method which consisted of a low impact exercises which improve flexibility and strength of whole body. It also improved the mind body connection of patients. Pilate's method improved significantly the strength of Pelvic floor muscles. PMFT was a most effective treatment for stress incontinence. This exercises played a great role as a treatment of stress incontinence and pelvic organ prolapsed (Culligan et al., 2010). Pilates exercise included 10 minutes warm up when lumbar spine was a neutral position. In that time patients was taken deep breath, breathing control with expiration during diaphragmatic breathing in various different types of position and posture. It helped to improved pelvic floor muscles strength and also reduced pain (Llewellyn, Konstantaki, Johnson & Francis, 2017).

Specific spinal stabilization exercise with pelvic floor muscles strengthening improved the contraction of multifidus and transverse abdominal muscles. These exercises also helped to reduced intensity of pain and disability. Also increased the level of confidence of patients and reduced the avoidance and fear of activity after injury (Miyamoto, Costa, Galvanin, & Cabral, 2011). Pelvic floor muscle training increased skeletal muscle strength especially pelvic floor muscle strength. Patients were conducted this treatment for three times a day and continued for 6-8 weeks which was performed by patients with the supervision of physiotherapist. Patients aimed to contracted muscles for 6-8 seconds. In this position it was maintained for 10-12 repetition. This exercise helped to improve body awareness, breathing and breathing relaxation. It also helped to strength the abdominal muscle, back muscle, thigh muscles. Patients were encouraged to maintain the preferable positions. They also reported that this exercises would be performed for maximum 12 repetition especially for home exercise training (Bo, 2004).

Along with other problem incontinence problem was the one of the main problem of spinal cord injury patients. With other conservative treatment pelvic floor muscle training and core muscle strengthening exercises. To reduction of stress incontinence and improve the control of bladder activity, reduction of overactive bladder activity, pelvic floor strengthening training played a prominent role in case of spinal cord injury patients (Vasquez et al., 2015). Pilate's method helped to improve whole body functions not only healthy person's but also spinal cord injured patients. The result of previous study showed that this method improved significantly the flexibility and the

strength of abdominal and spinal extensors muscles. It also helped to improve the general functions and also helped to reduction of pain. These process helped to improved the adaptation of the each patients in different various conditions (Miyamoto, Costa, Galvanin, & Cabral, 2011). Along with other complications chronic pain was the major and prominent problem and complication of SCI patients. According to prevalence it showed that about 65% spinal cord injury patients were suffered by chronic pain. Most of the study showed that this chronic pain might be musculoskeletal, visceral and neuropathic types of pain (Siddall, McClelland, Rutkowski, & Cousins, 2003). Spinal cord injury caused a significant burden not only individuals but also family, society as well as the economic conditions. SCI affected motor, sensory and autonomic functions (Noonan et al., 2012).

Traumatic spinal cord was the experience of threatening which affected their livelihood and also social life. To improve their life quality accurate and appropriate health system was so much important (Conradsson et al., 2018). Now a day's expectancy of life among spinal cord injury patients was increased day by day. Previous study showed that the life expectancy increased about 5 years than previous day (Wyndaele, & Wyndaele, 2006). As the low income third world country in case of Bangladesh, SCI was more common due to work related accidents and it's more common in young adult. This pattern also common in other middle and lower middle countries. So it also lower their income and they included their family faced a large financial problems. Now a day's recent evidence stated that Pilates based exercises was used a patients who have suffered by musculoskeletal conditions, sports injury as well as neurological conditions during rehabilitation. The effect of Pilate's exercises evidence was less common than other (Hossain et al., 2019).

3.1 Study design

This study had done through using Experimental study design. The study was a quantitative exploration of Randomized Clinical Trial (RCT). Pilate's method combined with conventional physiotherapy applied to the trial group and only conventional physiotherapy and conventional Strengthening program applied to the control group. This methodology was chosen to meet the study aim as an effective way to collect data. The researcher wanted to determine the effectiveness of Pilate's method of paraplegic SCI patients during rehabilitation.

3.2 Study Area

The study was conducted at Spinal cord Injury unit, CRP, Savar.

3.3 Study population

Paraplegic Spinal Cord Injury patients at the CRP, Savar.

3.4 Study Duration

70 participants with paraplegic SCI patients were recruited from indoor SCI unit, Centre for the Rehabilitation of the Paralysed (CRP), Savar, and Dhaka from a period of October 2019 to September 2020.

3.5 Sample Size

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 (Bailey, 1997, p. 121).

$$\begin{aligned}n &= \frac{z^2 pq}{d^2} \\n &= \frac{(1.96)^2 \times 0.5 (1-0.5)}{(.05)^2} \\n &= \frac{3.8416 \times 0.5 \times 0.5}{0.0025} \\n &= \frac{0.9604}{.0025} \\&= 384\end{aligned}$$

Where,

z = confidence level at 95% (standard value of 1.96)

p= estimated prevalence of subject = 0.5

d = margin of error at 5% (standard value of 0.05)

In SCI patients of Bangladesh the estimating proportion or percentage for population is infinite population. In case of RCT if the population is infinite than we measured the sample size according to the duration of the data collection period. In this time that is fulfill the inclusion criteria that were selected by simple random sampling with hospital randomization process.

3.6 Sampling Scheme

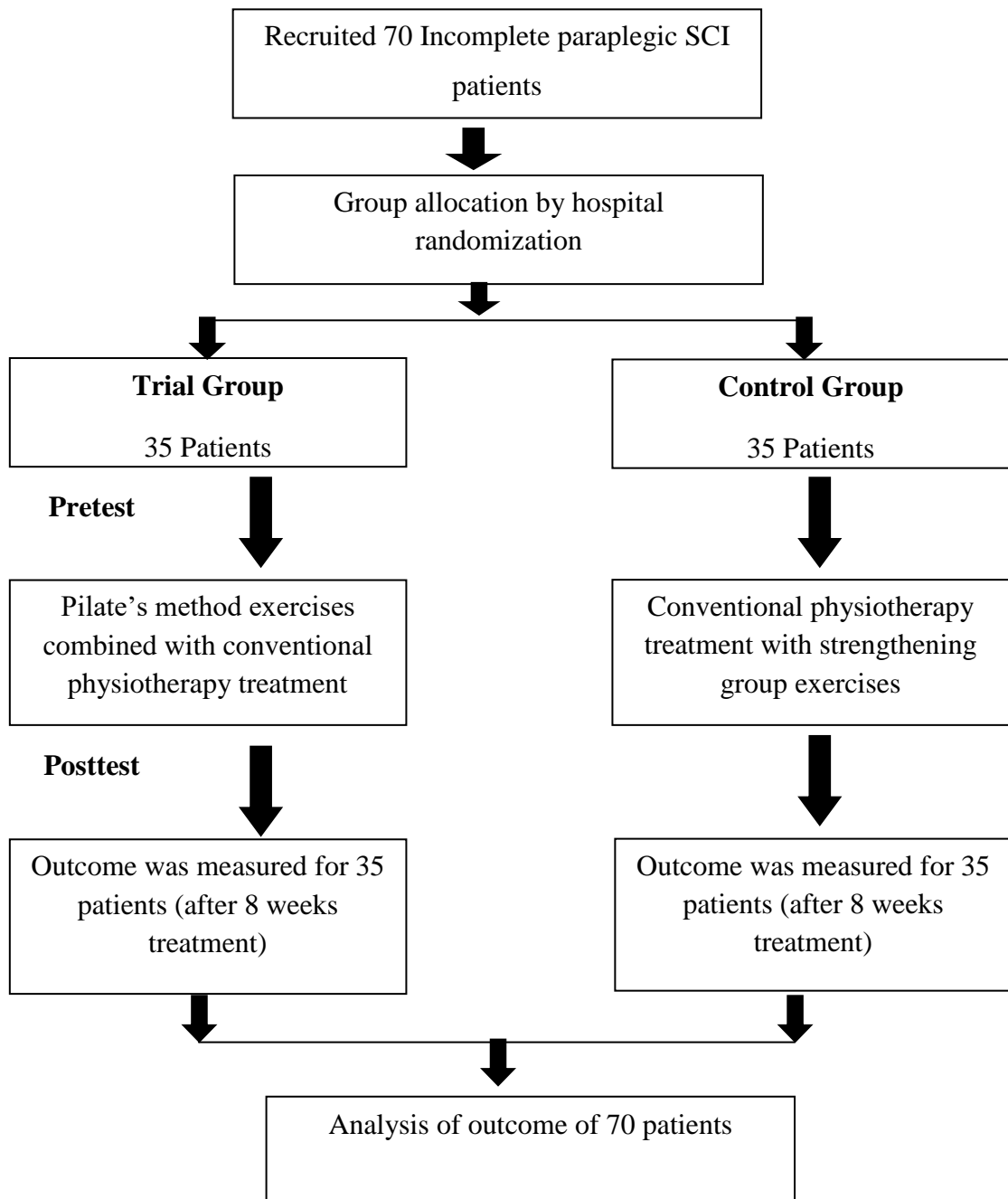


Figure-1: Sampling scheme

3.7 Inclusion Criteria

- Spinal Cord injury patients with Paraplegia and the neurological level was (T7-L5) (Kennedy, 1987).
- Male & Female both paraplegic patients were included (McColl et al., 2004).
- Incomplete B, C & D patients according to ASIA (Choi, Lee, & Kim, 2013).

3.8 Exclusion Criteria

- Medically unstable and any pathological disorder. (Kennedy, 1987).
- Any Complication present (Example-Pressure sore) (Consortium for Spinal Cord Medicine Clinical Practice Guidelines, 2001).
- Patients with cardiovascular complications & musculoskeletal injury (Myers, Lee, & Kiratli, 2007).

3.9 Method of data collection

Face to face interviews are the most effective way to get full cooperation of the participant in a survey (Fraenkel and Wallen, 2000, p.436). According to the participants' understanding level, sometimes the questions were described in the native language so that the patients can understand the questions perfectly and answer accurately.

3.10 Data collection tools

In that time some other necessary materials are used like pen, pencil, and white paper and clip board. The English questionnaires were converted into Bengali to ask the participants during interviews. Data collector took permission from each volunteer participant by using a written consent form in Bengali & English. The Data will be collected by qualified Physiotherapists who are working at indoor SCI unit. Two different assessors will be assigned.

3.11 Measurement tools

Spinal Cord Independence Measurement (SCIM) scale, Berg Balance Scale (BBS) and Sit & Reach Test was used for measurement of function, Balance and flexibility of SCI patients. The SCIM was developed for three specific areas of function of SCI patients. They are self-care (feeding, grooming, bathing, and dressing), respiration and sphincter management, and a patient's mobility abilities (bed and transfers and indoors/outdoors). On the other hand, the SCIM can also be used to help guide clinicians in determining treatment goals and objectives for patients with a SCI (Catz et al., 1997). The SCIM I and II were both found to be valid and reliable therefore, the SCIM III was developed in 2002 as an international version of the prior forms and it was designed to encompass patients in every walk of life, regardless of their culture (Catz et al., 1997). This study supports the internal validity and reliability of the BBS-12 as a measurement tool independent of the etiology of the neurologic disease causing the balance impairment (La Porta et al., 2012).

3.12 Treatment regime

All the physiotherapy treatments were performed at center 3 sessions per week for 8 weeks and finally 24 sessions was continued. Each Session consists of 30 minutes. Five physiotherapists were involved for physiotherapy treatment and this Pilates method of SCI unit.

Conventional Physiotherapy

Manual therapy techniques comprising of soft tissue mobilization, shoulder mobilization, spinal mobilization, postural drainage, chest physiotherapy, Gentle transverse friction massage (GTFM), Deep transverse friction massage (DTFM) depending on patients condition and impairments. Exercise therapy consisting of active fascilatory movement, active assisted movement, active movement, stretching exercise for upper & lower extremities and strengthening exercises, back muscle strengthening, pelvic floor muscle strengthening, strengthening by sand bag, breathing exercise, balance practice, squatting, lifting practice, transferring practice, bed mobility, stepping practice, bridging practice and group therapy. Cycling practice, Gym activity and gait reeducation also done as a conventional finally, home advice and patient education were delivered.

Strengthening Exercises

Upper & lower extremities strengthening exercises, back muscle strengthening, pelvic floor muscle strengthening, strengthening by sand bag, breathing exercise, squatting, lifting practice, stepping practice, bridging practice in group therapy. These exercises were conducted by control group participants while experimental groups are involved in Pilates exercise.

Pilates Exercises:

Name of the Experimental Exercise	Exercises
Initial Principles integration (Supine)	Coordination of breathing, neutral spine, transverses abdominals and pelvic floor activation.
Pelvic clock (Supine)	Pelvic movements like a clock, making the lumbar spine move in flexion, extension and rotation.
Basic Bridging (Supine)	Pelvic elevation with segmented flexion of the spine.
Adductor squeeze (Supine)	Squeeze of adductors muscles with a ball between the knees.
Bent knee fall out (Supine)	Unilateral abduction of an inferior limb with pelvic stabilization.
Supine Arm series (Supine)	Arm work out in flexion, abduction and rotation with trunk stabilization.
Quadrupede	Dissociation of one limb with neutral spine in the quadruped position.
Roll Down series (seated)	Spine segmented flexion 'rolling back' with band assistance.
Standing leg pump	Single leg dissociation (hip and knee flexion) with trunk stabilization and both hand support.
Assisted Aquats (Standing)	Squats with trunk stabilization and assistance of a band.
Home Exercises	Initial principles integration+ Basic bridging+ Standing pump
All exercises for 10 repetitions and three times in a week for 24 sessions or 8 weeks.	

Table-1: Description of Pilates exercises

Brief description of experimental group treatment protocol

Initial Principles integration (Supine)

This exercises start with the coordination of breathing, neutral spine, transverses abdominals and pelvic floor activation. This exercise is repeated for 10 times.

Pelvic clock

Exercise done in supine position where Pelvic movements like a clock, making the lumbar spine move in flexion, extension and rotation. Also repeated for 10 times.

Basic Bridging

Also performed in supine position and Pelvic elevation with segmented flexion of the spine.

Adductor Squeeze

In supine position Squeeze of adductors muscles with a ball between the knees. Also same 10 repetition done by patients.



Figure 2: Adductor Squeeze

Bent knee fall out: in Supine lying Unilateral abduction of an inferior limb with pelvic stabilization for 10 times.



Figure 3: Bent knee fall out

Supine Arm series: Arm work out in flexion, abduction and rotation with trunk stabilization in supine lying.



Figure 4: Supine Arm series

Quadrupede: Patient tries to Dissociation of one limb with neutral spine in the quadruped position.



Figure 5: Quadrupede

Roll Down series: in seated position patients Spine segmented flexion like ‘rolling back’ with band assistance for 10 times.



Figure 6: Roll down series

Standing leg pump: Patient stand up on single leg with any assistance and Single leg dissociation like hip and knee flexion with trunk stabilization and also both hand support has been done.



Figure 7: Standing leg pump

Assisted Aquats: In standing position patients squats with trunk stabilization and assistance of a band for 10 times.



Figure 8: Assisted Aquats

3.13 Quality control and confirmation

Investigator applied to The Clinical Trials Registry- India (CTRI) for RCT registration to maintain quality control and this trial has been registered as REF/2020/06/034411. The registration number for this trial is CTRI/2020/07/026486.

3.14 Ethical issues

A research proposal will submitted to the local ethical review committee of Bangladesh Health Professions Institute (BHPI) for being approval. The ethical consideration is making sure by an informed consent letter to the participant.

3.15 Informed consent

The investigator used a consent form both in English and Bengali to take the participant's consent and contained the consent of the participant that he/she was participating in the study and giving permission to the investigator to start the data collection sessions.

In order to ensure that the research have some values, the meaning of collected data has to be presented in ways that other research workers can understand. In other words the researcher has to make sense of the results. As the result came from an experiment in this research, data analysis was done with statistical analysis.

Statistical analysis was performed by using descriptive statistics for demographic data and inferential statistics for group differences of Independent function by SCIM score and Balance by Berg Balance score and also flexibility by sit & Reach test through Statistical Package for the Social Science (SPSS) version 20.

Baseline characteristics

The baseline characteristics of the participants showed that mean age (years) in the trial group was 35 and in the control group was 33. The table also describe that there was no statistically significant differences between trial and control group in the baseline characteristics. Gender distribution among the participants showed that 26 (74.03%) participants were male and 09 (25.07%) were female.

Variable(s)	Trial Group	Control Group
Age (mean)	35	33
Gender	Male = 26 (74.03%), Female = 09 (25.07%)	Male = 22 (62.9%), Female = 13 (37.1 %)
Living area	Rural=22 (62.9%), Urban=6 (17.1%)	Rural=12 (34.3%), Urban=14 (40%)
Cause of injury	Fall from height=17 (48.6%)	Fall from height=17 (34.3%)
Neurological Level	T7-T10=6(17.1%), T11- L1= 17(48.6%), L2-L5=12 (34.3%)	T7-T10=16(45.7%), T11- L1= 16(45.7%), L2-L5=3 (8.6%)
Skeletal level	T7-T9=3(8.6%), T10-T12= 4(11.4%), L1-L3=17 (48.6%), L4-L5=11(31.4%)	T7-T9=10(28.6%), T10- T12= 9(25.7%), L1-L3=15 (42.9%), L4-L5=1(2.9%)

Diagnosis	Incomplete B=5 (14.3%), Incomplete C=6(17.1%), Incomplete D=0	Incomplete B=11 (31.4%), Incomplete C=5(14.3%), Incomplete D=1(2.9%)
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Table 2: Baseline Characteristics

Demographic Information's

Among the 70 participants majority of them were male (69%) and female were 31%.

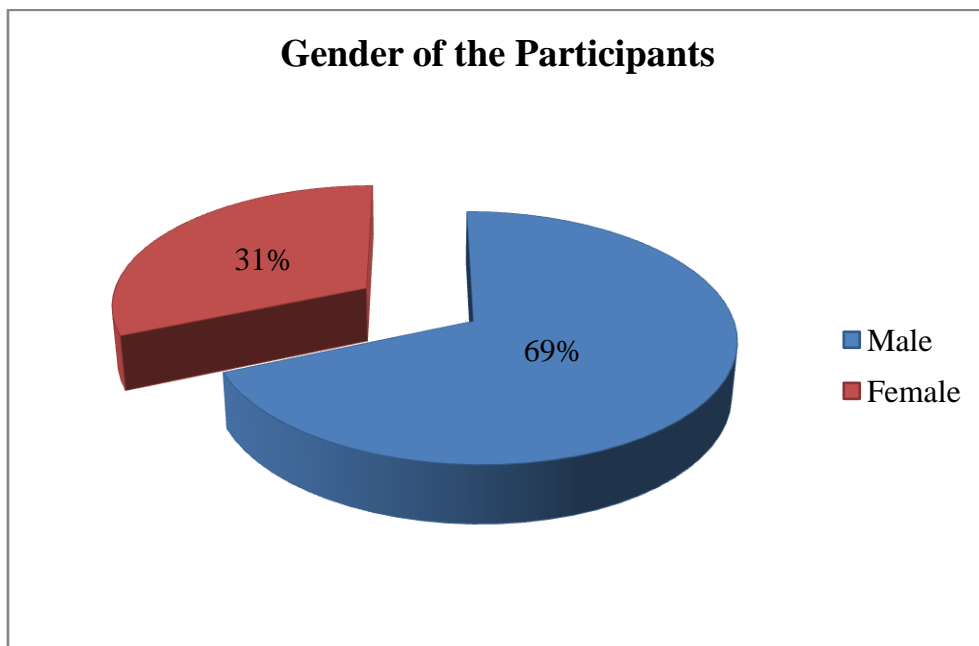


Figure 9: Gender of the Participants

Among the 70 participants majority of them were student (26), Housewife (14) and Farmer (19).

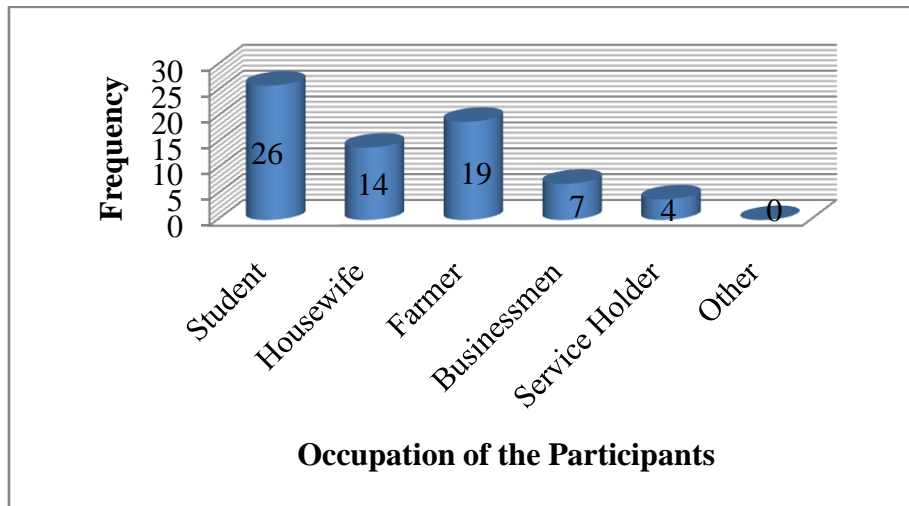


Figure 10: Occupation of the Participants

Among 70 participants most of the injury caused by RTA and fall from height.

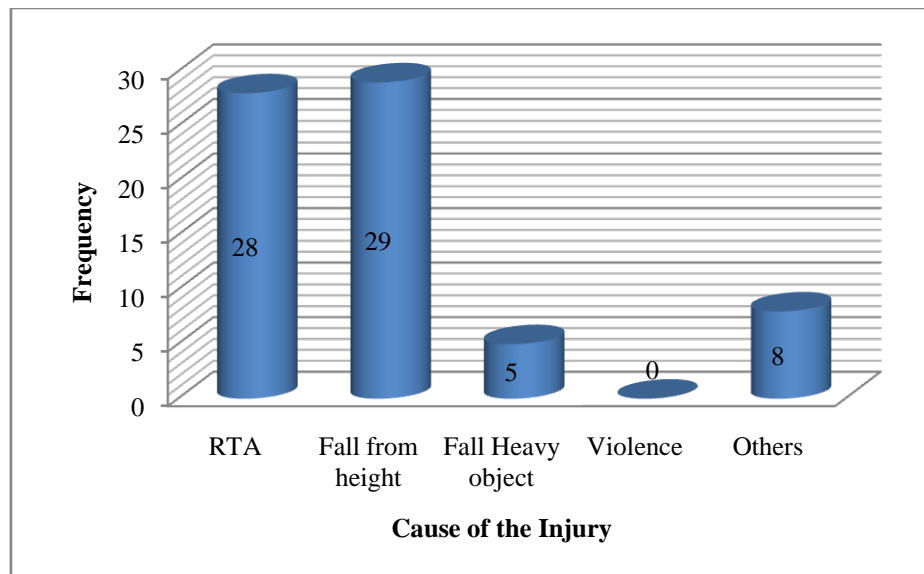


Figure 11: Occupation of the Participants

Among 70 participants, it was found 22 of them in the T7-T10 neurological level, 33 in T11-L1 and 15 of them in the L2-L5 Neurological level.

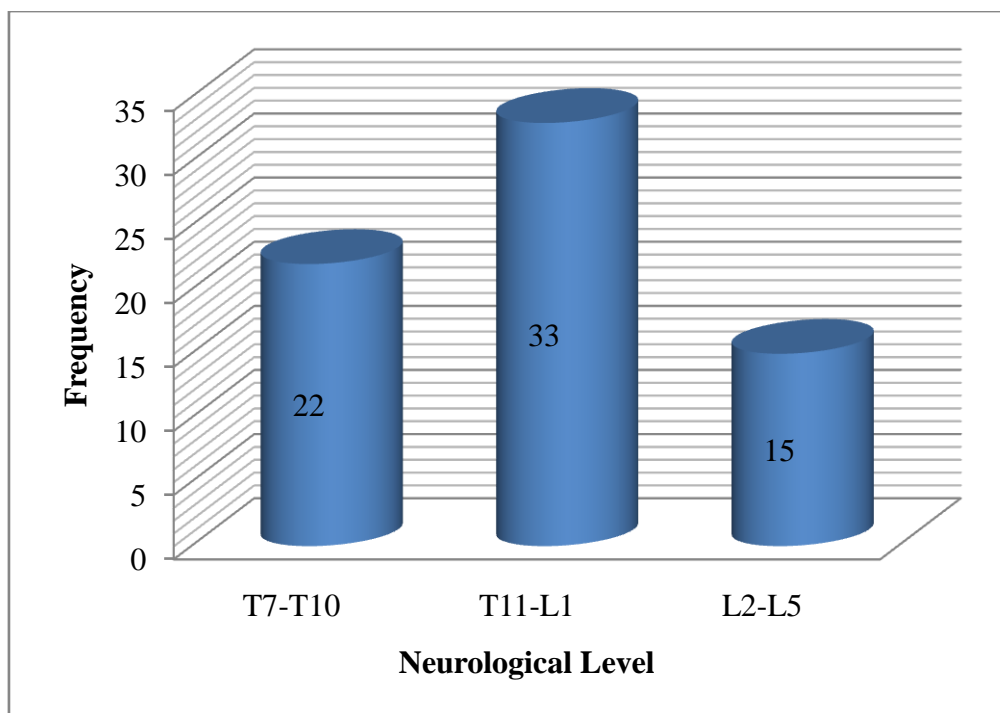


Figure 12: Occupation of the Participants

Inferential statistics

According to Hicks (2009), “Experimental studies with the different participant design where two groups are used and each will be tested in two different conditions and the data is nominal or scale should be analyzed with the unrelated t test.” The between group analysis of independence, balance was analyzed by Mann-Whitney U-test. The within group analysis of was independence, balance by Wilcoxon signed rank test and flexibility was done by Paired and Unpaired t test.

Mann-Whitney U test is a non-parametric test that is simply compares the result obtained from the each group to see if they differ significantly.

The formula of Mann-Whitney U test:

$$U = n_1 n_2 + \frac{n_x(n+1)}{2} - T_x$$

Here,

n_1 = the number of the subjects in trail group

n_2 = the number of the subject in control group.

T_x = the larger rank total.

n_x = the number of the subjects of the group with larger rank total.

Researcher has calculated all the U value and have presented in the following tables in this way (Mann-Whitney U test) for measurement of independence by SCIM scale.

No	Independence(SCIM)between experimental and control group	Observed “U” value	Significance Level	Decision
1	Pre feeding & post feeding	582.500	.558	Retain the null hypothesis
2	Pre & Post Bathing	590.00	.018	Reject the null hypothesis
3	Pre & post dressing	614.500	.366	Retain the null hypothesis
4	Pre & Post grooming	473.00	.009	Reject the null hypothesis
5	Pre & Post respiration	630.00	.317	Retain the null hypothesis
6	Pre & post bladder management	515.000	.071	Reject the null hypothesis (at 10% sig. level, where $\alpha=.1$)
7	Pre & post bowel management	650.000	.940	Retain the null

				hypothesis
8	Pre & Post use of toilet	467.00	.037	Reject the null hypothesis
9	Pre & post bed mobility	596.00	.032	Reject the null hypothesis
10	Pre & post transfer (bed to wheelchair)	423.000	.235	Retain the null hypothesis
11	Pre & post transfer (wheelchair to toilet)	369.000	.047	Reject the null hypothesis
12	Pre & post mobility (indoor)	455.000	.000	Reject the null hypothesis
13	Pre & post mobility on moderate distance	460.000	.000	Reject the null hypothesis
14	Pre & post mobility at outdoor (more than 100 meters)	470.000	.000	Reject the null hypothesis
14	Pre & post stair management	577.50	.547	Retain the null hypothesis
15	Pre & post transfer (wheelchair to car)	402.500	.003	Reject the null hypothesis
16	Pre & post transfer (ground to wheelchair)	542.500	.004	Reject the null hypothesis
17	Pre & post subtotal SCIM score	540.500	.007	Reject the null hypothesis

Table 3: Mann-Whitney U test for measurement of independence by SCIM scale.

This table shows the subdivision of SCIM scale values and the p values where pre & post difference of bathing, grooming, and use of toilet, bed mobility, mobility at indoor, mobility at moderate distance, mobility at outdoor & transferring (wheelchair to toilet, wheelchair to car, ground to wheelchair), value less than 0.05. So these subdivisions test is significant and decided that there may be a difference between experimental and control groups. On the other hand the others subdivisions values

were greater than the p value 0.05 and they retain the null hypothesis. But the overall SCIM score between trial or experimental group and control group between the Pilate’s method exercises and conventional exercise p value is less than 0.05 in case of measurement of independence level. So the test for the independence level is significant and suggested that there is a significant difference between the Pilates exercise and conventional physiotherapy exercises in case of measurement of independence level and the treatment may be applied to improve functional independence on the basis of data which were used.

No	Balance (BBS)between experimental and control group	Observed “U” value	Significance Level	Decision
1	Pre & post BBS rating scale score	638.00	.813	Retain the null hypothesis

Table 4: Mann-Whitney U test for measurement of balance by Berg balance scale.

This table shows the BBS scale values and the p values greater than 0.05. So this test is not significant and decided that there is no difference between two groups and they retain the null hypothesis. So the test for balance level is not significant and concluded that there is no significant difference between the Pilates exercise and conventional physiotherapy exercises in case of measurement of balance. Investigator used 8 weeks of treatment to improve the balance but the results showed non-significant and it seems to be that if the treatment period increased then the results may vary.

No	Flexibility(Sit & reach test)between experimental and control group	Observed “U” value	Significance Level	Decision
1	Pre & post sit & reach test score	706.50	.300	Retain the null hypothesis

Table 5: Mann-Whitney U test for measurement of flexibility by sit & Reach test

This table also shows that the sit & reaches test score values and the p values greater than 0.05. So this test is not significant and decided that there is no difference between two groups and they retain the null hypothesis. So the sit & reach test score between trial or experimental group and control group between the Pilate’s method exercises and conventional exercise p value is greater than 0.05 in case of measurement of flexibility level. So the test for flexibility level is not significant and concluded that there is no significant difference between the Pilates exercise and conventional physiotherapy exercises in case of measurement of flexibility and it may vary if the duration of the treatment increased.

Wilcoxon sign-ranked test: This test is an alternative to the paired t test when the assumption of normality or equality of variances is not met.

Formula of Wilcoxon sign-ranked test:

$$Z = \frac{W_x - \frac{n(n+1)}{4}}{\sqrt{\frac{n(n+1)(2n+1)}{24}}}$$

n= total number of participants

W_x = lowest value among positive and negative rank

No	Independence level (SCIM scale)	Observed “Z” value (within experimental group)	Significance Level (within experimental group)	Observed “Z” value (within control group)	Significance Level (within control group)
1	Pre feeding & post feeding	3.782	.000	4.583	.000
2	Pre & Post Bathing	3.025	.002	4.796	.000
3	Pre & post dressing	4.412	.000	4.583	.000
4	Pre & Post grooming	4.177	.000	5.099	.000
5	Pre & Post respiration	1.382	.180	.000	1.00
6	Pre & post bowel management	3.742	.000	3.606	.000
7	Pre & Post use of toilet	3.871	.000	3.941	.000
8	Pre & post bed mobility	4.291	.000	3.753	.000
9	Pre & post transfer (bed to wheelchair)	3.638	.000	4.600	.000
10	Pre & post transfer (wheelchair to toilet)	4.523	.000	4.707	.000
11	Pre & post mobility (indoor)	4.523	.000	4.983	.000
12	Pre & post mobility on moderate distance	4.426	.000	5.246	.000
13	Pre & post mobility at outdoor (more than 100 meters)	4.291	.000	5.072	.000

14	Pre & post stair management	.447	.655	1.000	.317
15	Pre & post transfer (wheelchair to car)	5.099	.000	4.707	.000
16	Pre & post transfer (ground to wheelchair)	5.209	.000	4.899	.000
17	Pre & post subtotal SCIM score	5.027	.000	5.165	.000

Table 6: Wilcoxon Signed rank test within experimental & contro group for independence

The Wilcoxon test provides a *z* score (5.027) and a *p* value (.000) for subtotal SCIM score which measures the independence level within the experimental or trial (Pilate's method exercises) group. And also this result shows that *Z* score (5.165) and a *p* value (.000) for subtotal SCIM score which measures the independence level within the control group. So this result suggested that there is a significant difference between before and after independence levels at significant level 5% on experimental and also at control groups. So the study concluded that the Pilates method exercises were effective to measure independency and as well as the conventional physiotherapy exercises has a positive significant effect in case of independence level of paraplegic SCI patients at rehabilitation. But when we compare between groups, we can expect better result from the experimental group as because of treatment protocol.

Researcher has calculated all the Z value and have presented in the following tables in this way (Wilcoxon Signed rank test) within experimental & control group.

No	Balance (BBS) rating scale	Observed “Z” value (within experimental group)	Significance Level (within experimental group)	Observed “Z” value (within control group)	Significance Level (within control group)
1	Pre & post BBS rating scale score	5.173	.000	5.174	.000

Table 7: Wilcoxon Signed rank test within experimental & control group for balance

The Wilcoxon test provides a z score (5.173) and a *p* value (.000) for BBS scale which measures the balance level within the experimental or trial (Pilates method exercises) group. And also this result shows that Z score (5.174) and a *p* value (.000) for BBS scale score which measures the balance level within the control group. So this result indicated that there is a significant difference between before and after balance levels at significant level 5% on experimental and also at control groups. So researcher concluded that the Pilates meted exercises were effective to measure balance ability and as well as the conventional physiotherapy exercises have a positive significant effect in case of balance level of paraplegic SCI patients at rehabilitation. But when we compare between groups, we can expect better result from the experimental group as because of treatment protocol.

Researcher has calculated all the Z value and have presented in the following tables in this way (Wilcoxon Signed rank test) within experimental & control group.

No	Flexibility (Sit & reach test)	Observed “Z” value (within experimental group)	Significance Level (within experimental group)	Observed “Z” value (within control group)	Significance Level (within control group)
1	Pre & post sit & reach test rating score	5.241	.000	5.207	.000

Table 8: Wilcoxon Signed rank test) within experimental & control group for flexibility

The Wilcoxon test provides a z score (5.241) and a *p* value (.000) for Pre & post sit & reach test rating score which measures the flexibility within the experimental or trial (Pilates method exercises) group. And also this result shows that Z score (5.207) and a *p* value (.000) for sit & reach test rating score which measures the flexibility within the group. So this result indicated that there is a significant difference within experimental and also control groups at before and after treatment of flexibility levels at significant level 5%. So researcher concluded that the Pilates method exercises were effective to measure the flexibility ability and as well as the conventional physiotherapy exercises has a positive significant effect in case of flexibility level of paraplegic SCI patients at rehabilitation. On the basis of data which are used this result found and it may be applied to improve the flexibility level.

The paired sample t-test: It is used to compare difference means of paired samples.

Formula of related/ paired t- test:

$$t = \frac{\bar{d}}{SE(\bar{d})} = \frac{\bar{d}}{\frac{SD}{\sqrt{n}}}$$

Here,

\bar{d} = mean of difference (d) between paired values,

SE (\bar{d})= SE of mean difference,

SD= standard deviation of difference d, and

n= number of values in each pair.

Table 7: Researcher has calculated all the t value and have presented in the following tables in this way (Paired t test)

Variables	Paired 't' value	df	Significant level
Sit & Reach test	17.512	69	.000

Table 9: Paired t test to measure flexibility

This study found that the paired t test provides observed t value = (17.512) with p value=0.000 a 5% level of significance. The observe t value was less than p value at 5% significant level that means the null hypothesis is rejected and alternative hypothesis is accepted of significance. Hence the study has a very strong evidence to conclude that the difference in before and after values is considered statistically significant. Therefore the test is highly significant at any reasonable level which means there is a difference in within group of Pilate's exercises training for flexibility of paraplegic SCI patients and conventional Physiotherapy. So the study was concluded that the difference in within groups for before-after values is considered statistically not significant in case of flexibility which measured by sit and reach test. On the basis of data which are used this result found and it may be applied to improve the flexibility level.

Unpaired t-test or student t test

Unpaired t-test was used to compare difference between two means of independent variables.

Formula:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Here,

\bar{x}_1 = Mean of the Experimental Group,

\bar{x}_2 = Mean of the Control Group,

n_1 = Number of participants in the Experimental Group,

n_2 = Number of participants in the Control Group

S = Combined standard deviation of both groups.

Variable	Difference between experimental group (before & after)	Unpaired 't' value	df	Significant level	Difference between control group (before & after)	Unpaired 't' value	df	Significant level
Sit & Reach test	Equal Variances assumed	.634	68	.528	Equal Variances assumed	.638	68	.526
	Equal Variances not assumed	.634	66.638	.528	Equal Variances not assumed	.638	65.122	.526

Table 10: Unpaired t test between groups for measurement of flexibility

This study notes that it has not violated the homogeneity assumption of variables. The observed t value (t=.634) has a p value of .528 as 5% level of significance at experimental group after the Pilates exercise provided. The observe t value was more

than the p value at 5 % significant level with degrees of freedom 68. Therefore the test is not significant at 5% level of significance. Hence the study concluded that there is no significant difference in the efficacy or the effect of the Pilates exercise in case of flexibility for paraplegic SCI patients during rehabilitation. That means the null hypothesis is retained and alternative hypothesis is rejected which means there is no difference between Pilates exercises training for flexibility of paraplegic SCI patients and conventional Physiotherapy. In case of control group the t value was .638 and the p value was .526 which was more than 0.05. The observed t value was more than the p value at 5% significant level that means the null hypothesis is retained and alternative hypothesis is rejected which means there is no difference in conventional physiotherapy exercises during rehabilitation for flexibility of paraplegic SCI patients. So the study was concluded that the difference in before-after values in between groups is considered statistically not significant in case of flexibility which measured by sit and reach test. This study found that for flexibility measured by sit & reach test the observed t value ($t=0.634$) has a p value of 0.528 as 5% level of significance at experimental group after the Pilates exercise provided. Standard table value was 1.67 for this degree which is greater than observed value. The table value was greater than the observed value that means the null hypothesis is rejected and alternative hypothesis is accepted which means there is a difference between before and after treatment of experimental group. So the study was concluded that the difference in before-after treatment of Pilates exercise values in is considered statistically significant in case of flexibility which measured by sit and reach test. This study also found that for flexibility measured by sit & reach test the observed t value ($t=0.638$) has a p value of 0.526 as 5% level of significance at control group after the conventional physiotherapy. Standard table value was 1.67 for this degree which is greater than observed value. The table value was greater than the observed value that means the null hypothesis is rejected and alternative hypothesis is accepted which means there is a difference between before and after treatment of control group. So the study was concluded that the difference in before-after treatment of conventional physiotherapy values is considered statistically significant in case of flexibility which measured by sit and reach test. Investigator used 8 weeks of treatment to improve the flexibility but the results showed non-significant and it seems to be that if the treatment period increased then the results may vary.

The purpose of this study was to determine the effect of Pilates exercises in patients with paraplegia spinal cord injury. Total 70 participants were taken in this study. In this experimental study 70 paraplegic participants with SCI were randomly assigned with hospital based randomization. Among these 70 participants, they were divided into two groups. One was experimental group and other was control group. This group attended in the SCI indoor department of physiotherapy, CRP, Savar from which this study aimed to determine the effect of Pilate's exercises for paraplegic SCI patients. The outcome was measured by using structured questionnaire. In this study, SCIM were used to measure the independence level, BBS for balance and sit & reach test for flexibility. Age, gender, marital status and occupational status, living area, educational status, neurological level, skeletal level was taking into consideration as demographic variables.

The present study found almost similar characteristics on baseline in age, gender, living area, neurologic level and skeletal level. The study found some similarities on demographic and clinical characteristics in gender, occupation, residence, skeletal and neurological level between both groups of the participants in pretest. De Boer et al. (2015) stated that, successful randomization may be done when there is a similarity on baseline characteristics. 70 paraplegic spinal cord injury patients were included as sample of the study, among them 26 (74.03%) were male and about 09 (25.07%) were female for Trial group and 22 (62.9%) were male, 13 (37.1 %) were female for control group. Anderson et al. (2009) found that male were 63% and female were 37% among 231 participants following SCI. So, it seems that male participants are more permeable than female participants in spinal cord injury. Male genders were found to be more prone to have SCI than female (National Spinal Cord Injury Statistical Center, 2016). The reason may majority of women are remain in home in Bangladesh and are not subjected to violent form of work to which men are more exposed. Out of the participant mean age were 35 for trial group and 33 was for control group. Similarly Bombardier et al. (2008) also found age range from (25-35 years) in their study. Both results claim that active younger are more vulnerable with the incidence of spinal cord injury. In this study out of 70 participants, farmer,

students and businessman such as shopper, hawker, and housewife etc occupation rate were higher due to traumatic spinal cord injury. Tzanos et al. (2016) stated that in Greece, the Spinal cord injury is mostly occurred who were found poorly engaged with occupation and the same picture had emerged from the present study in case of occupation. In this study, 75% participants' average monthly income was ≥ 10000 in both groups. It manifested that most of spinal cord injured patient came from middle or lower income family. It is nearly similar with Singh et al. (2003) within 483 participant's 217 participants' family income less than Rs.5000 per month. This type of population are less concern with safety measure and more vulnerable to injury.

In this study participants who lived in rural area were more affected than the people who lived in urban area. Among these approximately 62.9% (n=22) were in rural and 17.1% (n=6) were in urban area. The people of rural area are mostly poor and they are engage in risky work that may causing SCI. Majority of the participants lived in rural area also seen in a study conducted in India (Singh et al., 2003). In Bangladesh, more than 80% people lives in the village and about 60% of the total labor forces are involved in agriculture (Jahan, 2008).The people of rural area are mostly poor and they are engage in risky work that may cause SCI.

After completion of discussion on socio-demographic aspects, focus should be given on spinal cord injury related information. It may include- the causes of injury, the types of injury according to ASIA impairment scale, the length of injury from the date of occurrence, the neurological level, skeletal level, total SCIM score and total BBS score of the spinal cord injury participants. Etiology of spinal cord injury varies from region to region. According to this study, it was also found that fall from height was the highest cause of injury, secondly due to fall while carrying heavy load and then due to RTA. 48.6% (n=17) were injured by fall from height, Study conduct in Iran, Chabok, et al (2009) RTA 52% & fall 45.4%. But in India Singh et al, 2003, p.185 fall was 47% & RTA 34.78%.

Bye et al. (2016) on their study of spinal cord injury which had covered the overall population that were recent complete or incomplete spinal cord injury participants. But in this study, only the participants of a particular region were included and here the paraplegic spinal cord injury participants were included only. So, in this study, the percentages of types of injury were found- T7-T10=6(17.1%), T11-L1= 17(48.6%),

L2-L5=12 (34.3%) for experimental group and T7-T10=16(45.7%), T11-L1=16(45.7%), L2-L5=3 (8.6%) for control group. In case of skeletal level of spinal cord injury participants, the recent study had demonstrated that the most common site for injury was in the T11-L1 level and it was 17(48.6%) for trial group, In spite of having similarities, there were some differences too. In this study, among 70 participants, it had been showed that T11-L1 level was predominant whereas in the previous research they had not included any specific area of spinal cord (Rathore et al., 2008).

Another study of Bye et al. (2016) stated that strength training increases strength in partially paralyzed muscles of people with recent SCI in which there were also 70 participants involved who received 10 repetitions of Pilates training for 8 weeks. Repeated strengthening training of muscles with neurologically-induced weakness might not generate a large enough stimulus. Contraction of a small group of the muscle mass may not induce sufficient stimulation to stir up hypertrophy (Wernbom et al., 2007).

In this study, subdivision of SCIM scale values and the p values where pre & post bathing, grooming, and use of toilet, bed mobility, mobility at indoor, mobility at moderate distance, mobility at outdoor & transferring (wheelchair to toilet, wheelchair to car, ground to wheelchair) value less than 0.05. Pilate's method exercises and conventional exercise p value is less than 0.05 in case of measurement of functional independence level. So the test for the independence level is significant and concluded that there is a significant difference between the Pilates exercise with conventional physiotherapy exercises in case of measurement of independence level. One study showed that the SCIM scale was used for the functional changes in spinal cord lesion patients. Including this exercise with multidisciplinary team also played a vital role for measuring daily performance for SCI patients (Catz, et al., 1997).

On the other hand Berg Balance scale values and the p values greater than 0.05. So this test is not significant and decided that there is no significant difference between two groups and they retain the null hypothesis. So the BBS score between trial or experimental group and control group between the Pilate's method exercises and conventional exercise p value is greater than 0.05 in case of measurement of balance level. Another study reported that the BBS score was not also associated with the SCI

patients balance activity like it was not associated with the number of falls due to balance (Wirz, Muller & Bastiaenen, 2010).

In case of sit & reaches test score values and the p values greater than 0.05. So this test is also not significant and decided that there is no difference between two groups and they retain the null hypothesis and reject the alternative hypothesis. So the sit & reach test score between trial or experimental group and control group between the Pilate's method exercises and conventional exercise p value is greater than 0.05 in case of measurement of flexibility level.

The Wilcoxon test provides a z score (5.107) and a p value (0.000) for subtotal SCIM score which measures the independence level within the experimental or trial (Pilate's method exercises) group. And also this result shows that Z score (5.165) and a p value (.000) for subtotal SCIM score which measures the independence level within the control (Pilate's method exercises) group. This shows that there is a significant difference within the experimental and control groups for before and after treatment of independence levels at significant level 5%. So the study concluded that the Pilates method exercises were effective to measure independency as well as the conventional physiotherapy treatment was also a positive effect at before and after treatment in within group. One study also focused that that the SCIM II specially represented the functionally changes especially motor changes after first year of rehabilitation (Wirth et al 2008).

For Berg Balance scale the Wilcoxon test provides a z score (5.173) and a p value (.000). And also this result shows that Z score (5.174) and a p value (.000) for BBS scale score which measures the balance level within the control group. So this result indicated that there is a significant difference between before and after balance levels at significant level 5% on experimental and also at control groups. So researcher concluded that the Pilates method exercises were effective to measure balance ability and as well as the conventional physiotherapy exercises have a positive significant effect in case of balance level of paraplegic SCI patients at rehabilitation. So this test is statistically significant for that case and decided that there is a difference within experimental and control two groups and they reject the null hypothesis and accept the alternative hypothesis. On the other side another scholarly article recommended that BBS scale was effective to measure balance for sometimes than other scale in case of incomplete SCI patients. But the study also reported that further more studies

are needed to strong prove of evaluation of balance for SCI patients for strong reliability and validity (Lemay, & Nadeau, 2010). Another scholarly study stated that to use of one measurement scale for the balance measurement was not provided appropriate result or criteria in case of SCI patients and also it was not appropriate to get positive results for SCI patients in case of Pilate's exercises or other strengthening exercises (Arora, Oates, Lynd, & Musselman, 2020).

The Wilcoxon test provides a z score (5.241) and a *p* value (.000) for Pre & post sit & reach test rating score which measures the flexibility within the experimental or trial (Pilates method exercises) group. And also this result shows that Z score (5.207) and a *p* value (.000) for sit & reach test rating score which measures the flexibility within the group. So this result indicated that there is a significant difference within group at before and after treatment for flexibility levels at significant level 5% on experimental and also at control groups. So the study concluded that the Pilates method exercises were effective to measure the flexibility ability and as well as the conventional physiotherapy exercises has a positive significant effect in case of flexibility level of paraplegic SCI patients at rehabilitation. The other study also reported that in case of SCI patient's task oriented or task related activities played a negative effect or result to improve sitting, standing balance as well as flexibility which was measured by sit and reach test. But those studies also focused that it was sometimes possibility to get positive results in case of flexibility in chronic stages. On the other hand a few studies also said that in case of balance there were some positive effects on exercises to improve sitting and standing balance and also in flexibility level (Tse, Chisholm, Lam, Eng, & SCIRE Research Team 2018).

The paired t test provides t value = (17.512) with p value=0.000. Therefore the test is highly significant at any reasonable level of significant. So the study have very strong evidence to conclude that the difference in before-after values is considered statistically significant in case of flexibility which measured by sit and reach test.

The observed t value ($t=.634$) has a p value of .528 as 5% level of significance at experimental group after the Pilates exercise provided. The observe t value was more than the p value at 5 % significant level with degrees of freedom 68. Therefore the test is not significant at 5% level of significance. Hence the study concluded that there

is no significant difference in the efficacy or the effect of the Pilates exercise in case of flexibility for paraplegic SCI patients during rehabilitation. Which means the null hypothesis is retained and alternative hypothesis is rejected so there is no difference between Pilate's exercises training for flexibility of paraplegic SCI patients and conventional Physiotherapy. In case of control group the t value was .638 and the p value was .526 which was more than 0.05. The observe t value was more than the p value at 5% significant level that means the null hypothesis is retained and alternative hypothesis is rejected which means there is no difference in conventional physiotherapy exercises during rehabilitation for flexibility of paraplegic SCI patients. So the study was concluded that the difference in before-after values in between groups is considered statistically not significant in case of flexibility which measured by sit and reach test.

This study found that for flexibility measured by sit & reach test the observed t value ($t=0.634$) has a p value of 0.528 as 5% level of significance at experimental group after the Pilates exercise provided. Standard table value was 1.67 for this degree which is greater than observed value. The table value was greater than the observed value that means the null hypothesis is rejected and alternative hypothesis is accepted which means there is a difference between before and after treatment of experimental group. So the study was concluded that the difference in before-after treatment of Pilates exercise values in is considered statistically significant in case of flexibility which measured by sit and reach test.

Different studies showed that fall down was a common problem among ambulatory SCI patients due to weakness and flexibility which was not only occurs due to intrinsic cause but also occurs due to extrinsic reason. The main and major cause of fall was associated with the independence level, muscular strength, stability as well as physical fitness and flexibility. That was measured by different scales like functional reach test, SCIM scale, Sit & reaches test, BBS scale etc. Patients get more benefit if his or her flexibility level as well as balance, muscular strength were more than before after the rehabilitation. Exercise played a positive role to improve flexibility in case of SCI patient's especially incomplete paraplegic patients to improve their overall function balance and reduction of fall down problems. But the study also said that further study also needed to more strong prove in case of sit and reach test also (Srisim, Saengsuwan, & Amatachaya, 2015).

There were some situational limitations and barriers while considering the results of the study in different aspects. Those are as follows:

- The investigator only questioned a limited number of subjects (70 in total) that was difficult to generalize the result.
- This study was only conducted among incomplete paraplegia SCI patient at CRP. So the data cannot be generalized to the practice of documentation by all physiotherapists in Bangladesh. It will be more effective if we used it experiment on other category patients of SCI and compare.
- It is only the research ever in this Pilates exercise in Bangladesh, so local resources about documentation were not available for comparison.
- Time and resources were limited that have a great deal of impact of the study.

7.1 Conclusion

Spinal Cord injury is known as an illness or a injury which causes paralysis that results in the partial or total loss of use of all four limbs. The current study was experimental randomized control trial which two group which containing experimental and control group. Pre-test and post-test design was used in this study to examine the effectiveness of Pilate's exercises with conventional physiotherapy exercises for paraplegic SCI patients during rehabilitation. This study found statistically significant difference between experimental and control groups in case of measurement of independence level which measured by SCIM scale score. But the study also found the positive significant in within group analysis for both experimental and control group at before and after treatment of Pilates exercise and conventional physiotherapy. In case of balance ability this study was found no significant difference in between group analysis. On the flexibility measurement issues this study was found that no positive effect on between two groups at statistically. But the study also found that the statistically positive significant difference in within group analysis at before and after physiotherapy treatment of both groups. In case of paraplegic spinal cord injury patients, it is very important to increase core muscle strength as well as balance and flexibility for functional independence measurement and improvement. It has a positive impact on patient activity of daily living and functional level. The study concluded as the Pilates exercise with conventional physiotherapy exercises was effective than only conventional physiotherapy only for patients with incomplete paraplegic spinal cord injury but the study also concluded that there was also a positive effect on both group in within group analysis at before & after Pilates exercise with conventional physiotherapy as well as only conventional physiotherapy. The study also concluded that there was no statistically positive effect on balance and flexibility level at between group analyses. Finally concluded that it has less significantly capable of producing beneficial effects within this 8 weeks period on the improvement of their balance, flexibility and overall functional independency level. On the basis of data which are used this result found and it may be applied to improve the conditions. Here

used 8 weeks of treatment to improve the condition but the results showed non-significant and it seems to be that if the treatment period increased then the results may vary.

A double blinded randomized clinical trial is recommended in future with large sample size. Since Pilates exercises has been provided by physiotherapist in limiting manner without any protocol with the combination of core muscle exercises. The outcomes of the study would help physiotherapists at outside the study setting to formulate a management guideline to treat patients with SCI paraplegic patients during rehabilitation as well as the indoor settings of the study. But in case of Bangladesh it's too difficult to maintain and continue physiotherapy treatment in all stages. Government and non government body needs to develop their strategy. More evidence needs to develop in this area which may help physiotherapists to improve their skill about this evidence and as well as patient get more benefit. More evidence needs to be developed in this area to clear conception about it and its importance on rehabilitation of this condition.

7.2 Recommendations

The researcher proposed the various recommendations to certain authorities and personnel. Government need to plan awareness program in different area of our country for preventing the SCI and its complications with the risk. Specialized those were involved in the management and treatment team should refer to Physiotherapists for improvement for the client's conditions. CRP providing massive services to the SCI patients and need to create more post for Physiotherapy to provide collaborative services. Continued and regular study in this area should play an essential part in improving quality of life of the SCI patient. Recommendation for other researcher for further research in this field to increasing the number of sample.

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ANNEXURE 1: IRB from BHPI



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

Ref:

Date:

CRP/BHPI/IRB/02/2020/1387

16/02/2020

To
Fabiha Alam
Session: 2018-2019, Student ID: 111180059
BHPI, CRP, Savar, Dhaka- 1343, Bangladesh

Subject: Approval of thesis proposal "Pilate's method for paraplegic spinal cord injury patients during rehabilitation" by ethics committee.

Dear Fabiha Alam,

Congratulations.

The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above-mentioned dissertation, with yourself, as the Principal investigator. The following documents have been reviewed and approved:

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

Since the study involves questionnaire that takes maximum 30 minutes and have no likelihood of any harm to the participants, the members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 09:00 AM on September 28, 2019 at BHPI.

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring in the course of the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation. However, the members of ethics committee have approved the study to be conducted in the presented form at the meeting held at 9.00 AM on September 28, 2019 at BHPI.

Best regards,

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

ANNEXURE 2: Data Collection Permission

Date: October 14, 2019

To

The head of the Physiotherapy Department

Centre for the Rehabilitation of the Paralysed (CRP)

Savar, Dhaka-1343

Subject: Application for permission to collect data for conduct a research study.

Sir,

With due respect I would like to state that I am Fabiha Alam student of M. Sc in Physiotherapy (Part-II), BHPI. I am going to collect data related to the aforesaid subject entitled "**Pilates method for paraplegic spinal cord injury patients during rehabilitation**" from October 2019 to December 2019. For this reason I need proper permission for collecting data from SCI unit of physiotherapy department, CRP at Savar, Dhaka.

Therefore, I pray and hope that you would be kind enough to permit me to collect data from physiotherapy department for my research purpose.

Yours Faithfully



Fabiha Alam

M.SC in Physiotherapy (Part-II) students

Roll-02, Reg no: 2512

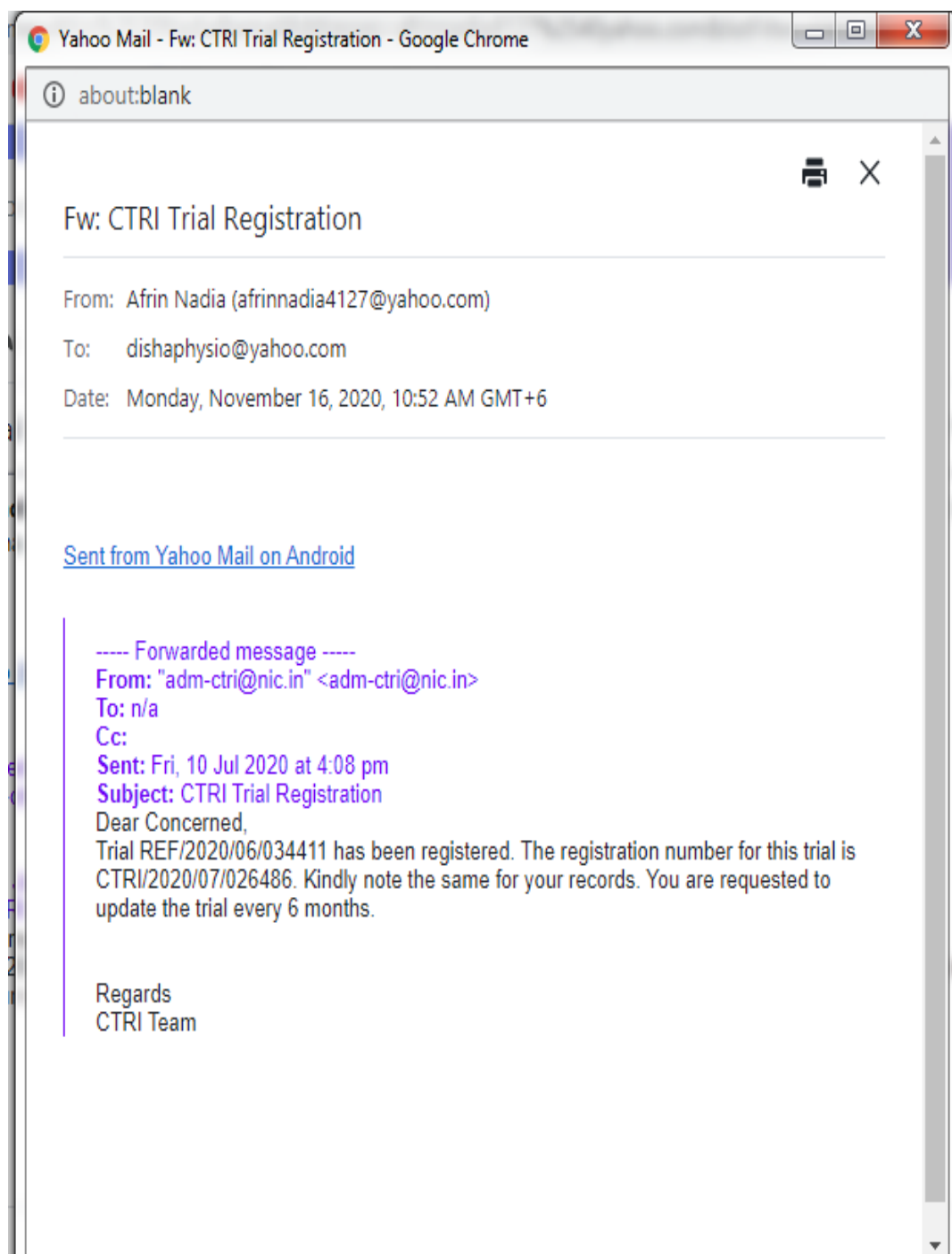
CRP, Savar, Dhaka-1343

Recommended
K. J. Hossain
Oct. 14, 2019

Approved
Please contact with Md. Mozaffar
Hossain, Incharge of SCI unit as
representative of data collection
process.


19/10/19
Mohammad Anwar Hossain
Associate Professor & Head
Physiotherapy Dept., CRP
CRP-Chapain, Savar, Dhaka-1

ANNEXURE 3: CTRI Trial Registration



ANNEXURE 4 (A): Questionnaire (English)

(Please fill the questionnaire with a black ball point and give tick and fill up the blank part of each question which is best suited to answer)

Part I: Personal information

ID: _____ Date: _____ Mobile No: _____
 Name: _____ Address: _____

Part II: Socio Demographic information:

Question Number	Questions/ Information on	Coding Category
1	Ageyears
	Education
2	Occupation
3	Living area

Part III: Medical Information:

Question Number	Questions/ Information on	Coding Category
1	Causes of injury	
	Neurological level (N/L)	
2	Skeletal level (S/L)	
3	Type of paralysis	
4	Diagnosis (according to medical note)	
5	Others	

Part IV: SCIM-Spinal Cord Independence Measure

Self care	Pretest	Post Test
<p>1. Feeding (cutting, opening containers, pouring, bringing food to mouth, holding cup with fluid)</p> <p>0. Needs parenteral, gastrostomy, or fully assisted oral feeding</p> <p>1. Needs partial assistance for eating and/or drinking, or for wearing adaptive devices</p> <p>2. Eats independently; needs adaptive devices or assistance only for cutting food and/or pouring and/or opening containers</p> <p>3. Eats and drinks independently; does not require assistance or adaptive devices</p>		
<p>2. Bathing (soaping, washing, drying body and head, manipulating water tap). A-upper body; B-lower body</p> <p>A. 0. Requires total assistance</p> <p>1. Requires partial assistance</p> <p>2. Washes independently with adaptive devices or in a specific setting (e.g., bars, chair)</p> <p>3. Washes independently; does not require adaptive devices or specific setting (not customary for healthy people) (adss)</p>		
<p>B. 0. Requires total assistance</p> <p>1. Requires partial assistance</p> <p>2. Washes independently with adaptive devices or in a specific setting (adss)</p> <p>3. Washes independently; does not require adaptive devices (adss) or specific setting</p>		
<p>3. Dressing (clothes, shoes, permanent orthoses: dressing, wearing, undressing). A-upper body; B-lower body</p> <p>A. 0. Requires total assistance</p> <p>1. Requires partial assistance with clothes without buttons, zippers or laces</p> <p>2. Independent with cwobzl; requires adaptive devices and/or specific settings</p> <p>3. Independent with cwobzl; does not require adss; needs assistance or adss only for bzl</p> <p>4. Dresses (any cloth) independently; does not require adaptive devices or specific setting</p>		

<p>B. 0. Requires total assistance</p> <p>1. Requires partial assistance with clothes without buttons, zippers or laces</p> <p>2. Independent with cwobzl; requires adaptive devices and/or specific settings (adss)</p> <p>3. Independent with cwobzl without adss; needs assistance or adss only for bzl</p> <p>4. Dresses (any cloth) independently; does not require adaptive devices or specific setting</p>		
<p>4. Grooming (washing hands and face, brushing teeth, combing hair, shaving, applying makeup)</p> <p>0. Requires total assistance</p> <p>1. Requires partial assistance</p> <p>2. Grooms independently with adaptive devices</p> <p>3. Grooms independently without adaptive devices</p>		
<p>SUBTOTAL (0-20)</p>		
<p>Respiration and Sphincter Management</p> <p>5. Respiration</p> <p>0. Requires tracheal tube (TT) and permanent or intermittent assisted ventilation (IAV)</p> <p>2. Breathes independently with TT; requires oxygen, much assistance in coughing or TT management</p> <p>4. Breathes independently with TT; requires little assistance in coughing or TT management</p> <p>6. Breathes independently without TT; requires oxygen, much assistance in coughing, a mask (e.g., peep) or IAV (bipap)</p> <p>8. Breathes independently without TT; requires little assistance or stimulation for coughing</p> <p>10. Breathes independently without assistance or device</p>		
<p>6. Sphincter Management - Bladder</p> <p>0. Indwelling catheter</p> <p>3. Residual urine volume (RUV) > 100cc; no regular catheterization or assisted intermittent catheterization</p> <p>6. RUV < 100cc or intermittent self-catheterization; needs assistance for applying drainage instrument</p> <p>9. Intermittent self-catheterization; uses external drainage instrument; does not need assistance for applying</p> <p>11. Intermittent self-catheterization; continent between catheterizations; does not use external drainage instrument</p> <p>13. RUV <100cc; needs only external urine drainage; no assistance is required for drainage</p> <p>15. RUV <100cc; continent; does not use external drainage instrument</p>		

<p>7. Sphincter Management - Bowel</p> <p>0. Irregular timing or very low frequency (less than once in 3 days) of bowel movements</p> <p>5. Regular timing, but requires assistance (e.g., for applying suppository); rare accidents (less than twice a month)</p> <p>8. Regular bowel movements, without assistance; rare accidents (less than twice a month)</p> <p>10. Regular bowel movements, without assistance; no accidents</p>		
<p>8. Use of Toilet (perineal hygiene, adjustment of clothes before/after, use of napkins or diapers).</p> <p>0. Requires total assistance</p> <p>1. Requires partial assistance; does not clean self</p> <p>2. Requires partial assistance; cleans self independently</p> <p>4. Uses toilet independently in all tasks but needs adaptive devices or special setting (e.g., bars)</p> <p>5. Uses toilet independently; does not require adaptive devices or special setting)</p>		
<p>SUBTOTAL (0-40)</p>		
<p>Mobility (room and toilet)</p> <p>Mobility in Bed and Action to Prevent Pressure Sores</p>		
<p>9. Mobility in Bed and Action to Prevent Pressure Sores</p> <p>0. Needs assistance in all activities: turning upper body in bed, turning lower body in bed, sitting up in bed, doing push-ups in wheelchair, with or without adaptive devices, but not with electric aids</p> <p>2. Performs one of the activities without assistance</p> <p>4. Performs two or three of the activities without assistance</p> <p>6. Performs all the bed mobility and pressure release activities independently</p>		
<p>10. Transfers: bed-wheelchair (locking wheelchair, lifting footrests, removing and adjusting arm rests, transferring, lifting feet).</p> <p>0. Requires total assistance</p> <p>1. Needs partial assistance and/or supervision, and/or adaptive devices (e.g., sliding board)</p> <p>2. Independent (or does not require wheelchair)</p>		

<p>11. Transfers: wheelchair-toilet-tub (if uses toilet wheelchair: transfers to and from; if uses regular wheelchair: locking wheelchair, lifting footrests, removing and adjusting armrests, transferring, lifting feet)</p> <p>0. Requires total assistance</p> <p>1. Needs partial assistance and/or supervision, and/or adaptive devices (e.g., grab-bars)</p> <p>2. Independent (or does not require wheelchair)</p>		
<p>Mobility (indoors and outdoors, on even surface)</p> <p>12. Mobility Indoors</p> <p>0. Requires total assistance</p> <p>1. Needs electric wheelchair or partial assistance to operate manual wheelchair</p> <p>2. Moves independently in manual wheelchair</p> <p>3. Requires supervision while walking (with or without devices)</p> <p>4. Walks with a walking frame or crutches (swing)</p> <p>5. Walks with crutches or two canes (reciprocal walking)</p> <p>6. Walks with one cane</p> <p>7. Needs leg orthosis only</p> <p>8. Walks without walking aids</p>		
<p>13. Mobility for Moderate Distances (10-100 meters)</p> <p>0. Requires total assistance</p> <p>1. Needs electric wheelchair or partial assistance to operate manual wheelchair</p> <p>2. Moves independently in manual wheelchair</p> <p>3. Requires supervision while walking (with or without devices)</p> <p>4. Walks with a walking frame or crutches (swing)</p> <p>5. Walks with crutches or two canes (reciprocal walking)</p> <p>6. Walks with one cane</p> <p>7. Needs leg orthosis only</p> <p>8. Walks without walking aids</p>		
<p>14. Mobility Outdoors (more than 100 meters)</p> <p>0. Requires total assistance</p> <p>1. Needs electric wheelchair or partial assistance to operate manual wheelchair</p> <p>2. Moves independently in manual wheelchair</p> <p>3. Requires supervision while walking (with or without devices)</p> <p>4. Walks with a walking frame or crutches (swing)</p> <p>5. Walks with crutches or two canes (reciprocal waking)</p> <p>6. Walks with one cane</p> <p>7. Needs leg orthosis only</p> <p>8. Walks without walking aids</p>		

<p>15. Stair Management</p> <p>0. Unable to ascend or descend stairs</p> <p>1. Ascends and descends at least 3 steps with support or supervision of another person</p> <p>2. Ascends and descends at least 3 steps with support of handrail and/or crutch or cane</p> <p>3. Ascends and descends at least 3 steps without any support or supervision</p>		
<p>16. Transfers: wheelchair-car (approaching car, locking wheelchair, removing arm and footrests, transferring to and from car, bringing wheelchair into and out of car)</p> <p>0. Requires total assistance</p> <p>1. Needs partial assistance and/or supervision and/or adaptive devices</p> <p>2. Transfers independent; does not require adaptive devices (or does not require wheelchair)</p>		
<p>17. Transfers: ground-wheelchair</p> <p>0. Requires assistance</p> <p>1. Transfers independent with or without adaptive devices (or does not require wheelchair)</p>		
<p>SUBTOTAL (0-40)</p>		
<p>Total SCIM Score (0-100)</p>		

Part V: Berg Balance Tests and Rating Scale

1. Sitting to Standing

Instructions: Please stand up. Try not to use your hands for support.

- () able to stand without using hands and stabilize independently
- () able to stand independently using hands
- () able to stand using hands after several tries
- () needs minimal aid to stand or to stabilize
- () needs moderate or maximal assist to stand

2. Standing Unsupported

Instructions: Please stand for two minutes without holding.

- () able to stand safely 2 minutes
- () able to stand 2 minutes with supervision
- () able to stand 30 seconds unsupported
- () needs several tries to stand 30 seconds unsupported
- () unable to stand 30 seconds unassisted

If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported.

Proceed to item #4.

3. Sitting with back unsupported but feet supported on floor or on a tool

Instructions: Please sit with arms folded for 2 minutes.

- able to sit safely and securely 2 minutes
- able to sit 2 minutes under supervision
- able to sit 30 seconds
- able to sit 10 seconds
- unable to sit without support 10 seconds

4. Standing to sitting

Instructions: Please sit down.

- sits safely with minimal use of hands
- controls descent by using hands
- uses back of legs against chair to control descent
- sits independently but has uncontrolled descent
- needs assistance to sit

5. Transfers (Instructions: Arrange chairs(s) for pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.)

- able to transfer safely with minor use of hands
- able to transfer safely definite need of hands
- able to transfer with verbal cueing and/or supervision
- needs one person to assist
- needs two people to assist or supervise to be safe

6. Standing Unsupported with eyes closed

Instructions: Please close your eyes and stand still for 10 seconds.

- able to stand 10 seconds safely
- able to stand 10 seconds with supervision
- able to stand 3 seconds
- unable to keep eyes closed 3 seconds but stays steady
- needs help to keep from falling

7. Standing Unsupported with feet together

Instructions: Place your feet together and stand without holding.

- () able to place feet together independently and stand 1 minute safely
- () able to place feet together independently and stand for 1 minute with supervision
- () able to place feet together independently but unable to hold for 30 seconds
- () needs help to attain position but able to stand 15 seconds with feet together
- () needs help to attain position and unable to hold for 15 seconds

8. Reaching Forward With outstretched arm while

Instructions: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the finger reaches while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.)

- () can reach forward confidently >25 cm (10 inches)
- () can reach forward >12 cm safely (5 inches)
- () can reach forward >5 cm safely (2 inches)
- () reaches forward but needs supervision
- () loses balance while trying/requires external support

9. Pick up object from the floor from a standing position

Instructions: Pick up the shoe/slipper which is placed in front of your feet.

- () able to pick up slipper safely and easily
- () able to pick up slipper but needs supervision
- () unable to pick up but reaches 2-5cm (1-2 inches) from slipper and keeps balance independently
- () unable to pick up and needs supervision while trying
- () 0unable to try/needs assist to keep from losing balance or falling

10. Turning to look behind over left and right shoulders while standing

Instructions: Turn to look directly behind you over toward left shoulder. Repeat to the right. Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.

- () looks behind from both sides and weight shifts well
- () looks behind one side only other side shows less weight shift

- () turns sideways only but maintains balance
- () needs supervision when turning
- () needs assist to keep from losing balance or falling

11. Turn 360 Degrees

Instructions: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.

- () able to turn 360 degrees safely in 4 seconds or less
- () able to turn 360 degrees safely one side only in 4 seconds or less

- () able to turn 360 degrees safely but slowly
- () needs close supervision or verbal cueing
- () needs assistance while turning

12. Placing alternate foot on step or stool while standing unsupported

Instructions: Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times.

- () able to stand independently and safely and complete 8 steps in 20 seconds

- () able to stand independently and complete 8 steps in >20 seconds

- () able to complete 4 steps without aid with supervision

- () able to complete >2 steps needs minimal assist

- () needs assistance to keep from falling/unable to try

13. Standing unsupported one foot in front

Instructions: (demonstrate to subject) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the subject's normal stride width)

- () able to place foot tandem independently and hold 30 seconds

- () able to place foot ahead of other independently and hold 30 seconds

- () able to take small step independently and hold 30 seconds
- () needs help to step but can hold 15 seconds
- () loses balance while stepping or standing

14. Standing on one leg

INSTRUCTIONS: Stand on one leg as long as you can without holding.

- () able to lift leg independently and hold >10 seconds
- () able to lift leg independently and hold 5-10 seconds
- () able to lift leg independently and hold = or >3 seconds
- () tries to lift leg unable to hold 3 seconds but remains standing independently
- () unable to try or needs assist to prevent fall

Total score =56	Pretest	Posttest

Part VI: Sit and Reach Test Scores

Adult Men - results in centimeters (cm)

- Above 34 = Excellent
- 28 to 34 = Above average
- 23 to 27 = Average
- 16 to 22 = Below average
- Below 16 = Poor

Adult Women - results in centimeters (cm)

- Above 37 = Excellent
- 33 to 36 = Above average
- 29 to 32 = Average
- 23 to 28 = Below average
- Below 23 = Poor

Test score (cm)	Pretest	Post test	Remark

ANNEXURE 4 (B): Questionnaire (Bangla)

Socio-Demographic Information Chart

পার্ট I: ব্যক্তিগত তথ্য

ID:

তারিখ:

মোবাইল নং:

নাম:

ঠিকানা:

পার্ট II: অর্থ সামাজিক প্রেক্ষাপটের তথ্য

Question Number	Questions/ Information on	Coding Category
1	বয়সবছর
	শিক্ষাগত যোগ্যতা
2	পেশা
3	আবাসন

পার্ট III: স্বাস্থ্য বিষয়ক তথ্য

Question Number	Questions/ Information on	Coding Category
1	ইনজুরির কারণ	
	নিউরোলজিকাল লেভেল	
2	স্কেলেটাল লেভেল	
3	প্যারালাইসিসের ধরণ	
4	নির্ণিত রোগ	
5	অন্যান্য	

পার্ট IV: SCIM-SPINAL CORD INDEPENDENCE MEASURE

নিজস্ব যত্ন	Pretest	Post Test
<p>১. খাওয়ানো(কাটা, কন্টেইনার খোলা, ঢালা, খাবার মুখে নেওয়া, তরলভর্তি কাপ ধরে রাখতে পারা)</p> <p>০. প্যারেন্টেরাল, গ্যাস্ট্রোটমি অথবা সম্পূর্ণ মুখে খাওয়াতে সহযোগীতার প্রয়োজন।</p> <p>১. খাওয়া, পান করা অথবা অ্যাডাপ্টিভ ডিভাইস পরিধানে আংশিক সাহায্যের প্রয়োজন।</p> <p>২. স্বাধীনভাবে খেতে পারা; শুধুমাত্র খাবার কাটা, ঢালা অথবা কন্টেইনার খোলায় অ্যাডাপ্টিভ ডিভাইস প্রয়োজন</p> <p>৩. স্বাধীনভাবে খেতে এবং পান করতে পারা; কোনো ধরণের সহযোগীতা বা অ্যাডাপ্টিভ ডিভাইসের প্রয়োজন হয় না।</p>		
<p>২. গোসল করা(সাবান মাখানো, ধোয়া, মাথা ও শরীর শুকানো, কল ব্যবহার করা). ক-উর্ধাংশ;খ-নিম্নাংশ</p> <p>ক. ০. সম্পূর্ণ সাহায্যের প্রয়োজন।</p> <p>১. আংশিক সাহায্যের প্রয়োজন।</p> <p>২. অ্যাডাপ্টিভ ডিভাইস বা নির্দিষ্ট সেটিংস এর সাথে স্বাধীনভাবে ধৌত করতে পারা।</p> <p>৩. স্বাধীনভাবে ধৌত করতে পারা; কোনো ধরণের অ্যাডাপ্টিভ ডিভাইস বা নির্দিষ্ট সেটিংস এর প্রয়োজন নেই।</p>		
<p>খ. ০. সম্পূর্ণ সাহায্যের প্রয়োজন।</p> <p>১. আংশিক সাহায্যের প্রয়োজন।</p> <p>২. অ্যাডাপ্টিভ ডিভাইস বা নির্দিষ্ট সেটিংস এর সাথে স্বাধীনভাবে ধৌত করতে পারা।</p> <p>৩. স্বাধীনভাবে ধৌত করতে পারা; কোনো ধরণের অ্যাডাপ্টিভ ডিভাইস বা নির্দিষ্ট সেটিংস এর প্রয়োজন নেই।</p>		
<p>৩. পরিধান করা(জামা, জুতো, স্থায়ী অর্থোসিস: পরিধান করা এবং খোলা). ক-উর্ধাংশ;খ-নিম্নাংশ</p> <p>ক. ০. সম্পূর্ণ সাহায্যের প্রয়োজন।</p> <p>১. বোতাম, চেইন অথবা ফিতাবিহীন জামার ক্ষেত্রে আংশিক সাহায্যের প্রয়োজন।</p> <p>২. Cwobzl এর ক্ষেত্রে adds এর সাহায্যে স্বাধীনভাবে করতে পারা।</p> <p>৩. adds এর সাহায্য ব্যতীত cwobzl স্বাধীনভাবে করতে পারা; শুধুমাত্র bzl এর ক্ষেত্রে adds এর প্রয়োজন।</p> <p>৪. যে কোনো ধরণের কাপড় স্বাধীনভাবে পরতে পারা; কোনো ধরণের adds এর প্রয়োজন নেই।</p>		

<p>খ. ০. সম্পূর্ণ সাহায্যের প্রয়োজন।</p> <p>১. cwobzl ক্ষেত্রে আংশিক সাহায্যের প্রয়োজন।</p> <p>২. Cwobzl এর ক্ষেত্রে adds এর সাহায্যে স্বাধীনভাবে করতে পারা।</p> <p>৩. adds এর সাহায্য ব্যতীত cwobzl স্বাধীনভাবে করতে পারা; শুধুমাত্র bzl এর ক্ষেত্রে adds এর প্রয়োজন।</p> <p>৪. যে কোনো ধরনের কাপড় স্বাধীনভাবে পরতে পারা; কোনো ধরনের adds এর প্রয়োজন নেই।</p>		
<p>৪. পরিষ্কার-পরিচ্ছন্নতা (হাতুখ ধোয়া, দাত মাজা, চুল আঁচড়ানো, শেভিং, সাজসজ্জা করা)</p> <p>০. সম্পূর্ণ সাহায্যের প্রয়োজন।</p> <p>১. আংশিক সাহায্যের প্রয়োজন।</p> <p>২. অ্যাডাপ্টিভ ডিভাইসের সাহায্যে স্বাধীনভাবে পরিচ্ছন্ন থাকা।</p> <p>৩. অ্যাডাপ্টিভ ডিভাইসের সাহায্য ব্যতীত স্বাধীনভাবে পরিচ্ছন্ন থাকা।</p>		
<p>SUBTOTAL (0-20)</p>		
<p>শ্বসন এবং স্ফিংটার পরিচালনা</p> <p>৫. শ্বসন</p> <p>০. ট্র্যাকিয়াল টিউব(TT) এবং পারমানেন্ট অথবা ইন্টারমিনেন্ট অ্যাসিস্টেড ভেন্টিলেশন(IAV) প্রয়োজন।</p> <p>২. TT এর সাহায্যে স্বাধীনভাবে শ্বাস নিতে পারা; এক্ষেত্রে অক্সিজেন প্রয়োজন, কাশি অথবা TT ম্যানেজমেন্ট এর ক্ষেত্রে সর্বোচ্চ সহায়তা প্রয়োজন।</p> <p>৪. TT এর সাহায্যে স্বাধীনভাবে শ্বাস নিতে পারা, কাশি কিংবা TT ম্যানেজমেন্ট এর ক্ষেত্রে সামান্য সহায়তা প্রয়োজন।</p> <p>৬. TT ব্যতীত স্বাধীনভাবে শ্বাস নিতে পারা; অক্সিজেন প্রয়োজন এবং কাশির ক্ষেত্রে সর্বোচ্চ সহায়তা প্রয়োজন; মাস্ক এবং IAV প্রয়োজন।</p> <p>৮. TT ব্যতীত স্বাধীনভাবে শ্বাস নিতে পারা; কাশির জন্য সামান্য সহায়তা প্রয়োজন।</p> <p>১০. কোনো রকম সহায়তা বা ডিভাইস ব্যতীত স্বাধীনভাবে শ্বাস নিতে পারা</p>		

<p>৬. স্ফিংটার পরিচালনাঃ ব্লাডার</p> <p>০. স্থায়ী ক্যাথেটার।</p> <p>৩. অবশিষ্ট মূত্রের পরিমাণ(RUV)>100cc. রেগুলার অথবা অ্যাসিস্টেড ইন্টারমিনেন্ট ক্যাথেটারের প্রয়োজন নেই।</p> <p>৬. RUV<100cc অথবা ইন্টারমিনেন্ট সেলফ ক্যাথেটারাইজেশন; নিষ্কাশন যন্ত্র প্রয়োগের জন্য সাহায্যের প্রয়োজন।</p> <p>৯. ইন্টারমিনেন্ট সেলফ ক্যাথেটারাইজেশন; বাইরের নিষ্কাশন যন্ত্র ব্যবহার করা হয় এবং প্রয়োগের জন্য কোনো প্রকার সাহায্যের প্রয়োজন হয় না।</p> <p>১১. ইন্টারমিনেন্ট সেলফ ক্যাথেটারাইজেশন; কোনো ধরণের বাইরের ড্রেনেজ ব্যবস্থাপনা নেই।</p> <p>১৩. RUV<100cc; শুধুমাত্র বাইরের ড্রেনেজ ব্যবস্থা প্রয়োজন; কোনো প্রকার সাহায্যের প্রয়োজন নেই।</p> <p>১৫. RUV<100cc; কন্টিনেন্ট; বাইরের ড্রেনেজ ব্যবস্থা প্রয়োজন নেই।</p>		
<p>৭. স্ফিংটার পরিচালনাঃ পায়খানা</p> <p>০. অনিয়মিত বা খুব কম পায়খানা হওয়া (৩ দিনে একবারেরও কম)</p> <p>৫. নিয়মিত কিন্তু সাহায্যের প্রয়োজন (উদাহরণস্বরূপ, সাপোজিটরি প্রয়োগের মাধ্যমে); ব্যতিক্রমী দূর্ঘটনা (মাসে দুইবারেরও কম)।</p> <p>৮. সাহায্যব্যতীত নিয়মিত হয়; ব্যতিক্রমী দূর্ঘটনা (মাসে দুইবারেরও কম)।</p> <p>১০. কোনো সাহায্য ছাড়াই নিয়মিত মলত্যাগ হয়; কোনো দূর্ঘটনা নেই।</p>		
<p>৮. টয়লেটের ব্যবহার(পেরিনিয়াল অঞ্চলের স্বাস্থ্যরক্ষা। মলত্যাগের আগে/পরে কাপড়ের সমন্বয়, ন্যাপকিন কিংবা ডায়পার ব্যবহার করা)</p> <p>০. সম্পূর্ণ সাহায্যের প্রয়োজন।</p> <p>১. আংশিক সাহায্যের প্রয়োজন; নিজে পরিষ্কার করতে সক্ষম নয়।</p> <p>২. আংশিক সাহায্যের প্রয়োজন; নিজে পরিষ্কার করতে সক্ষম।</p> <p>৪. adds এর সাহায্যে টয়লেটের যাবতীয় কাজ নিজে নিজেই সম্পন্ন করতে পারা।</p> <p>৫. adds এর সাহায্য ব্যতীত নিজে নিজেই স্বাধীনভাবে টয়লেট ব্যবহার করতে পারা।</p>		

SUBTOTAL (0-40)		
গতিশীলতা (রুম এবং টয়লেট)		
<p>৯. বিছানায় নড়াচড়া এবং চাপজনিত ঘা প্রতিরোধে করণীয়</p> <p>০. সকল কাজেই সাহায্যের প্রয়োজন; বিছানায় শরীরের উপরের এবং নিচের অংশ ঘুরানো, বিছানায় বসা, হুইলচেয়ারে পুশ আপ ইত্যাদিতে অ্যাডাপ্টিভ ডিভাইসের সাহায্য অথবা সাহায্য ছাড়া, কিন্তু কোনো ইলেক্ট্রিক যন্ত্রের নয়।</p> <p>২. উপরের যেকোনো একটি কার্যক্রম সাহায্য ছাড়া করতে পারা।</p> <p>৪. সাহায্যব্যতীত দুইটি অথবা তিনটি কাজ সম্পন্ন করতে পারা।</p> <p>৬. বিছানায় সকল প্রকার নড়াচড়া ও চাপমুক্ত করার কাজ স্বাধীনভাবে করতে পারা।</p>		
<p>১০. স্থানান্তর: বিছানা-হুইলচেয়ার (হুইলচেয়ার লক করা, ফুটরেস্ট তোলা, হাতল সরানো বা অ্যাডজাস্ট করা, স্থানান্তরণ, পা তোলা)</p> <p>০. সম্পূর্ণ সাহায্যের প্রয়োজন।</p> <p>১. আংশিক সহায়তা এবং/অথবা সুপারভিশন এবং/অথবা অ্যাডাপ্টিভ ডিভাইসের প্রয়োজন।</p> <p>২. নিজেই করতে পারা (অথবা হুইলচেয়ারেরই প্রয়োজন নেই)।</p>		
<p>১১. স্থানান্তর: হুইলচেয়ার-টয়লেট</p> <p>০. সম্পূর্ণ সাহায্যের প্রয়োজন।</p> <p>১. আংশিক সহায়তা এবং/অথবা সুপারভিশন এবং/অথবা অ্যাডাপ্টিভ ডিভাইসের প্রয়োজন।</p> <p>২. নিজেই করতে পারা (অথবা হুইলচেয়ারেরই প্রয়োজন নেই)।</p>		

<p>চলাচল (ঘরের ভেতরে বা বাইরে এমনকি সমতলে)</p> <p>১২. ভেতরে চলাচল</p> <p>০. সম্পূর্ণ সহায়তা প্রয়োজন।</p> <p>১. ম্যানুয়েল হুইলচেয়ার চালানোর জন্য ইলেক্ট্রিক অথবা আংশিক সহায়তা প্রয়োজন।</p> <p>২. ম্যানুয়েল হুইলচেয়ারে স্বাধীনভাবে চলাচলে সক্ষম।</p> <p>৩. হাঁটার সময় সুপারভিশন প্রয়োজন (ডিভাইস সহ/ব্যতীত)।</p> <p>৪. ওয়াকিং ফ্রেম বা ক্রাচের সাহায্যে হাঁটা (সুইং)।</p> <p>৫. ক্রাচ অথবা দুই কেইনের সাহায্যে হাঁটা।</p> <p>৬. একটি কেইনের সাহায্যে হাঁটা।</p> <p>৭. শুধুমাত্র পায়ের অর্থোসিস প্রয়োজন।</p> <p>৮. ওয়াকিং এইড ব্যতীত হাঁটা।</p>		
<p>১৩. মোটামুটিদূরত্বেচলাচল (১০-১০০মিটার)</p> <p>০. সম্পূর্ণ সহায়তা প্রয়োজন।</p> <p>১. ম্যানুয়েল হুইলচেয়ার চালানোর জন্য ইলেক্ট্রিক অথবা আংশিক সহায়তা প্রয়োজন।</p> <p>২. ম্যানুয়েল হুইলচেয়ারে স্বাধীনভাবে চলাচলে সক্ষম।</p> <p>৩. হাঁটার সময় সুপারভিশন প্রয়োজন (ডিভাইস সহ/ব্যতীত)।</p> <p>৪. ওয়াকিং ফ্রেম বা ক্রাচের সাহায্যে হাঁটা (সুইং)।</p> <p>৫. ক্রাচ অথবা দুই কেইনের সাহায্যে হাঁটা।</p> <p>৬. একটি কেইনের সাহায্যে হাঁটা।</p> <p>৭. শুধুমাত্র পায়ের অর্থোসিস প্রয়োজন।</p> <p>৮. ওয়াকিং এইড ব্যতীত হাঁটা।</p>		
<p>১৪. বাইরেচলাচল (১০০মিটারেরবেশিদূরত্ব)</p> <p>০. সম্পূর্ণ সহায়তা প্রয়োজন।</p> <p>১. ম্যানুয়েল হুইলচেয়ার চালানোর জন্য ইলেক্ট্রিক অথবা আংশিক সহায়তা প্রয়োজন।</p> <p>২. ম্যানুয়েল হুইলচেয়ারে স্বাধীনভাবে চলাচলে সক্ষম।</p> <p>৩. হাঁটার সময় সুপারভিশন প্রয়োজন (ডিভাইস সহ/ব্যতীত)।</p> <p>৪. ওয়াকিং ফ্রেম বা ক্রাচের সাহায্যে হাঁটা (সুইং)।</p> <p>৫. ক্রাচ অথবা দুই কেইনের সাহায্যে হাঁটা।</p> <p>৬. একটি কেইনের সাহায্যে হাঁটা।</p> <p>৭. শুধুমাত্র পায়ের অর্থোসিস প্রয়োজন।</p>		

<p>৮. ওয়াকিং এইড ব্যতীত হাঁটা।</p>		
<p>১৫. সিঁড়ি ব্যবস্থাপনা</p> <p>০. সিঁড়ি বেয়ে উপরে উঠতে বা নিচে নামতে না পারা।</p> <p>১. অন্যব্যক্তির সাপোর্ট বা সুপারভিশনের সাহায্যে কমপক্ষে ৩টি ধাপ উঠতে বা নামতে পারা।</p> <p>২. হ্যান্ডরেইল এবং/অথবা ক্রাচ অথবা কেইনের সাপোর্টে কমপক্ষে ৩ ধাপ উঠতে বা নামতে পারা।</p> <p>৩. কোনো সাপোর্ট বা সুপারভিশন ছাড়াই কমপক্ষে ৩ ধাপ উঠতে বা নামতে পারা।</p>		
<p>১৬. স্থানান্তর (হুইলচেয়ার-গাড়ি)</p> <p>০. সম্পূর্ণ সহায়তা প্রয়োজন।</p> <p>১. আংশিক সহায়তা এবং/অথবা সুপারভিশন এবং/অথবা অ্যাডাপ্টিভ ডিভাইসের প্রয়োজন।</p> <p>২. নিজে স্বাধীনভাবে স্থানান্তর করতে পারা; কোনো ধরণের অ্যাডাপ্টিভ ডিভাইসের প্রয়োজন নেই।</p>		
<p>১৭. স্থানান্তর (গ্রাউন্ড-হুইলচেয়ার)</p> <p>০. সাহায্যকারী প্রয়োজন।</p> <p>১. নিজে স্বাধীনভাবে স্থানান্তর করতে পারা; অ্যাডাপ্টিভ ডিভাইসের সাহায্য অথবা সাহায্য ছাড়া (অথবা হুইলচেয়ারের প্রয়োজন নেই)।</p>		
<p>SUBTOTAL (0-40)</p>		
<p>Total SCIM Score (0-100)</p>		

পার্ট V: বার্গ ব্যালেন্স টেস্ট এবং রেটিং স্কেল

১. বসা থেকে দাঁড়ানো

- ক) একা দাঁড়াতে সক্ষম
- খ) হাতের সাপোর্টে একা দাঁড়াতে সক্ষম।
- গ) কিছুক্ষণ চেপ্টা করার পর হাতে দাঁড়াতে সক্ষম।
- ঘ) কোনো সাহায্যকারীর মাধ্যমে দাঁড়াতে পারা।
- ঙ) সর্বোচ্চ শক্তি প্রয়োজন হয় দাঁড়ানোর জন্য।

২. সাহায্যছাড়া দাঁড়ানো

- ক) নিরাপদভাবে ২ মিনিট দাঁড়াতে পারা
- খ) ২ মিনিট সুপারভিশনে দাঁড়াতে পারা।
- গ) সাহায্যছাড়া ৩০ সেকেন্ড দাঁড়াতে পারা।
- ঘ) ৩০ সেকেন্ড দাঁড়ানোর জন্য কষ্ট করতে হয়।
- ঙ) ৩০ সেকেন্ড সাপোর্ট ছাড়া দাঁড়াতে না পারা।

৩. পিঠের সাহায্যব্যতীত কিন্তু ফ্লোর বা টুলের সাহায্য নিয়ে বসা

- ক) নিরাপদভাবে এবং নির্বিঘ্নে ২ মিনিট বসতে পারা।
- খ) সুপারভিশনে ২ মিনিট বসতে পারা।
- গ) ৩০ সেকেন্ড বসতে পারা।
- ঘ) ১০ সেকেন্ড বসতে পারা।
- ঙ) সাহায্যছাড়া ১০ সেকেন্ডও বসতে না পারা।

৪. দাঁড়ানো থেকে বসা

- ক) হাতের সর্বনিম্ন ব্যবহার করে নিরাপদে বসতে পারা।
- খ) হাত ব্যবহার করে পড়ে যাওয়া নিয়ন্ত্রণ করা।
- গ) পায়ের পেছনের অংশ চেয়ারে ঠেকিয়ে হঠাৎ পড়ে যাওয়া রক্ষা করা।
- ঘ) নিজে বসতে পারা কিন্তু হঠাৎ পড়ে যাওয়া।
- ঙ) বসার জন্য সাহায্য প্রয়োজন।

৫. স্থানান্তর

- ক) হাতের সামান্য ব্যবহার করেই নিরাপদে ট্রান্সফার করতে পারা।
- খ) হাতের সম্পূর্ণ ব্যবহার করে নিরাপদে ট্রান্সফার করতে পারা।
- গ) ট্রান্সফার করতে মৌখিক নির্দেশনা এবং/অথবা সুপারভিশন প্রয়োজন।
- ঘ) সাহায্যের জন্য একজন ব্যক্তির প্রয়োজন।
- ঙ) নিরাপদ থাকতে ২ জন ব্যক্তির সাহায্য অথবা সুপারভাইজের প্রয়োজন।

৬. সাহায্যছাড়া চোখ বন্ধ করে দাঁড়ানো

- ক) নিরাপদে ১০ সেকেন্ড দাঁড়াতে পারা।
- খ) সুপারভিশনে ১০ সেকেন্ড দাঁড়াতে পারা।
- গ) ৩ সেকেন্ড দাঁড়াতে পারা।
- ঘ) দাঁড়াতে পারলেও ৩ সেকেন্ড পর্যন্ত চোখ বন্ধ করে থাকতে না পারা।
- ঙ) পড়ে যাওয়া থেকে রক্ষার জন্য সাহায্যের প্রয়োজন।

৭. সাহায্যছাড়া দুই পা একত্র করে দাঁড়ানো

- ক) নিজে নিজে দুই পা একত্র করে ১ মিনিট নিরাপদে দাঁড়াতে পারা।
- খ) নিজে নিজে দুই পা একত্র করে সুপারভিশনে ১ মিনিট নিরাপদে দাঁড়াতে পারা।
- গ) নিজে নিজে দুই পা একত্র করতে সক্ষম কিন্তু ৩০ সেকেন্ডের বেশি থাকতে না পারা।
- ঘ) সাহায্য নিয়ে দুই পা একত্রে ১৫ সেকেন্ড দাঁড়াতে পারা।
- ঙ) সাহায্য নিয়ে ১৫ সেকেন্ড পর্যন্ত দাঁড়াতে না পারা।

৮. সোজা করে সামনে হাত বাড়ানো

- ক) সহজেই > ২৫ সেমি (১০ ইঞ্চি) পর্যন্ত সামনে পৌঁছাতে পারা।
- খ) নিরাপদে ১২ সেমি (৫ ইঞ্চি) এর বেশি পর্যন্ত সামনে পৌঁছাতে পারা।
- গ) নিরাপদে > ৫ সেমি (২ ইঞ্চি) সামনে পৌঁছাতে পারা।
- ঘ) সামনে হাত বাড়াতে পারা কিন্তু সুপারভিশনের প্রয়োজন।
- ঙ) চেপ্টা করার সময় ব্যালেন্স হারিয়ে ফেলে/ বাইরের সাপোর্ট প্রয়োজন হয়।

৯. দাঁড়ানো অবস্থায় ফ্লোর থেকে কোনো বস্তু তোলা

- ক) সহজে এবং নিরাপদে স্লিপার তুলতে পারা।
- খ) সুপারভিশনে থেকে স্লিপার তুলতে পারা।
- গ) নিজে ব্যালেন্স রেখে স্লিপারের ২-৫সেমি (১-২ইঞ্চি) পর্যন্ত পৌঁছানো কিন্তু তুলতে না পারা
- ঘ) তুলতে না পারা এবং চেষ্টায় সুপারভিশন প্রয়োজন।
- ঙ)

১০. দাঁড়ানো অবস্থায় বাম ও ডান কাঁধের উপর দিয়ে পিছনে ঘুরে তাকানো

- ক) দুইপাশ দিয়েই পেছনে তাকানো এবং ভালোভাবে ওজন স্থানান্তর করতে পারা।
- খ) একদিক দিয়ে পেছনে তাকানো, অন্যদিকে ওজন কম স্থানান্তর হয়।
- গ) শুধুমাত্র পাশে ঘুরতে পারা এবং ব্যালেন্স রক্ষা করতে পারা।
- ঘ) ঘুরারবসময় সুপারভিশন প্রয়োজন।
- ঙ) ব্যালেন্স হারানো অথবা পড়ে যাওয়া থেকে রক্ষার জন্য সাহায্য প্রয়োজন।

১১. ৩৬০ ডিগ্রি ঘুরা

- ক) নিরাপদে ৪ সেকেন্ড বা এর কম সময়ে ঘুরতে পারা।
- খ) নিরাপদে এক দিক দিয়ে ৪ সেকেন্ড বা কম সময়ে ৩৬০ ডিগ্রি ঘুরতে পারা।
- গ) নিরাপদে কিন্তু আস্তে আস্তে ৩৬০ ডিগ্রি ঘুরতে পারা।
- ঘ) নিকটবর্তী সুপারভিশন এবং মৌখিক নির্দেশনা প্রয়োজন।
- ঙ) ঘুরার সময় সাহায্যকারী প্রয়োজন।

১২.

- ক) ২০ সেকেন্ডে ৮টি ধাপ সম্পন্ন করে নিজে নিজে এবং নিরাপদে দাঁড়াতে পারা।
- খ) ২০ সেকেন্ডের বেশি সময়ে ৮টি ধাপ সম্পন্ন করে নিজে নিজে এবং নিরাপদে দাঁড়াতে পারা।
- গ) সাহায্য ছাড়াই ৪টি ধাপ সম্পন্ন করতে পারা।
- ঘ) ন্যূনতম সাহায্য নিয়ে ২ এর বেশি ধাপ সম্পন্ন করতে পারা।
- ঙ) পড়ে যাওয়া থেকে বাঁচতে সাহায্যের প্রয়োজন।

১৩. এক পা সামনে দিয়ে সাপোর্ট ছাড়া দাঁড়ানো

- ক) স্বাধীনভাবে পা ট্যান্ডেমে রাখা এবং ৩০ সেকেন্ড পর্যন্ত ধরে রাখা।
খ) স্বাধীনভাবে একটি পা অন্য পা এর সামনে নিয়ে আসা এবং ৩০ সেকেন্ড পর্যন্ত ধরে রাখা।
গ) স্বাধীনভাবে ছোট পদক্ষেপ দিতে সক্ষম এবং ৩০ সেকেন্ড পর্যন্ত ধরে রাখতে সক্ষম।
ঘ) পদক্ষেপ দিতে সাহায্যের প্রয়োজন কিন্তু ১৫ সেকেন্ড পর্যন্ত ধরে রাখতে সক্ষম।
ঙ) পদক্ষেপ বা দাঁড়ানো অবস্থায় ব্যালেন্স হারিয়ে ফেলা।

১৪. এক পায়ে দাঁড়ানো

- ক) স্বাধীনভাবে পা উঠাতে এবং ১০ সেকেন্ডের বেশি ধরে রাখতে সক্ষম।
খ) স্বাধীনভাবে পা উঠানো এবং ৫-১০ সেকেন্ড পর্যন্ত ধরে রাখতে সক্ষম।
গ) স্বাধীনভাবে পা উঠানো এবং ৩ সেকেন্ড বা এর বেশি ধরে রাখতে সক্ষম।
ঘ) পা উঠানোর চেষ্টা করলেও ৩ সেকেন্ড ধরে রাখতে না পারা; কিন্তু স্বাধীনভাবে দাঁড়াতে পারা।
ঙ) চেষ্টা করতে অক্ষম অথবা পতন রোধে সাহায্যকারী প্রয়োজন।

Total score=56	Pretest	Posttest

Part VI: Sit and Reach Test Scores

Adult Men - results in centimeters (cm)

- Above 34 = Excellent
- 28 to 34 = Above average
- 23 to 27 = Average
- 16 to 22 = Below average
- Below 16 = Poor

Adult Women - results in centimeters (cm)

- Above 37 = Excellent
- 33 to 36 = Above average
- 29 to 32 = Average
- 23 to 28 = Below average
- Below 23 = Poor

Test score (cm)	Pretest	Post test	Remark