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Effectiveness of Lower Extremity Mirror Therapy on Balance and Gait for Post Stroke Patients

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Effectiveness of Lower Extremity Mirror Therapy on Balance and Gait for Post Stroke Patients.

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

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Declaration

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

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Acronyms

BBS	Berg Balance Scale
BHPI	Bangladesh Health Professions Institute
BMRC	Bangladesh Medical Research Council
CRP	Centre for the Rehabilitation of the Paralysed
IRB	Institutional Review Board
MT	Mirror Therapy
PT	Physiotherapy
RCT	Randomized Controlled Trial
TUG	Time Up and Go
WHO	World Health Organization

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Abstract

Background*:** Stroke is a disorder where brain is damaged either by blockage in the blood vessels or rupture of the blood vessels. It is one of the leading cause of death. ***Objectives*:** To find out the effectiveness of lower extremity mirror therapy on balance and gait for post stroke patients. ***Methodology*:** Experimental study design was used in this study. 20 patients with stroke were randomly assigned into two groups among them 10 patients were assigned into experimental group received Mirror Therapy with Conventional Physiotherapy and another 10 into control group received only conventional physiotherapy. Total treatment sessions were twenty-four comprising of 3 sessions per week for 4 weeks. ***Outcome measurement tools*:** Berg balance scale (BBS) has used to measure balance, 10 meter walk test and timed up and go (TUG) has used to measure mobility. ***Analysis of data: Inferential statistics such as paird t test, and unpaired t test was done for BBS, 10 meter walk test and time up and go by using SPSS version 22. ***Results*:** After observing pre-test and post-test score the significant improvement wasn‟t found. P-value was >0.05. Improvements were not statistically significant.But according to mean difference experimental group has little superior effect than control group. ***Conclusion:*** These results showed no statistical significant value but there was a mean difference, which indicate that mirror therapy with conventional physiotheapy can be an effective therapeutic approach for stroke patients with balance and gait problems.

Key words: Mirror Therapy, Stroke, Conventional physiotherapy.

Word count: 11,016

CHAPTER- I INTRODUCTION

1.1 Background

Stroke is a devastating disorder and one of the leading causes of death and long-term disability worldwide (May et al., 2020). It is a cerebrovascular disease marked by a loss of brain function that occurs suddenly. According to World Health Organization "a clinical syndrome consisting of rapidly developing clinical signs of focal disturbance of cerebral function lasting more than 24 hours or leading to death with no apparent cause other than a vascular origin"(Coupland et al., 2017). There are two forms of stroke: hemorrhagic and ischemic. Ischemic stroke occurs when blood flow to the brain is interrupted, whereas hemorrhagic stroke occurs when blood vessels in the brain rupture. The most frequent type of stroke is ischemic stroke, which accounts for 80% of all occurrences. Approximately 20% of all strokes are hemorrhagic strokes (Su et al., 2021).

Every year, 16.9 million people suffer from a stroke, according to the Global Burden of Disease 2010 report. In the same way, during the last two decades, there has been a 25% increase in the global incidence of stroke in young/middle-aged individuals (aged 20-64 years). Furthermore, every year, 5.9 million people die from strokes throughout the world, with 71% of them surviving in low-to middle-income nations. Stroke is more common in men around the world, while women are more severely affected (Béjot et al., 2016).

According to WHO, Indonesia has the highest rate of stroke among Asian countries, and it has become the leading cause of death, killing 328.5 thousand people in 2012 (WHO, 2015). Indonesia has the highest stroke death rate, with 193.3/100,000 person-years in age-sex standardized mortality in 2010 (Venketasubramanian et al., 2017). According to the Indonesian Basic Health Research, the prevalence of stroke in Indonesia is 12.1 per million, with the greatest rate (17.9%) in North Sulawesi province and the lowest in Yogyakarta province (16.9 %) (Setyopranoto et al., 2019).

The prevalence of stroke in Pakistan's KP province is 1.2 percent (1200 per 100,000 population). The majority of the patients were under the age of 50. There is no marked difference in stroke prevalence between men and women (Sherin et al., 2020).

In India, the estimated adjusted prevalence rate of stroke in rural areas is 84-262/100,000, while in urban areas it is 334-424/100,000. According to current population-based studies, the incidence rate is 119-145/100,000 (Pandian and Sudhan, 2013).

In 2018, China's death rate from cerebrovascular illnesses was 149.49 per 100 000, resulting in 1.57 million fatalities. It came in third place after cancer and heart disease as the primary causes of mortality. In 2013, the age-standardized stroke prevalence and incidence were 1114.8 per 100 000 people and 246.8 per 100 000 person-years, respectively (Yi et al., 2020). In Bangladesh stroke is identified as the third leading cause of death. The mortality is ranked 84 in the world by World Health Organization in Bangladesh. The prevalence of stroke was 0.3% in Bangladesh which was found in a hospital-based study (Islam et al., 2012).

After a stroke, psychological alterations such as emotional, behavioral, and cognitive abnormalities are common. Emotional difficulties that can happen after stroke. Depression and anxiety are two common issues. There is also evidence of emotional ability, a "catastrophic reaction," anger, violence, impatience, and apathy. Additional issues include post-traumatic stress disorder and the fear of falling. After a stroke, some patients engage in challenging activities. Around 30% of people who have had a stroke develop depression (I. Kneebone and B. Lincoln, 2012). About 80% of stroke patients have cognitive impairments. Cognitive impairments are significant since they are relevant to rehabilitation outcomes (Coco et al., 2016)

The loss of motor functions, as well as induced paralysis, abnormal reflexes, and spasticity, are among the significant neurological deficits caused by a stroke, all of which interfere with a person's independent mobility. Hemiparetic gait is a symptom of motor loss that is defined by an asymmetry in spatial-temporal characteristics, as well as changes in step length and stance phase. Furthermore, there is a decrease in the amplitude of hip and knee flexion, as well as an increase in plantar flexion or a loss of dorsal flexion capability at the ankle level. This results in a loss of balance, an increased risk of falling, and limitations in

the individual's everyday activities and involvement in community social activities (Pérez-de la Cruz, 2020).

As a result, for most patients, regaining independent walking in order to become more involved in the community and improve social interaction is a major aim for rehabilitation. Although several rehabilitation methods, such as rigorous, repetitive mobility-task training, the use of orthoses, neuromuscular electric stimulation, and others, have been demonstrated to be efficient ways to increasing walking ability and balance. Because of the significant cost of the essential equipment and the nature of labor-intensive one-on-one therapy, the majority of them are not done for a long time. In recent years, mirror therapy, a new, simple and low-cost technique, has attracted much attention in stroke rehabilitation (Li et al., 2018).

Mirror therapy was first introduced by Ramachandran as a simple non-invasive technique for the treatment of phantom pain and recently has a wide area such as complex regional pain syndrome, peripheral nerve injury, and hemiparesis following stroke (Mohan et al., 2013). It is one of the methods which helps to enhance neuroplasticity. The main concept of MT is to use visual reflection in the mirror (May et al., 2020). Patients with arm amputees can experience the movement of a phantom limb while looking at a mirror reflection of the moving, intact arm subsidiary on the adjudged phantom. In recent studies showed mirror therapy has beneficial effects for the treatment of hemiparesis following stroke (Mohan et al., 2013).

1.2 Rationale

Bangladesh is the most densely populated developing country in the world. Nowadays stroke is a very common condition in our country. Stroke is the most important reason for death and most primary causes of grown-up disability with impairment in the world. One of the main purposes of the rehabilitative process is to help patients achieve as high a level of functional independence as possible within the limits of their impairments. Mirror Therapy is a treatment technique that tries to improve balance and gait and reduce impairment related to balance functional status and mobility.

One of the most important impairment of stroke is balance. Therefore, improving balance is essential part of daily activities though rehabilitation. Another important impairment of stroke is functional impairment and mobility. Most of the survivors are facing difficulties history of falling several times after having stroke. Recently Stroke is increasing day by day in developed and developing countries worldwide.

At least 85% of stroke patients experience hemiplegia and lower extremity function is damaged. Functional loss in the lower extremity causes difficulty in performing daily living activities, and causes to become independent.

The target in stroke rehabilitation is to enable the highest functional independence level possible for the individual and to increase the quality of life despite the current limitations. However, conventional treatment methods used for this purpose are insufficient in enabling lower extremity functional recovery. Several studies are made on the effectiveness of mirror therapy in post stroke upper extremity rehabilitation. In other country there have been very few studies made on the effectiveness of mirror therapy in post stroke lower extremity rehabilitation. There has not been research on lower extremity mirror therapy in Bangladesh. Mirror therapy will help in improving balance and gait and motivate the patients also. The researcher would like to conduct this study in order to develop evidence to improve balance and gait in relation to physiotherapy intervention of stroke patients. A new physiotherapy intervention will be established easily for stroke patients. So that after doing this study patient will be more aware of physiotherapy management.

1.3: Aim

To find out the effectiveness of lower extremity mirror therapy on balance and gait for post stroke patients.

1.4: Objectives:

1.4.1. General objective

To investigate the effectiveness of lower extremity mirror therapy on balance and gait for post stroke patients.

1.4.2: Specific objectives:

- To find out the difference of effectiveness of conventional therapy and mirror therapy individually and between two groups.
- To explore the socio demographic features of participants.
- To explore the basic physical parameter eg. Height, Weight, BMI
- To see the association between age and BMI with berg balance, 10 meter walk test and time up and go

1.5. Operational definition

Stroke: Stroke may be defined as rapidly developing of clinical signs which lasting more than 24 hours with no apparent cause of vascular origin or leading to death. It is a clinical syndrome.

Gait: A person's gait is their walking pattern. Walking requires muscular coordination and balance to push the body forward in a pattern known as the stride.

Balance: A state of body position where an even distribution of weight causes the body to be upright and steady and prevent from fall.

Conventional Therapy: Conventional physiotherapy is a group of selected treatment techniques set by a physiotherapist on the basis of evidence that are widely used around the world for the treatment of specific disease (Kishner & Colby, 2007).

Mirror Therapy: Mirror therapy refers to the use of a mirror to create a reflective illusion of an affected limb in order to trick the brain into thinking movement has occurred without pain, It involves placing the affected limb behind a mirror, which is sited so the reflection of the opposing limb appears in place of the hidden limb.

CHAPTER- II LITERATURE REVIEW

A literature review is an investigation, critical appraisal, and synthesis of prior research that is related to the study subject. The objective of the literature review was to distinguish between what has already been done and what needs to be done, to define the background of the subject, and to link concepts and theories to problems and challenges, find significant variables related to the topic, synthesize and gain a wider look, connect ideas and theory to issues and questions, and identify the main methodologies and data collection tools that have been employed (Hart, 2018).

Stroke:

A stroke is derived from the Greek term "apoplexia." Apoplexy is a word used to describe a state in which all mental functions cease abruptly, although breathing and pulse rate continue to be maintained. Sudden pain, hypoxia, inability to move any body part, and loss of bowel control are all common symptoms of apoplexy. But this idea of a stroke is unable to properly explain the current definition of a stroke (Coupland et al., 2017).A stroke is a sudden, localized neurological deficiency caused by a disorder in the brain (Gomez-Cuaresma et al., 2021).

Symptoms:

Aphasia, carelessness, sensory loss, pain, dysarthria, cognitive abnormalities, dysphagia, depression, and, most importantly, motor weakness are all frequent stroke symptoms that may result in greater impairments. Strokes have long-term and significant impacts on patients, with reduced brain function having the largest impact (Stroke Association, 2017).

Risk Factors:

Raising blood pressure, diabetes, heart illness, smoking, age and sex, race, personal or family history, being overweight or obese, lack of physical exercise, stress and depression, alcohol use, bad food, and so on are all risk factors for stroke (Boehme et al., 2017).

Physical Problems:

In adults, stroke is the primary cause of serious long-term impairment. More than 60% of stroke survivors have permanent neurological impairments that limit everyday activities. After a stroke, lower-extremity motor function is generally affected, limiting functional mobility (Ji and Kim, 2015). The lower limbs are required for ambulation, standing, and walking, all of which are necessary for carrying out everyday tasks. Motor activation, muscle tone, selective joint movement, and balance are all controlled by the brain, whereas the spinal cord controls gait. As a result, paralysis in the lower limbs may result in motor function impairment and balance abnormalities associated with gait dysfunction in people who have had a stroke. Many hemiplegic individuals are still unable to walk independently after rehabilitation and varied degrees of spontaneous recovery (Li et al., 2018).

Impact of stroke in range of motion:

Spasticity is a frequent clinical disease that develops after a stroke and is related to severe pain, lowering patients' quality of life (Harrison and Field, 2015). Spasticity is defined as "a motor disease characterized by a velocity-dependent increase in tonic stretch reflexes with excessive tendon jerks resulting from stretch reflex hyper excitability." Instead of "spasticity" or "hypertonia," the reduction in range of motion in spasticity might be responsible for an increase in hyper-resistance (i.e., abnormal activity during the passive stretch) (van den Noort et al., 2017). Muscular contracture-related muscle stiffness may enhance spasticity, resulting in an increase in sensory input from muscle spindles. Spasticity may disrupt lower limb function, affecting passive muscular stretching, range of motion, and motor unit recruitment during voluntary contraction (Cabanas-Valdés et al., 2019). Spasticity may affect limb alignment in people who have had a stroke, making walking, self-care, and other everyday tasks difficult (Núñez-Cortés et al., 2020).

Impact of stroke in Balance:

Balance and coordination difficulties are common post-stroke complications (Iruthayarajah et al., 2017). The capacity to develop and sustain bodily homeostasis both inside and outside of the base of support is known as balance. After a stroke, impaired balance control

is a key barrier to regaining independence in everyday activities. A lack of balance usually leads to a fall and, as a consequence, serious injuries. Patients with post-stroke balance problems are common (Li et al., 2015) Individuals' capacity to engage in everyday activities and reintegrate back into society is hampered by these limitations. Although the vast majority of stroke survivors (75%) regain independent standing-balance capacity, weight bearing asymmetry and increased postural sway, as well as a reduced ability to freely transfer body weight or tolerate external disturbances, frequently persist (van Duijnhoven et al., 2016). It is generally acknowledged that balance is affected by three sensory systems: visual, vestibular, and somatosensory (mechanoreceptors and proprioceptors) (Li et al., 2015). Balance and balance-dependent tasks (such as ambulation or posture maintenance) are disrupted when a neurological lesion, such as a stroke, impacts these systems (Iruthayarajah et al., 2017).

Impact of stroke in Gait:

The lower limbs are required for ambulation, standing, and walking, all of which are necessary for carrying out everyday tasks (Li et al., 2018). Upper motor neuron syndrome, which is caused by a stroke, is characterized by muscular weakness, decreased selective motor control, stiffness, and proprioceptive deficiencies that make it difficult to walk normally (Lauziere et al., 2014). The recovery of gait is a crucial goal in the rehabilitation of stroke victims. After a stroke, individuals have a wide range of walking abilities that are based on the level of sensorimotor damage. After a stroke, 50% of patients are unable to walk initially, whereas 12% can walk with help and 37% can walk freely. After 11 weeks of stroke recovery, 18 percent of patients are still unable to walk, 11% can walk with help, and 50% can walk on their own (Balaban and Tok, 2014). Patients who have had a stroke and are functionally ambulatory have gait patterns that are different from healthy people's and are linked to an increased risk of falling. Patients who have had a stroke have shown significant differences in their walking patterns. Many hemiplegic individuals are still unable to walk freely after rehabilitation and varied degrees of spontaneous recovery. Most patients use compensatory strategies such as hip-hiking and hip-circumduction in combination with a slower walking speed that allows them to conduct a range of everyday

tasks (Boudarham et al., 2013). As a result, for most patients, regaining independent walking and increasing social interaction is a major aim for rehabilitation (Li et al., 2018).

Paralysis and muscular weakness in the lower limbs may cause balance and movement problems in patients who have had a stroke. This limits the activities of daily life for persons who have had a stroke (In et al., 2016). Intervention is mainly performed by physiotherapists in clinical settings. Changing postures, breathing exercises, and exercise treatment in passive and active mobilization are all frequent components of traditional physiotherapy for stroke. It varies depending on the context, is non-standard, and is based on the therapist's discretion. However, although the traditional intervention is successful, it is not ideal. Brunnstorm, Bobath, Proprioceptive Neuromuscular Facilitation (PNF), Rood, Carr & Shepherd, Constraint Induced Movement Therapy (CIMT), and other standard protocol therapies were proven helpful (Pollock et al., 2000).

Mirror Therapy:

Although there have been many various therapeutic ways to improve balance and gait, the most popular have been functional electrical stimulation, virtual reality training, whole body vibration training, treadmill training, and robot-assisted training (Mohan et al., 2013). The majority of these therapies have been shown to be beneficial, but they are not widely used due to the high cost ofthe necessary equipment (Thieme et al., 2015). Mirror therapy is a relatively recent form of treatment that focuses on moving the unaffected limb (Sütbeyaz et al., 2007).

The patient sits in front of a mirror that is parallel to his midline, covering the vision of the (affected) limb, which is positioned behind the mirror, in mirror treatment (MT). When the patient looks in the mirror, he or she sees the unaffected limb positioned as the affected limb.Mirror treatment approaches improve motor learning and result in cortical rearrangement associated with efficient motor recovery on a neurophysiological level (Bhoraniya et al., 2018).

Mirror therapy combines the benefits of visual feedback and imagery training with the effect of bilateral movement training (In et al., 2016). Mirror treatment improves

neuroplasticity and helps to prevent or decrease learned nonuse of the paretic limb. Furthermore, the cross-facilitatory drive from the uninjured hemisphere causes greater excitability in the mirror neurons and homologous motor pathways of the paretic limb, improving their preparation and promoting function recovery (Mohan et al., 2013).

The impact of MT on ambulation and lower extremity motor function has been investigated in a limited number of trials, and MT has been proven effective (May et al., 2020). Mirror treatment has previously been used to treat chronic stroke patients' upper extremities. As a result, there has been an improvement in upper extremity motor function (Yavuzer et al., 2008). Due to the fact that mirror therapy is increasingly being utilized in the rehabilitation of paralyzed lower limbs, it is not well established with reliable evidence due to small research samples and various therapeutic regimens.

Because of paralysis, most patients who have had a stroke suffer trunk asymmetry. Asymmetry like this is a key obstacle to enhancing posture and gait (Ikai et al., 2003). Patients must, however, bend their bodies to the unaffected side to gaze at the picture reflected in the mirror during mirror treatment. This causes the neck to deviate away from the midline, resulting in even more asymmetric posture. As a result, patients have distorted visual information and are unable to maintain proper balance. When patients or therapists tilt the mirror to correct an imbalance, the picture in the mirror is distorted, and there is no visual illusion effect (In et al., 2016).

Article Findings:

Altschuler et al. (2001) who demonstrated mirror therapy effects on upper extremity joint range of motion, motion velocity, and accuracy, used mirror treatment with stroke patients. Stevens and Stoykov (2003) found that three to four weeks of mirror treatment improved Fugl–Meyer Assessment scores, active range of motion, movement speed, and hand dexterity in two stroke patients. Sathian et al. (2000) discovered that a chronic stroke patient improved grip strength and hand mobility in the paretic limb following two weeks of mirror treatment.

According to a study by May et al. (2020) mentioned that there were significant differences in all parameters between the groups, except for the degree of ankle plantar flexion spasticity, and at all-time points between Week 0 and 4 and Week 0 and 12 ($p<0.05$). These findings imply that combining MT with a traditional rehabilitation program resulted in a larger improvement in lower extremity motor function and ambulation, which lasts for a short time after therapy.

The mirror group exhibited much better improvement at follow-up than the control group. As a result, there is a major difference between the two groups. In subacute stroke patients, mirror treatment paired with a traditional stroke rehabilitation program improves lower-extremity motor recovery and motor performance (Sütbeyaz et al., 2007).

A total of 13 research ($n = 572$) fulfilled the inclusion criteria, according to Li et al. (2018). A meta-analysis found that mirror therapy had a significant effect on walking speed, balance function, lower limb motor recovery, and passive range of motion of ankle dorsiflexion, without improving mobility or spasticity of ankle muscles. The systematic review shows that using mirror therapy in addition to some form of rehabilitation seems to be beneficial in certain areas of lower limb function, but there is not enough data to recommend when or how to use it.

According to Ji and Kim, (2015) mentioned that there was a significant difference between the experimental and control groups in post-training improvements for single stance, step length, and stride length. However, there were no significant variations in stance phase, swing phase, velocity, cadence, or step width between the two groups ($P > 0.05$). It was concluded that mirror treatment might help improve the effects of stroke on walking abilities.

In et al. (2016) mentioned that statistically significant improvements in the VRRT(Virtual reality reflection therapy) group compared to the control group for BBS, FRT, TUG, postural sway (Medio lateral sway distance with eyes open and closed, anteroposterior and total sway distance with eyes open but not with eyes closed), and 10 mWV (p0.05). VRRT (even as a home therapy) combined with a traditional rehabilitation program for individuals

with chronic stroke may be even more useful in improving affected lower limb function than a normal rehabilitation program alone.

Louie et al. (2018) mentioned that there were seventeen RCT involving with 633 participants. In at least one lower extremity outcome, thirteen trials found a significant between-group difference favoring mirror treatment. A strong favorable impact was identified after mirror therapy training in a meta-analysis of six studies that reported changes in gait speed. Mobility and motor recovery were also improved by lower extremity mirror treatment. Balance capacity did not have a significant pooled impact. Mirror treatment for the lower extremity improves gait speed significantly. This review also found Mirror therapy had a minor favorable impact on mobility and lower extremity motor recovery after stroke.

According to Bhoraniya et al. (2018) nentioned that both groups of gait parameters improved, however Group A had statistically significant differences ($P < 0.05$) in all gait parameters. When compared to traditional treatment, mirror therapy improved gait capacity in chronic stroke patients.

Broderick et al. (2018) mentioned that the review covered nine studies. Mirror treatment had a substantial impact on motor function when compared to sham and non-sham therapies, according to the key end measures. Additionally, there was evidence of a significant effect of mirror therapy on balance capacity, walking velocity, PROM for ankle dorsiflexion, and step length. The findings suggest that employing mirror therapy for the treatment of some lower limb impairments in stroke patients may be beneficial. Although the findings are somewhat encouraging, excessively optimistic interpretations are advised owing to methodological concerns with the research included.

Outcome Measurement Tool:

Outcome measurement tool is a very important component of every research and has to be valid and reliable. The following research project used three outcome measurement tool Berg Balance Scale (BBS) 10 meter walk test and Time up and go (TUG) to measure the post intervention outcome of balance and gait respectively.

Berg Balance Scale:

Clinical balance function was evaluated using the Berg Balance Scale (BBS). Excellent intra-rater (ICC = 0.99) and inter-rater (ICC = 0.98) reliabilities for the BBS with stroke patients have been discovered (Wong et al., 2013). There was a substantial connection between BBS upon admission and falls, with fallers having lower BBS scores (cut-off 29; sensitivity 80%; specificity 78%) (Maeda et al., 2009).The BBS is a 14-item scale that uses a variety of standing activities to assess functional balance. Each item is given a value between 0 and 4, with a total score of 56. The BBS is a brief questionnaire that takes around 10–20 minutes to complete, and its usefulness as an outcome measure has been shown in stroke patients (Iruthayarajah et al., 2016).

Time Up and Go:

The TUG was used to assess functional mobility, and it had high test-retest reliability (ICC = 0.95) for individuals with chronic stroke (Wong et al., 2013). The TUG measures the time in seconds it takes a person to stand from sitting on a chair, walk three meters, turn around and walk three meters back, and then sit back down on the chair. The TUG has been shown to be a reliable tool in the stroke population for measuring balance and gait (Ng and Hui-Chan, 2005)

10 Meter Walk Test:

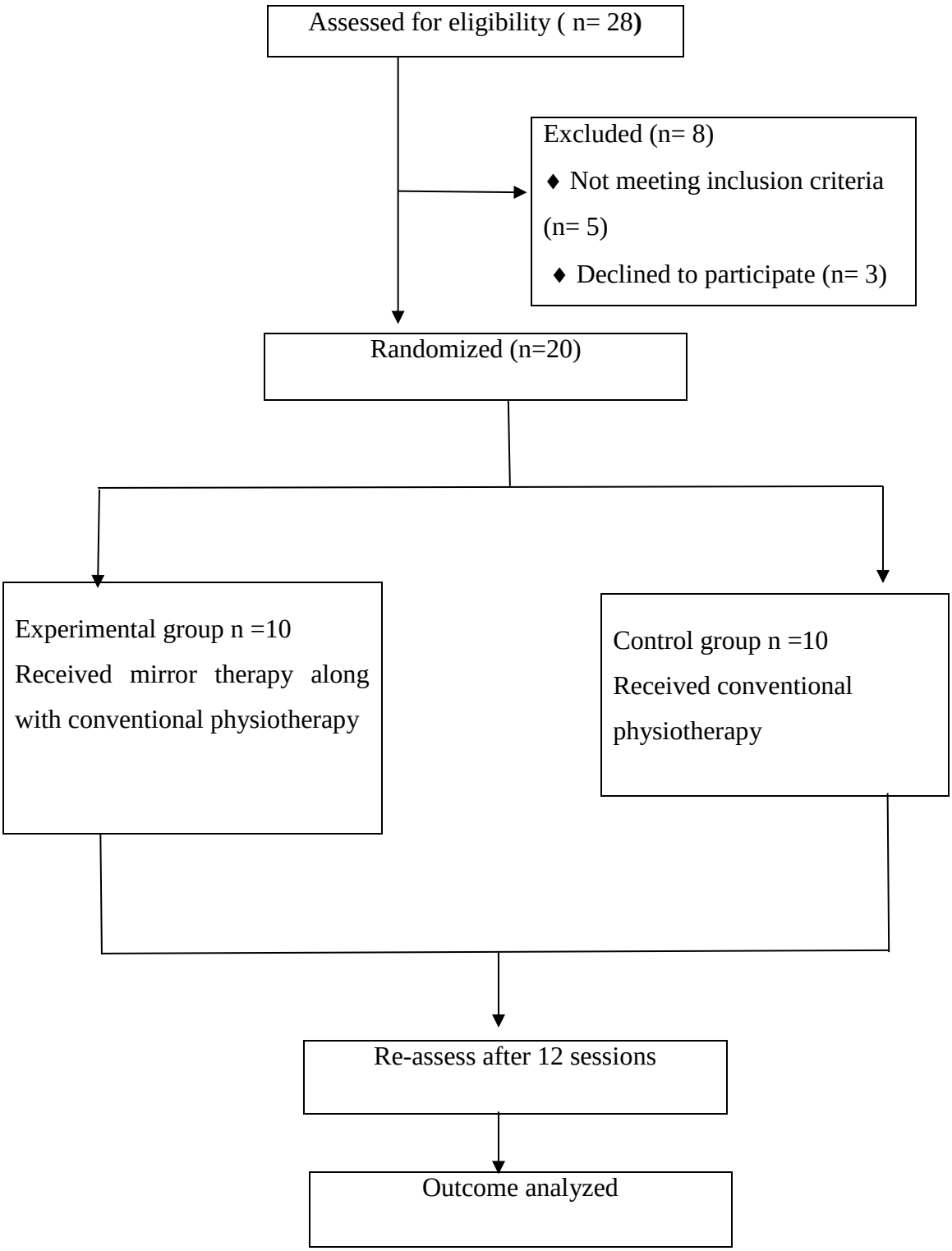
To assess a subject's walking speed, the 10-meter walk test (10MWT) is often used (Wong et al., 2013). Test-retest reliability on the 10mWT was estimated to be 0.83, and the lowest detectable change values at the 95% confidence level were 0.40 m/s, respectively (Cheng et al., 2020).The individual is instructed to walk for 10 meters at a comfortable and rapid speed. The time is recorded for the middle 8 meters, eliminating the first and final 1 meter for walking acceleration and deceleration. Both comfortable (Speed-C) and rapid (Speed-F) walking speeds are estimated using the average of three performances. It has sufficient psychometric qualities for measuring gait speed in post-stroke patients (Arya et al., 2019)

CHAPTER- III METHODOLOGY

3.1 Study Design

The study was conducted by using Randomized Control Trail (RCT) design with two different subject groups. The study was randomized control trial between different subject designs. Both groups received a common treatment regimen except one intervention. Only the experimental group received Mirror therapy along with conventional physiotherapy while in control group only conventional physiotherapy treatment program was given. It was a assessor blinded study, which has been conducted at Neurology and stroke rehabilitation unit of CRP, Savar and Mirpur.

Consort Flow Chart



3.2 Study area

The study was conducted from Outdoor Neurology and Stroke Rehabilitation Unit, Department of Physiotherapy, CRP, Savar and Mirpur.

3.3 Study Population

A population refers to the entire group of people who meet the criteria set by the researcher. The populations of this study were the stroke patients being treated at CRP.

3.4 Sample size

20 samples were taken due to time limitation and patient flow was low (estimated sample size 156 by sample size calculation).

3.5 Sample Selection:

All participants who meet selection criterias included in the study from 1st March to 15th April 2022. Experimental cases were selected from CRP, Savar and Control cases selected from CRP, Mirpur.

3.6 Sampling Technique

Hospital based randomization technique was used for this study

3.7 Inclusion criteria

- Participants with stroke in any stage of stroke.
- Both Ischemic and Hemorrhagic stroke
- Both male and female
- Patients with stroke who were >18 years of age (Li et al., 2018).
- Were able to understand and follow simple verbal instructions (Mohan et al., 2013).
- No significant cognitive deficit (Ji & Kim, 2015).
- Berg Balance Score above 21

3.8 Exclusion criteria

- Medically unstable patient.
- Patients who have pusher syndrome (Mohan et al., 2013).
- Patients who have visual deficits (Mohan et al., 2013).

3.9 Method of data collection

3.9.1 Data collection

Data has been collected face to face interview of participants.

3.9.2 Questionnaire

The questionnaire contained 7 parts including consent form, respondent identification, Sociodemographic information, Physical parameter, berg balance, 10 meter walk test and TUG.

3.9.3 Data collection procedure

The study procedure was conducted through assessing the patient, initial recording, treatment and final recording. After screening the patient at department, the patients were assessed by graduated physiotherapists who were qualified. 12 sessions of treatment was provided for every subject. 20 subjects were chosen for data collection according to the inclusion criteria. The researcher randomly assigned all participants into two groups; one is experimental group and another is control group. Experimental group received Mirror therapy with conventional physiotherapy and control group received only conventional physiotherapy. Data was gathered through a pre-test and post-test intervention and the data was collected by using a written questionnaire form which was formatted by the researcher. Pre-test was performed before beginning the treatment. The balance, gait and mobility were noted with Berg Balance test, 10- metre walk test and Timed Up and Go test included questionnaire form. The same procedure was performed to take post-test at the end of 12 sessions of treatment. The researcher collected the data both in experimental and control group in front of graduate qualified physiotherapists in order to reduce the biasness. At the end of the study, specific test was performed for statistical analysis.

3.9.4 Data analysis

Descriptive and inferential analysis were conducted through SPSS 20.0 software, Microsoft excel, Microsoft word and were presented by graphs, charts and tables.

3.10 Outcome measurement tools

3.10.1 Berg Balance Scale (BBS)

The BBS is a 14-item scale that uses a variety of standing activities to assess functional balance. Each item is given a value between 0 and 4, with a total score of 56. The BBS is a brief questionnaire that takes around 10–20 minutes to complete, and its usefulness as an outcome measure has been shown in stroke patients.

3.10.2 10m walk test

The 10-meter walk test (10 MWT) is a standard clinical assessment for determining walking speed in meters per second. The individual is instructed to walk for 10 meters at a comfortable and rapid speed. The time is recorded for the middle 8 meters, eliminating the first and final 1 meter for walking acceleration and deceleration. Both comfortable (Speed-C) and rapid (Speed-F) walking speeds are estimated using the average of three performances. It has sufficient psychometric qualities for measuring gait speed in post-stroke patients.

3.10.3 Timed Up and Go Test

The TUG assesses static and dynamic balance abilities. The TUG measures the time in seconds it takes a person to stand from sitting on a chair, walk three meters, turn around and walk three meters back, and then sit back down on the chair. The TUG has been shown to be a reliable tool in the stroke population for measuring balance and gait.

3.11 Treatment protocol

Treatment protocol for experimental group

Total Duration: 45 minute

- **Name of the exercise:** Hip, knee and ankle flexion exercise (Mohan et al., 2013).

Purpose: Improve hip, knee and ankle mobility

Starting Position: Semi declined position, Hip 90 degree bend, knee straighten and ankle neutral position

Instruction: Hip bend fully, knee bend fully, slowly point your toes up toward you, and then return to the starting position.

Dose: 5 to 10 repetitions 2 set.

- **Name of the exercise:** Hip medial rotation and lateral rotation exercise (Mohan et al., 2013).

Purpose: Increase hip joint range of motion exercise

Starting Position: Half lying position, Hip 90 degree bend, knee straighten and ankle neutral position

Instruction: Hip and knee bend then moving the knee inward and outward.

Dose: 5 to 10 repetitions 2 set.

- **Name of the exercise:** Hip abduction with external rotation followed by hip adduction with internal rotation (Mohan et al., 2013).

Purpose: Improve range of motion.

Starting Position: Semi decline position, Hip 90 degree bend, knee straighten and ankle neutral position.

Instruction: 1) Ankle rotate inward then hip adduction.

2) Ankle rotate outward then hip abduction.

Dose: 5 to 10 repetitions 2 set.

- **Name of the exercise:** Ankle Dorsiflexion exercise (May et al., 2020)

Purpose: Improve gait and range of motion.

Starting Position: Sitting position**,** hip 90 degree bend, knee 90 degree bend and ankle neutral position.

Instruction: 1) Sit on the chair with legs stretched out in front of you.

2) Toes pointed forward away from your body and pulling your toes towards your shin, hold for 5 seconds and then return to the starting position.

Dose: 5 to 10 repetitions 2 set.

- **Name of the exercise:** Ankle Planter flexion exercise (May et al., 2020)

Purpose: Improve gait and range of motion.

Starting Position: Sitting position**,** hip 90 degree bend, knee 90 degree bend and ankle neutral position.

Instruction: 1) Straighten your knee,

2) Rise on your toes and hold for 5 seconds.

Dose: 5 to 10 repetition 2 se.t

- **Name of the exercise:** Squatting

Purpose: Improve balance and flexibility.

Starting Position: Stand with a feet little wider than your hips and toes facing front

Instruction: 1) Drive your hips back bending at the knees and ankles and pressing your knees slightly.

2) Sit into a squat position while still keeping your heels and toes on the ground, chest up and shoulder back.

3) Strive to eventually reach parallel, knees are bent to a 90 degree angle.

4) Press into your heels and straighten legs to a standing upright position.

Dose: 5 to 10 repetition 2 set.

- **Name of the exercise:** Forward stepping

Purpose: Improve balance.

Starting Position: Stand with feet, shoulder width apart.

Instruction: 1) Lift unaffected foot and step forward, planting your foot firmly on the ground.

2) Slowly shift your weight onto your affected foot.

3) Return to the starting position.

Dose: 5 to 10 repetition 2 set.

- **Name of the exercise:** Weight shifting exercise

Purpose: Improve balance.

Starting position: Standing, place the feet slightly wider than hip width apart.

Instruction: Leading with the upper body, lean the body gently to the right while keeping both feet in contact with the floor. Repeat in the other direction.

Dose: 5 repetition of 2 set.

- **Name of the exercise:** Wobble board exercise

Purpose: Improve balance.

Starting position: 1) Begin by standing on the balance board with your feet hip distance apart. Your feet should be on the outer edges of the board.

2) Keep your posture upright and maintain a neutral spine.

Instruction: 1) Stand in the starting balance position.

2) Slowly tilt the board to the right side and then to the left side.

Dose: Tilt from side to side for 30 seconds.

- **Name of the exercise:** Sit to Stand

Purpose: Improve mobility.

Starting position: 1) Sit toward the front edge of a sturdy chair without armrests. Your knees should be bent and your feet should be flat on the floor and shoulder-width apart.

2) Place your hands lightly on each side of the seat. Keep your back and neck as straight as possible, with your chest slightly forward.

Instruction: 1) Lean forward and slightly shift your weight to the front of your feet.

2) Slowly stand up. Use your hands as little as possible.

3) Stand and sit down slowly. Tighten your core and abdominal muscles to control your lowering as much as possible.

Dose: 5 to 10 repetition 2 set.



Treatment protocol for control group:

Total Duration: 45 minute

- Weight bearing and shifting exercise
- Forward stepping
- Sit to stand exercise
- Soft surface weight shifting
- Static balance practice
- Dynamic balance practice
- Reaching forward
- Turning
- Sensory motor stimulation
- Single leg bridging practice
- Double leg bridging practice
- Trunk bridging practice with gym ball support
- High kneeling
- Half kneeling
- Pelvic balance practice on gym ball
- Wobble board exercise
- Squatting
- Trunk control exercise
- Ankle dorsiflexion
- Ankle planterflexion
- Selective knee flexion
- Parallel bar walking
- Frankle exercise
- Adductor muscle strengthening
- Hamstring muscle strengthening
- Quadriceps muscle strengthening
- Core muscle strengthening

- Foot mobilization according to bobath
- Ecentric exercise of lower limb
- TA stretching
- Pelvic tilting in standing position
- Gait practice in ledder
- Unstable surface walking
- Straight line walking
- Single leg standing

3.13 Ethical Consideration

The proposal of the desertation including methodology was approved by Institutional Review Board and obtained permission from the concerned authority of ethical committee of Bangladesh Health Professions Institute (BHPI). The whole process of this research project was done by following the Bangladesh Medical Research Council (BMRC) guideline and World Health Organization (WHO) Research guidelines. Again before beginning the data collection, researcher obtained the permission from the concerned authorities ensuring the safety of the participants. The researcher strictly maintained the confidentiality regarding participants condition and treatments.

3.12 Informed Consent

An information sheet and consent form both in English and Bengali were used by the researcher to take the participants consent. The researcher obtained consent of participation from every individuals. A signed informed consent form was receive from each participant. Participants were informed that they were completely free to decline answering any question as well as to withdraw their consent and terminate participation at any time during the study. The researcher also ensured that withdrawal of participation from the study would not affect their treatment in the physiotherapy department and they would still get the same facilities. Every individual had the opportunity to discuss their problem with the administration of CRP.

CHAPTER- IV RESULTS

4.1 Table 1: Baseline characteristics of the participants:

Variable	Experimental Group Mean (n=10)	Control Group Mean (n=10)	P value
Age (years)	46	51	0.364
Height (cm)	161.84	165.20	0.387
Weight (kg)	65.90	64.70	0.672
BMI (kg/m2)	25.81	24.32	0.227
BBS Pretest	32.60	33.40	0.753
10 meter walk pretest	29.00	28.00	0.879
TUG pretest	32.70	35.70	0.713

4.2 Table 2: Physical Parameters

Serial no.	Variable (n=20)	Type of variable	Mean±SD
1.	Age (years)	Continuous	48.65 ±12.692
2.	Height (cm)	Continuous	163.52 ±8.407
3.	Weight (kg)	Continuous	65.3 ±6.097
4.	BMI (kg/m2)	Continuous	25.07 ±2.702
5.	Monthly expenditure	Continuous	41100 ±12523.242

4.2.1. Age of the participants:-

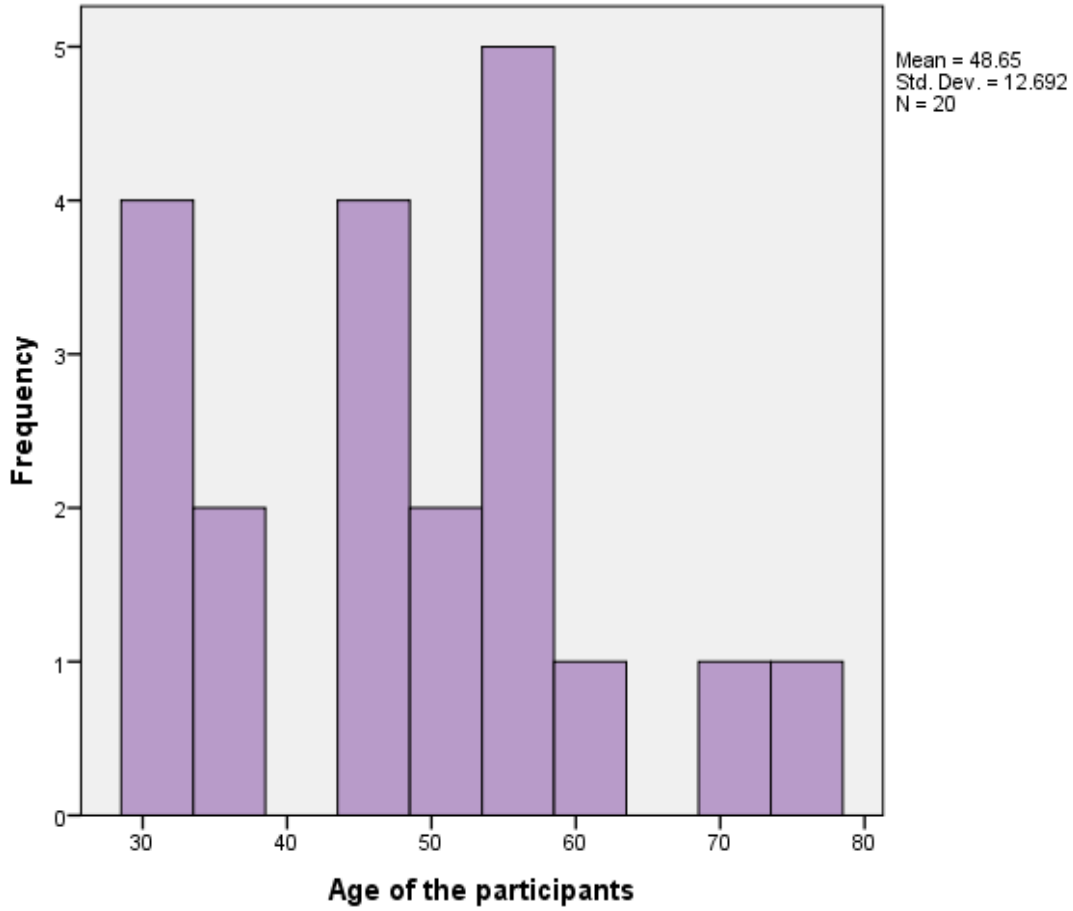


Figure 2: Age of the participants

The Socio-demographic Information table shows that among 20 participants with stroke the mean age of participants were 48.65 and standard deviation were 12.692 whereas experimental group mean age with standard deviation were 46(8.907) and control group mean age with standard deviation were 51(15.656).

4.2.2. Height of the participants

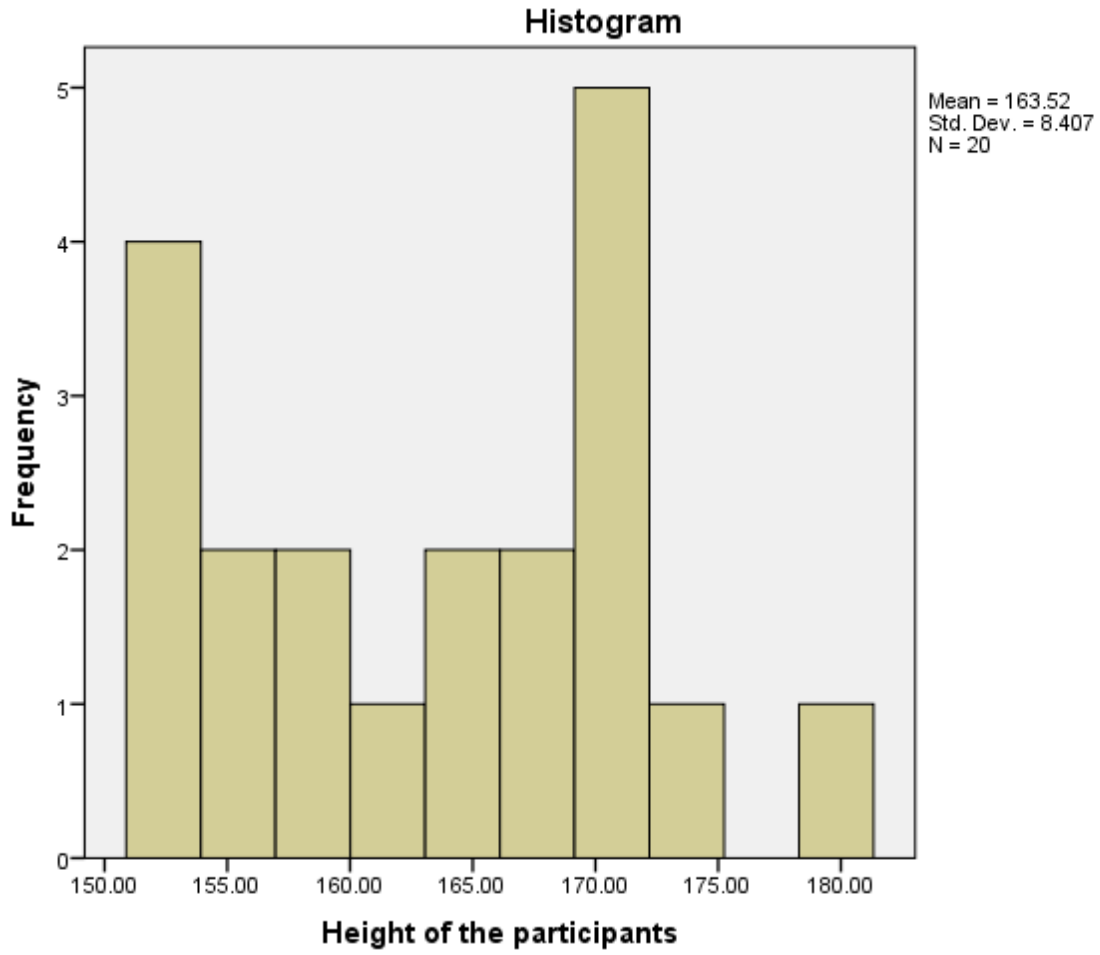


Figure 3: Height of the participants

Among 20 participants, the mean height with standard deviation was 163.52(8.407). Among them the mean height with SD of experimental group was 161.89(7.797) and control group was 165.20(9.065).

4.2.3. Weight of the participants

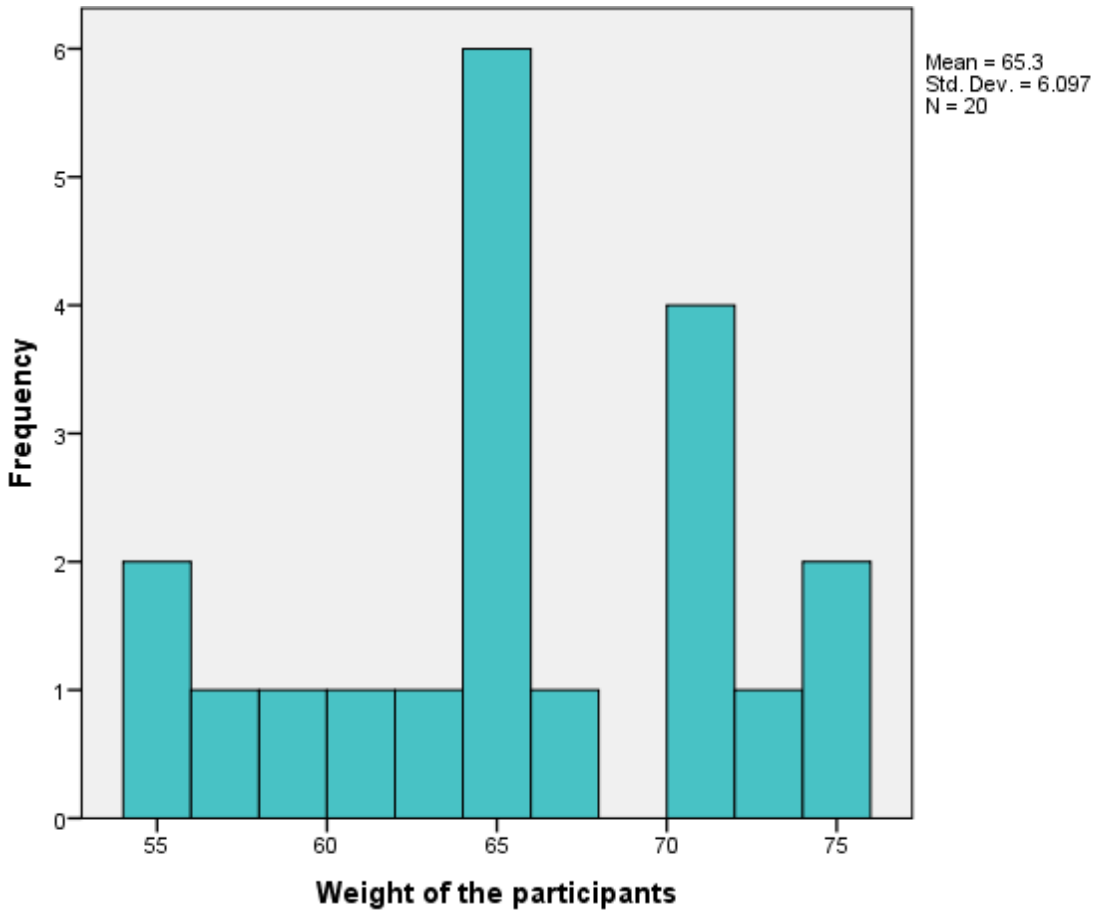


Figure 4: Weight of the participants

Among the participants, the mean with standard deviation of weight was 65.3(6.097) whereas experimental and control group was 65.9(4.954) and 64.7(7.288)

4.2.4. BMI distribution among participants

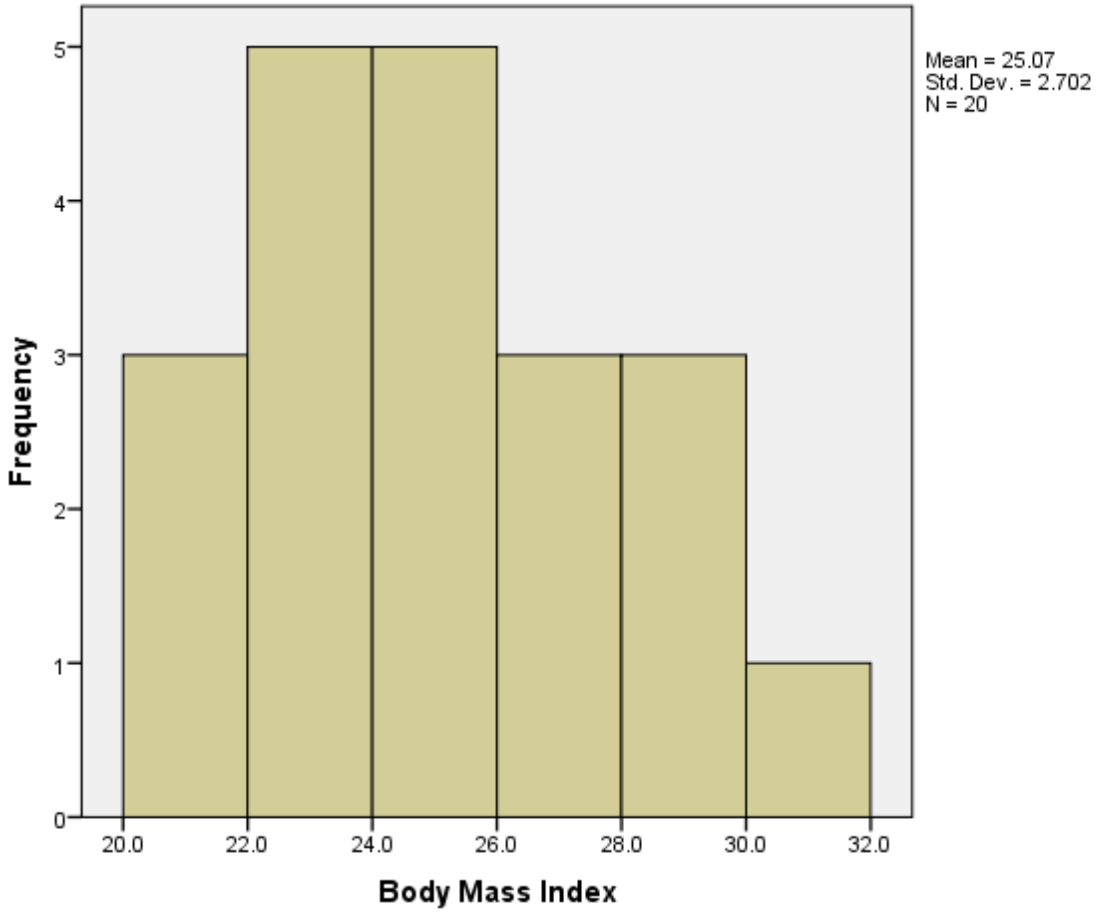


Figure 5: BMI distribution among participants

Among participants, Mean BMI was 25.180 (3.2501) in experimental group and 24.80 (1.9008) in control group.

4.2.5. Monthly expenditure

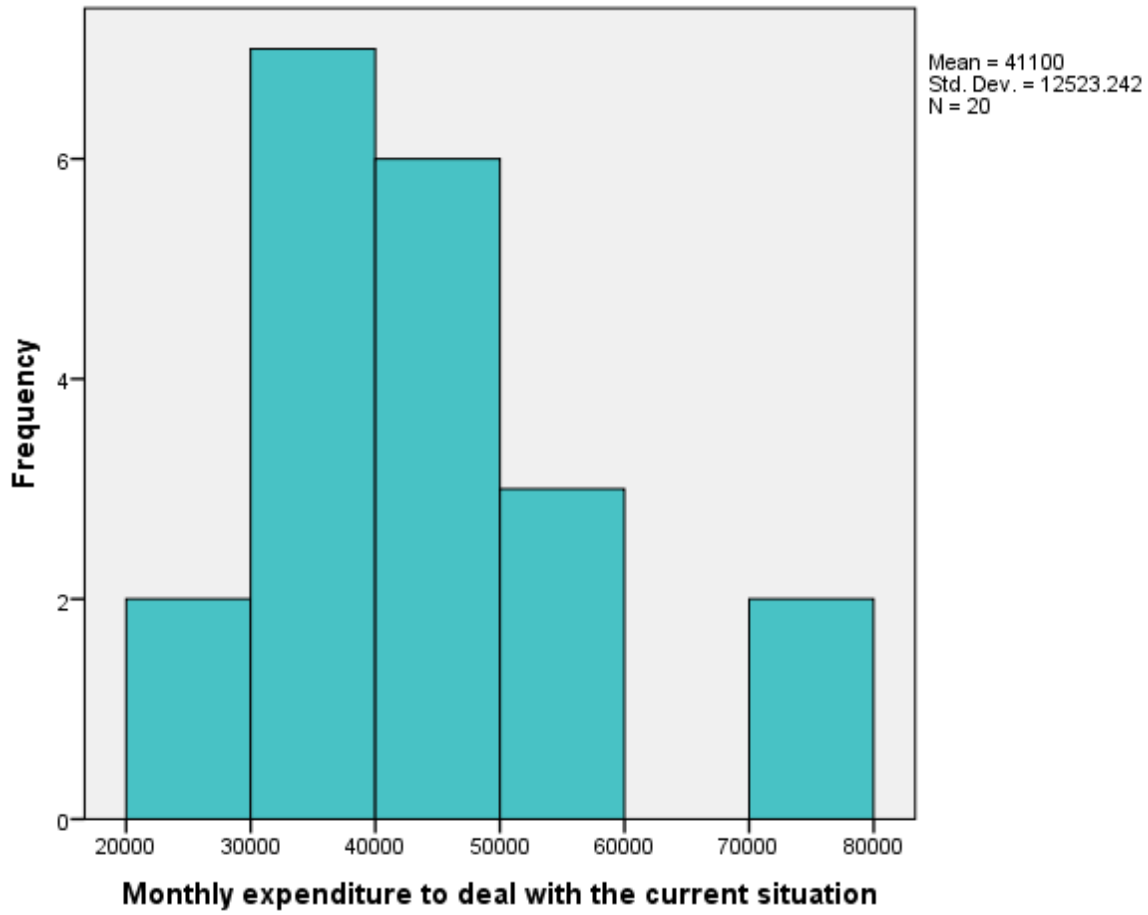


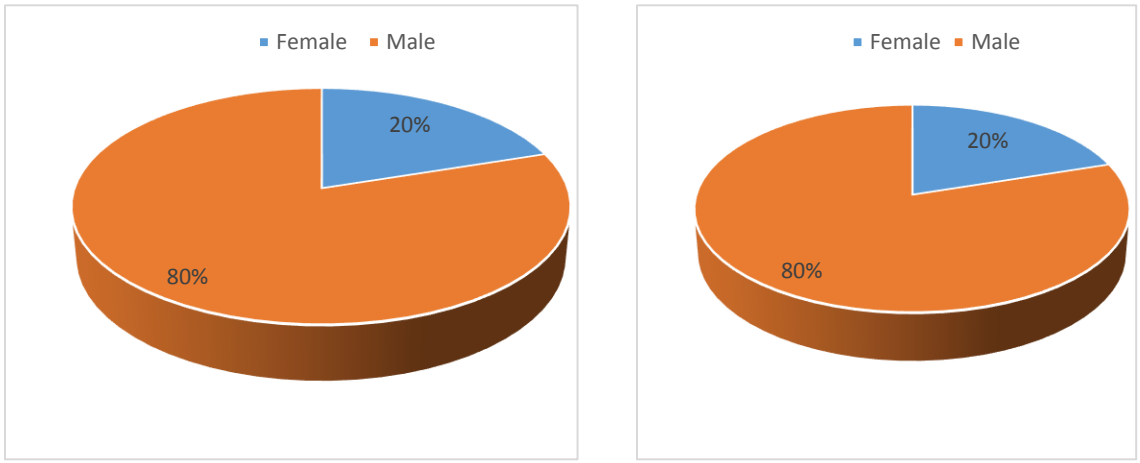
Figure 6: Monthly expenditure to deal with the current situation

Among the participants of the study, the mean with standard deviation of monthly expenditure was 41100(12523.242).

4.3 Table 3: Sociodemographic and stroke related information

Serial no.	Variable	Type of variable	Frequency/Percentage
1	Gender	Nominal	Female, n=4/20% Male. n=16/80%
2	Marital status	Nominal	Living with spouse, n = 16/80% Living without spouse, n = 4/20%
3	Educational qualification	Nominal	Illiterate = 4/20% Primary = 6/30% Secondary = 3/15% Higher Secondary =1/5% Graduation =3/15% Post-graduation =3/15%
4	Family type	Nominal	Nuclear, = 9/45% Combined, = 11/55%
5	History of polypharmacy	Nominal	Yes, = 17/85% No, = 3/15%
6	Comorbidity	Nominal	Hypertension, = 7/35% Hypertension and diabetes mellitus, = 9/45% None, = 4/20%
7	Living area	Nominal	Urban = 12/60% Rural = 8/40%
8	Type of lesion	Nominal	Ischemic =85% Hemorrhagic = 15%
9	Affected body site	Nominal	Right=60% Left=40%
10	Previous history of stroke	Nominal	Yes=30% No=70%

4.3.1. Gender Distribution among participants



Experimental Group Control Group

Figure 6: Gender Distribution among participants

Among 30 participants, n=16 (80%) participants were male and n= 4 (20%) participants were female. In experimental group, male participants were 80% and female participants were 20%.In control group male participants were 80% and female participants were 20%.

4.3.2. Educational qualification

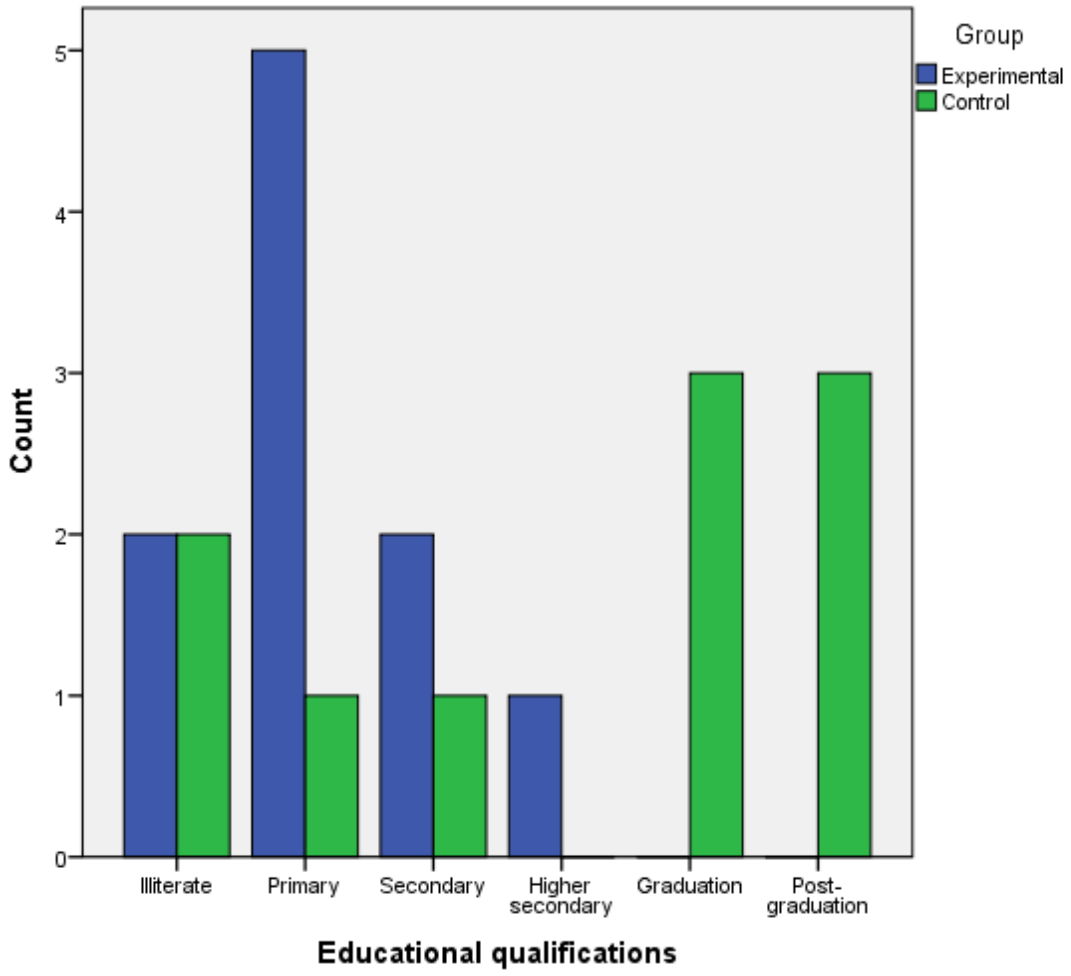
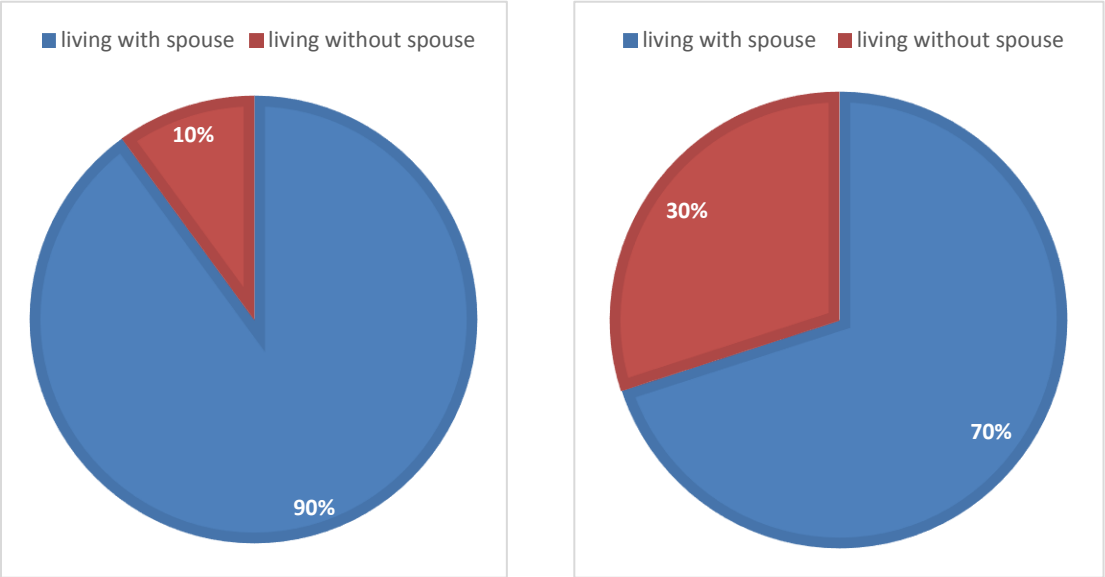


Figure 8: Educational qualification among participants

In this study, among the 20 participants 20% (n=4) were illiterate, 30% (n=6) had completed primary studies, 15% (n=3) has completed secondary level, 5% (n=1) has completed higher secondary level, 15% (n=3) has completed graduation and 15% (n=3) has completed post-graduation.

4.3.3. Marital status

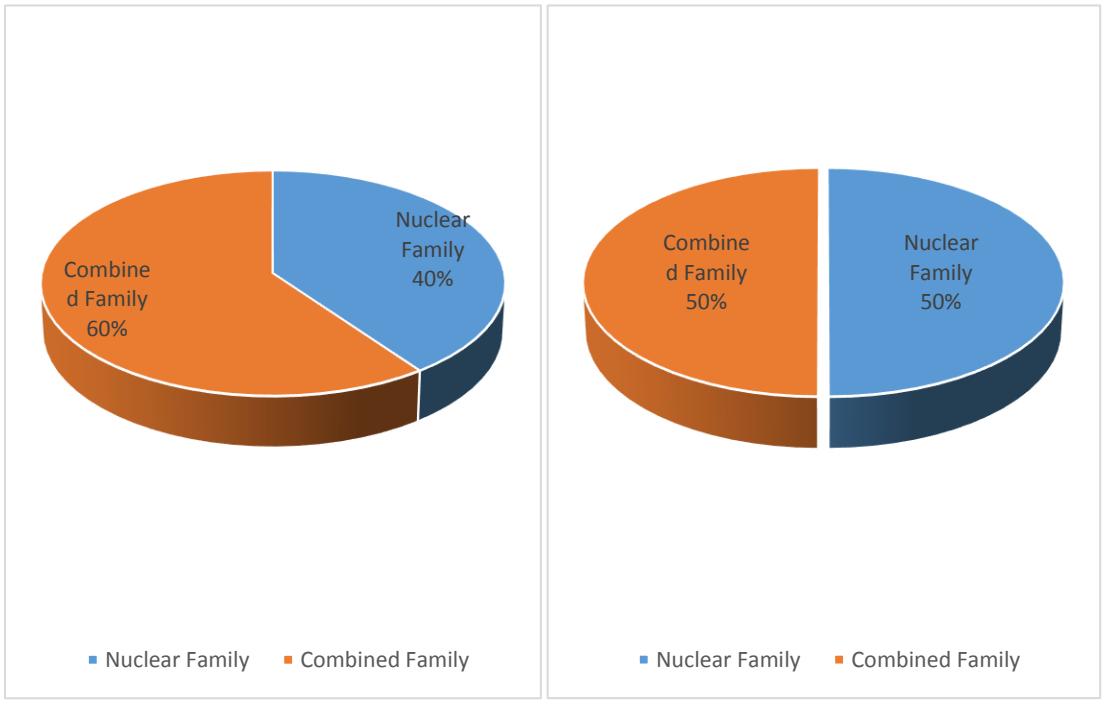


Experimental Group Control Group

Figure 9: Marital status of the participants

Among the participants, 80% (n=16) were living with spouse and 20% (n=4) were living without spouse. In experimental group, 90% were living with spouse and 10% were living without spouse. In control group, 70% were living with spouse and 30% were living without spouse.

4.3.4. Family Type of the participants



Experimental Group Control Group

Figure 10: Family Type of the participants

Among the participants 45% (n=9) has a nuclear family and 55% (n=11) has a combined family. 40% has nuclear family and 60% has combined family in experimental group whereas 50% has nuclear family and 50 % has combined family in control group.

4.3.5 History of polypharmacy

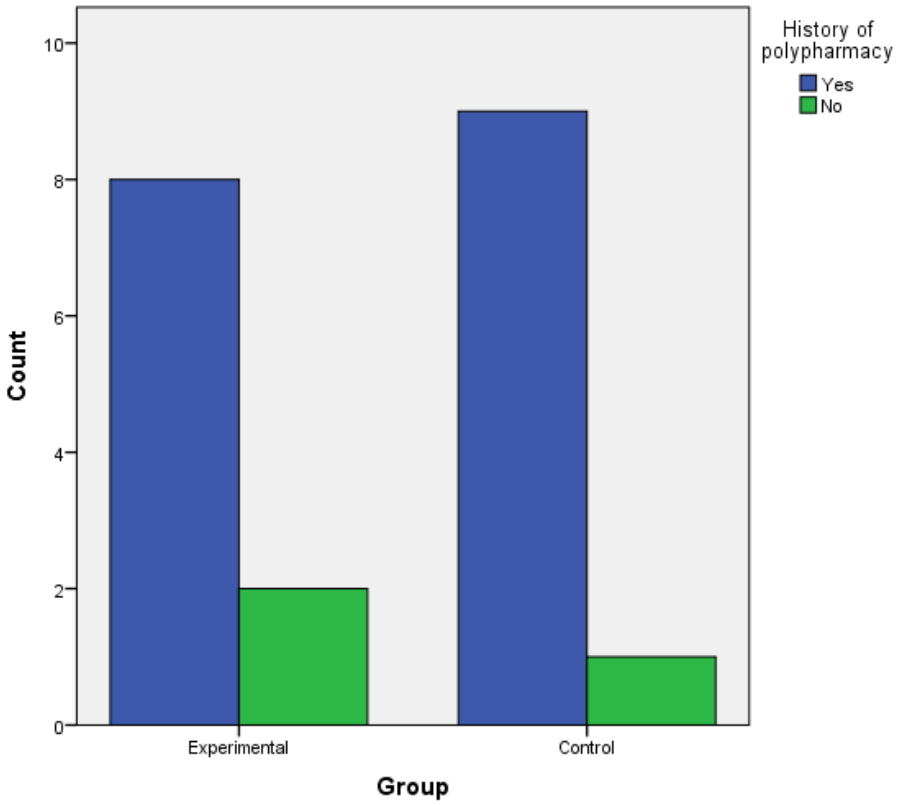


Figure 11: History of polypharmacy among participants

Among the all 20 participants history of polypharmacy were 85% (n=17) and no history of polypharmacy were 15% (n=3). In control group, history of polypharmacy was 90% (n=9) and no history of polypharmacy 10% (n=1). In experimental group, history of polypharmacy was 80% (n=8) and no history of polypharmacy 20% (n=2).

4.3.6 Comorbidity of the participants

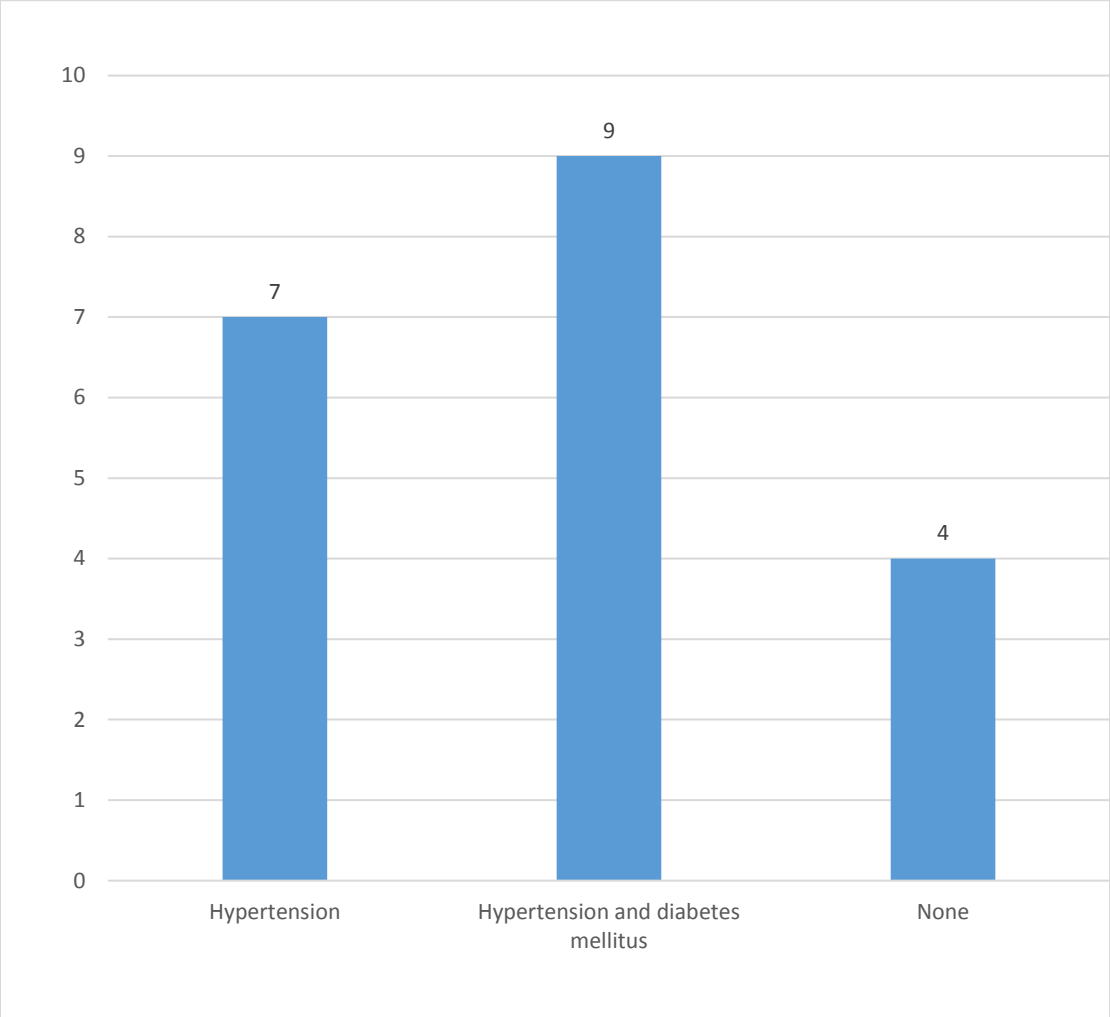
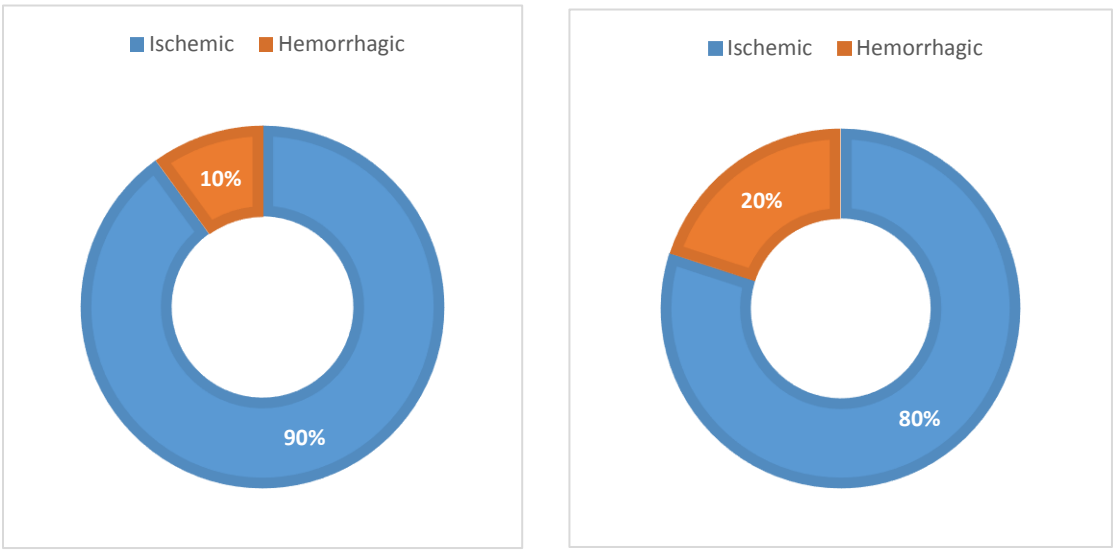


Figure 12: Comorbidity of the participants

Among 10 participants of control group (n=3) 30% knew that they had been suffering from hypertension, (n=6) 60% suffering from hypertension and diabetes mellitus and (n=1) 10% did not have any comorbidity. On the other hand, among 10 participants in experimental group (n=4) 40% were aware about their hypertension, (n=3) 30% suffering from hypertension and diabetes mellitus and (n=3) 30% did not have any comorbidity.

4.3.7. Type of lesion



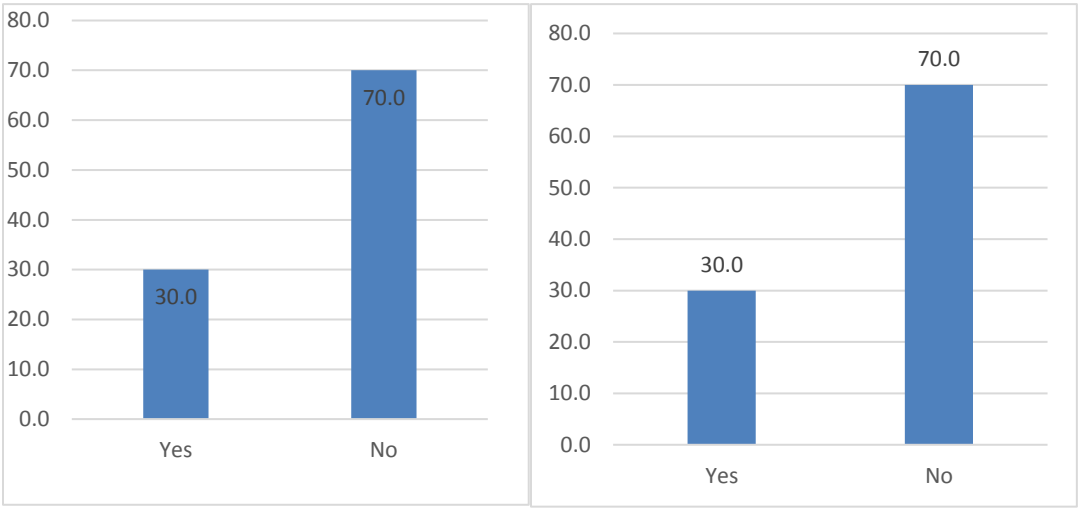
Experimental Group

Control Group

Figure 13: Type of lesion among participants

Total participants was 20. Among them 85% (n=17) had Ischemic type of stroke and 15% (n=3) had hemorrhagic type of stroke. In experimental group, 90% (n=9) had Ischemic type of stroke and 10% (n=1) had hemorrhagic type of stroke. In control group, 80% (n=8) had Ischemic type of stroke and 20% (n=2) had hemorrhagic type of stroke.

4.3.8. Previous history of stroke

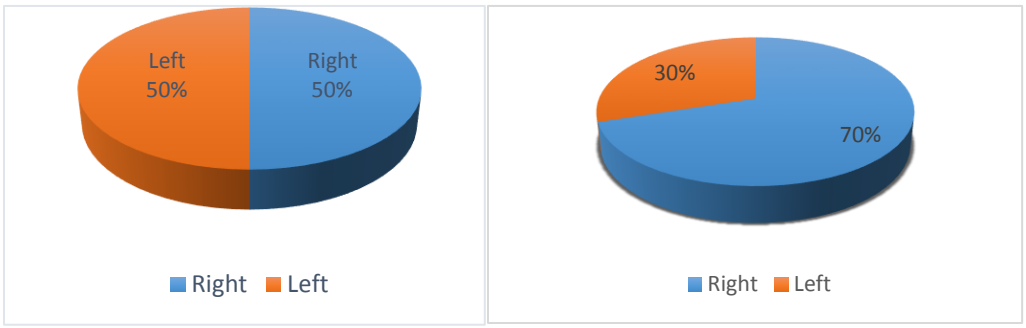


Experimental Group Control Group

Figure 14: Previous history of stroke

Among 20 participants, 30% (n=6) of them was a previous history of stroke and 70% (n=14) was no previous history of stroke.

4.3.9. Affected side of the participants



Experimental Group Control Group

Figure 15: Affected side of the participants

20 stroke patients were included as sample of the study, among them 60% (n=12) were right site and 40% (n=8) were left site affected. In control group, 70% (n=7) were right side and 30% (n=3) were left side affected. In experimental group, 50% (n=5) were right side and 50% (n=5) were left side affected.

4.3.10. Living area

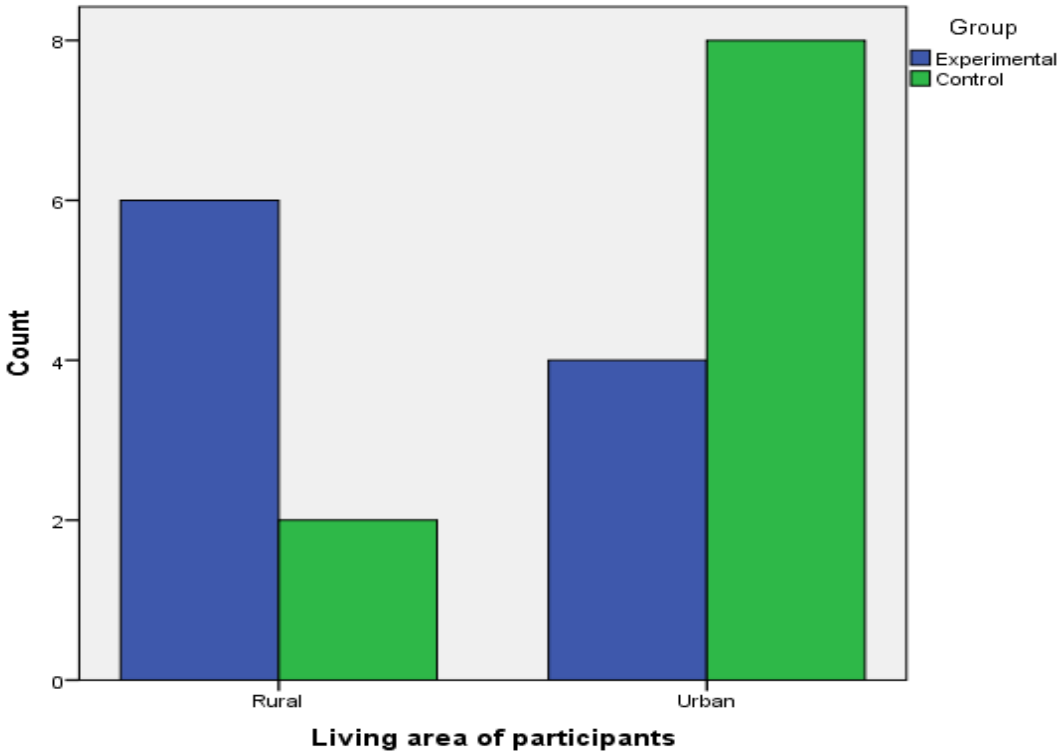


Figure 16: Living area of participants

The study was conducted on 20 stroke patients. Among them 60% (n=12) were urban area, 40% (n=8) were rural area. In experimental group, 60% (n=6) were rural area and 40% (n=4) were urban area. In control group, 20% (n=2) were lived in rural area and 80% (n=8) were urban area.

Inferential Analysis

Q. Is there any difference between Experimental Pre BBS mean and Experimental Post BBS mean?

1. Hypothesis

H_0 = There is no difference between experimental pre BBS mean and experimental post BBS mean

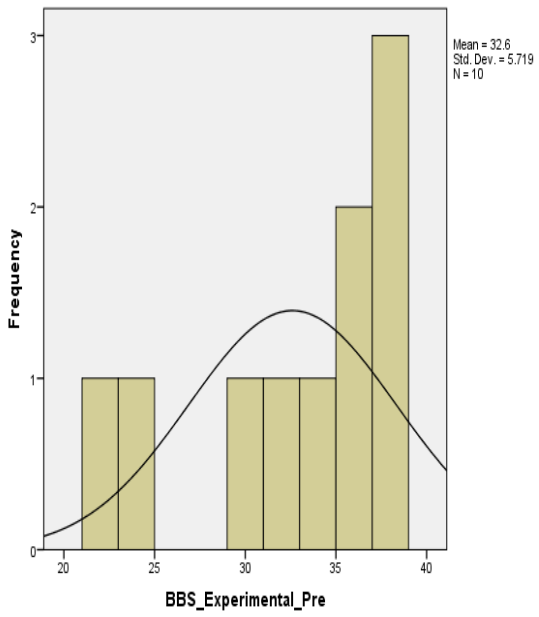
H_A= There is difference between experimental pre BBS mean and experimental post BBS mean

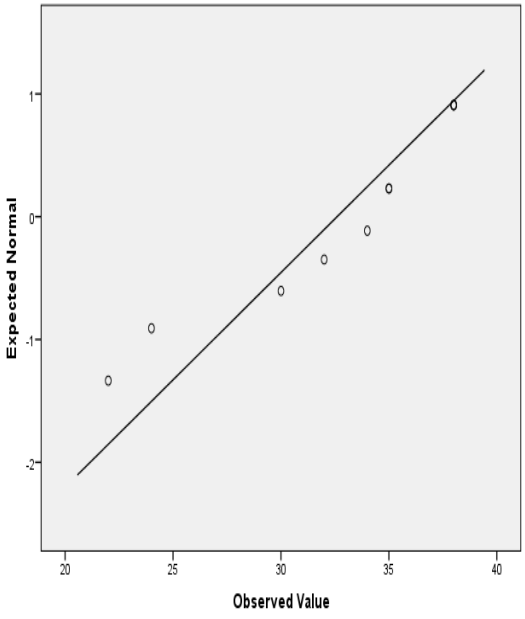
2. α value

$\alpha = 0.05$

3. Assumption

- Normality test-BBS score is normally distributed (Kolmogorov- Smirnov = .200, histogram and QQ plot)





- Homogeneity (base line criterias are similar, table: 1)

- Sample size 30<

4. Compute the statistics

- Paired t test

Table 4:

Variable	Experimental pretest mean	Experimental posttest mean	Mean Difference	Paired t test		Comment
				T value	Significance (2 tailed) P value	
BBS	32.60	48.90	-16.300	-10.471	.000	Significant

The table is showing there is difference in actual mean and there is also statistically significant difference between the means (t = -10.471, P = .000). Since the p value is less than 0.05, the result is significant and the null hypothesis is rejected and the alternative hypothesis is accepted. So, it can conclude that Mirror Therapy along with conventional physiotherapy is effective in individual group to improve balance for the patients with stroke in terms of balance.

Q. Is there any difference between Control Pre BBS mean and Control Post BBS mean?

1. Hypothesis

H_0 = There is no difference between control pre BBS mean and control post BBS mean

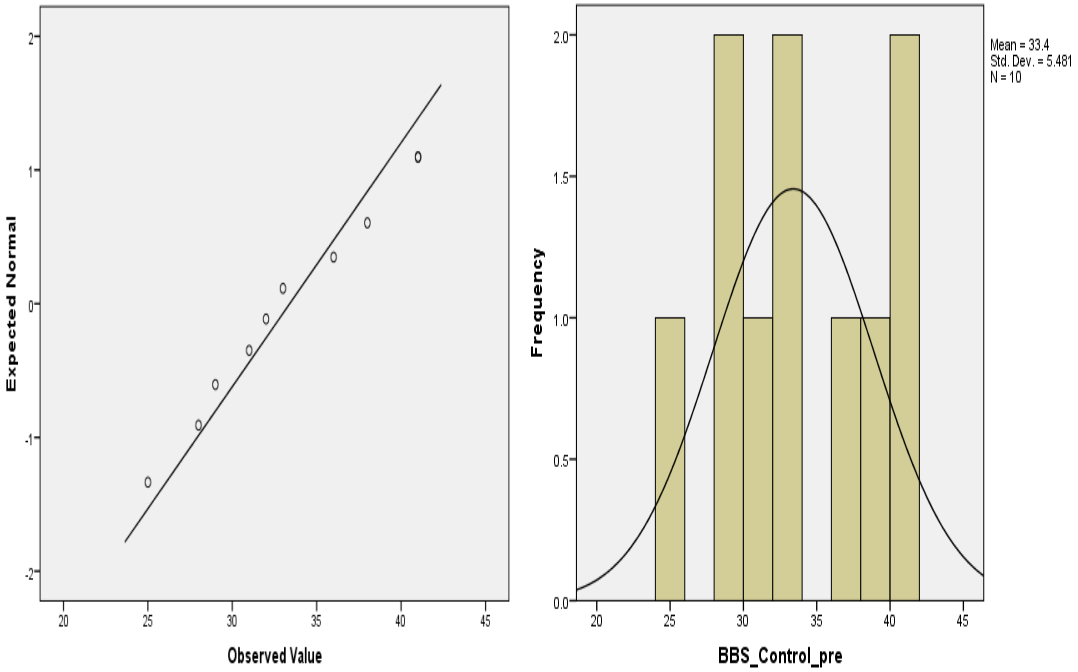
H_A= There is difference between control pre BBS mean and control post BBS mean

2. α value

$\alpha = 0.05$

3. Assumption

- Normality test-BBS score is normally distributed (, histogram and QQ plot)



- Homogeneity (base line criteria's are similar, table: 1)

- Sample size 30<

4. Compute the statistics

- Paired t test

Table 5:

Variable	Control pretest mean	Control posttest mean	Mean Difference	Paired t test		Comment
				T value	Significance (2 tailed) P value	
BBS	33.40	44.50	-11.100	-10.589	.000	Significant

The table is showing there is difference in actual mean and there is also statistically significant difference between the means (t = -10.589, P = .000). Since the p value is less than 0.05, the result is significant and the null hypothesis is rejected and the alternative hypothesis is accepted. So, it can conclude that Conventional Physiotherapy is effective in individual group to improve balance for the patients with stroke in terms of balance.

Q. Is there any difference between Experimental Pre BBS mean and Control Pre BBS mean?

1. Hypothesis

H_0 = There is no difference between experimental pre BBS mean and control pre BBS mean

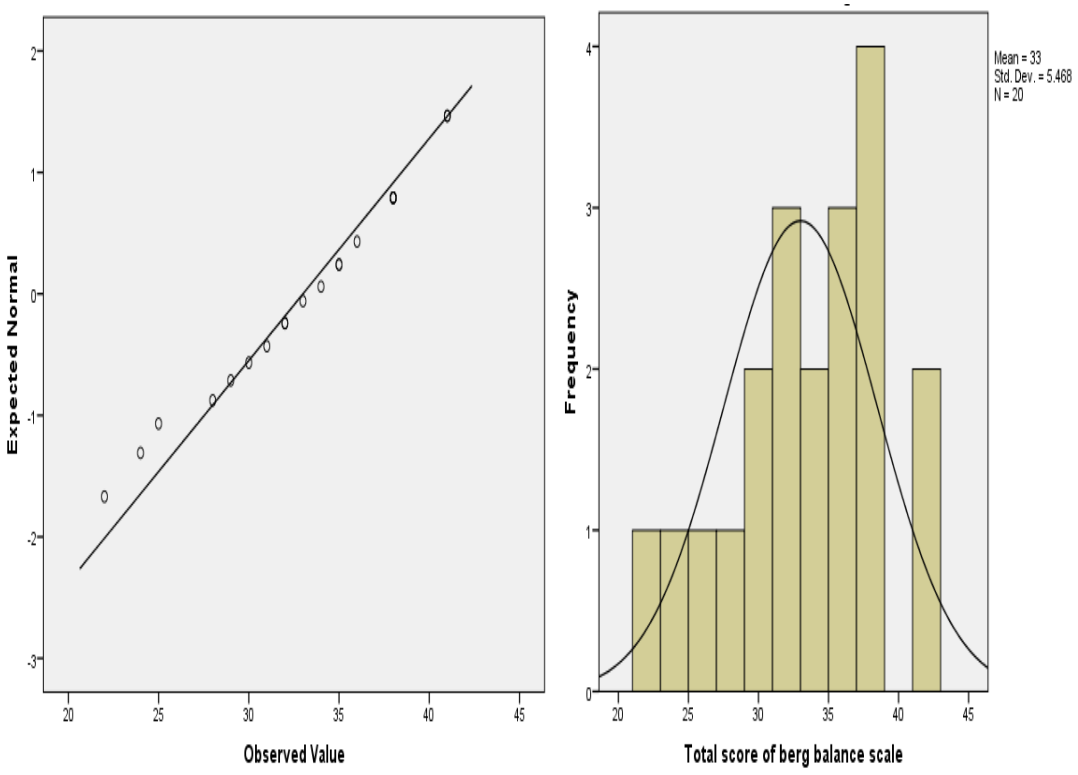
H_A= There is difference between experimental pre BBS mean and control pre BBS mean

2. α value

α = 0.05

3. Assumption

- Normality test-BBS score is normally distributed (Kolmogorov- Smirnov = .200, histogram and QQ plot)



- Homogeneity (base line criteria's are similar, table: 1)

- Sample size 30<

4. Compute the statistics

- Unpaired t test

Table 6:

Variable	Experimental pretest mean	Control pretest mean	Mean Difference	Unpaired t test		Comment
				T value	Significance (2 tailed) P value	
BBS	32.40	33.40	-.800	-.319	.753	Not Significant

The table is showing BBS experimental pretest and control pretest there is little difference in actual mean but there is no statistically significant difference between the two mean (t = -.319, P =.753). Since the p value is greater than 0.05, the result is not significant and the null hypothesis cannot be rejected.

Q. Is there any difference between Experimental Post BBS mean and Control Post BBS mean?

1. Hypothesis

H_0 = There is no difference between experimental post BBS mean and control post BBS mean

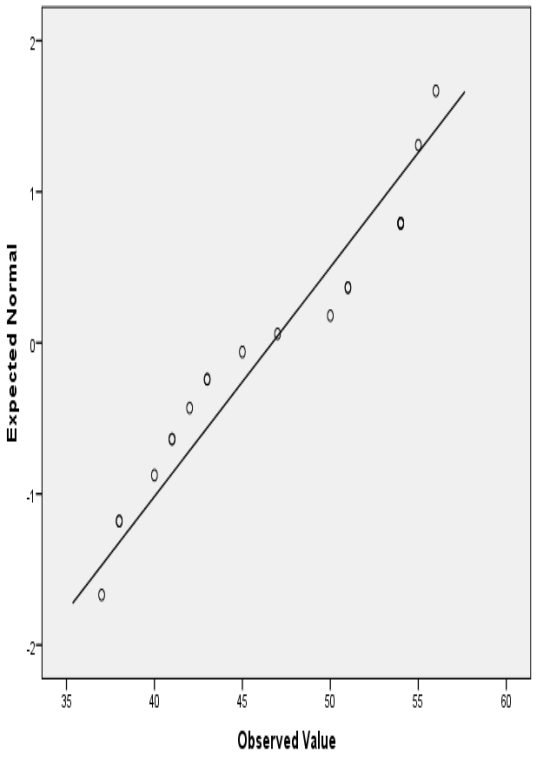
H_A= There is difference between experimental post BBS mean and control post BBS mean

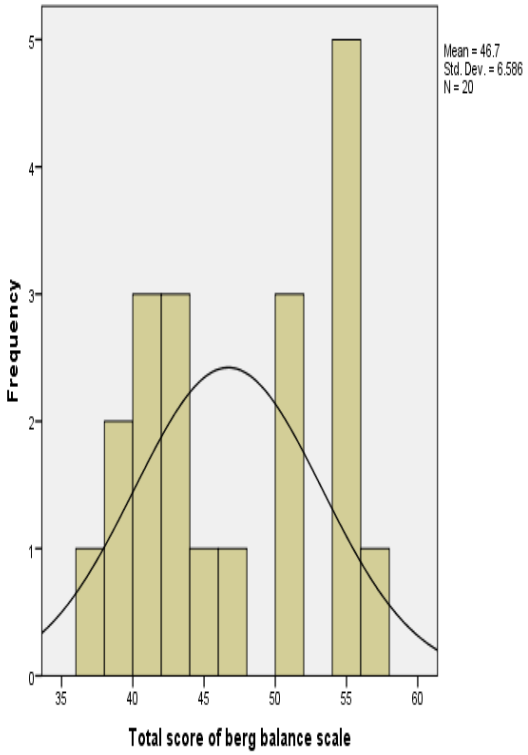
2. α value

$\alpha = 0.05$

3. Assumption

- Normality test-BBS score is normally distributed (.149, histogram and QQ plot)





- Homogeneity (base line criteria's are similar, table: 1)

- Sample size 30<

4. Compute the statistics

- Unpaired t test

Table 7:

Variable	Experimental posttest mean	Control posttest mean	Mean Difference	Unpaired t test		Comment
				T value	Significance (2 tailed) P value	
BBS	48.90	44.50	4.400	1.548	.139	Not Significant

The table is showing BBS experimental posttest and control posttest there is approximately 4.400 unit actual mean difference but statistical difference is not significant (t = 1.548, P =.139). Since the p value is greater than 0.05, the result is not significant and the null hypothesis cannot be rejected.

In the individual group, there was a positive effect of treatment. However, in between group analysis no group could be able to bring superior effect in the experimental group and control group. But clinically there is difference, experimental group treatment has little superior effect than control group but statistically the improvement was not significant.

Q. Is there any difference between Experimental Pre 10 meter walk mean and Experimental Post 10 meter walk mean?

1. Hypothesis

H_0 = There is no difference between experimental pre 10 meter mean and experimental post 10 meter walk mean

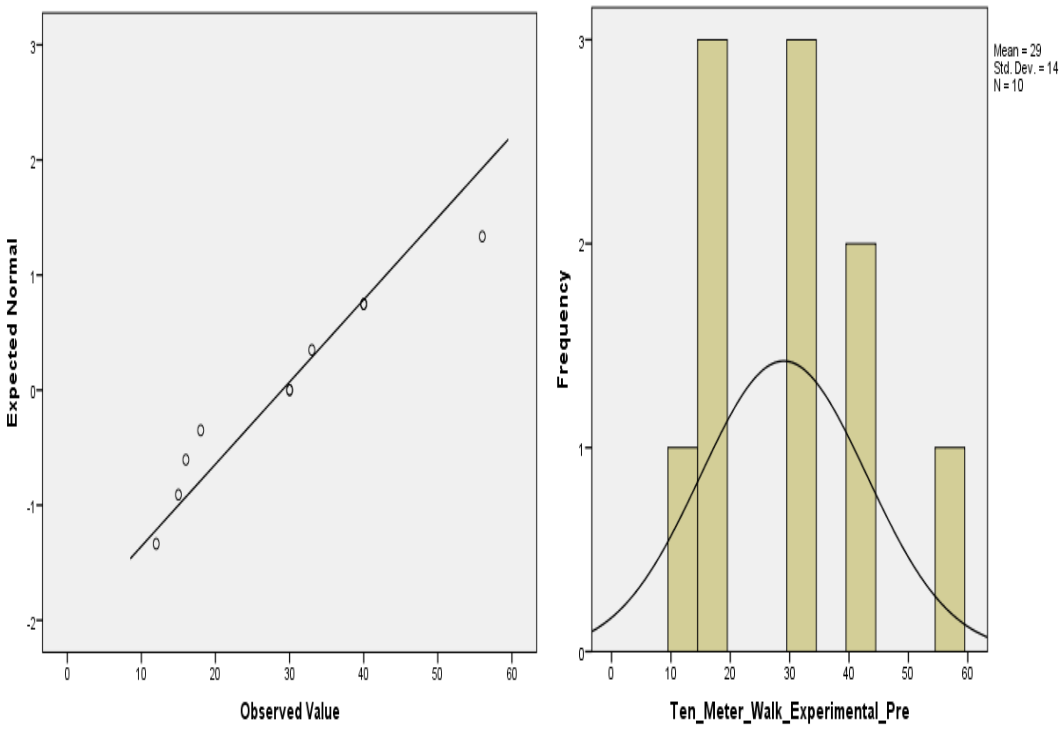
H_A= There is difference between experimental pre 10 meter walk mean and experimental post 10 meter walk mean

2. α value

$\alpha = 0.05$

3. Assumption

- Normality test-10 meter walk score is normally distributed (Kolmogorov- Smirnov = .200, histogram and QQ plot)



- Homogeneity (base line criteria's are similar, table:1)

- Sample size 30<

4. Compute the statistics

- Paired t test

Table 8:

Variable	Experimental pretest mean	Experimental posttest mean	Mean Difference	Paired t test		Comment
				T value	Significance (2 tailed) P value	
10 meter walk test	29.00	19.60	9.400	5.045	.001	Significant

The table is showing there is difference in actual mean and there is statistically significant difference between the means (t =5.045, P = .001). Since the p value is less than 0.05, the result is significant. So null hypothesis is rejected and the alternative hypothesis is accepted. So, it can conclude that Mirror Therapy along with conventional physiotherapy is effective in individual group to improve walking speed for the patients with stroke.

Q. Is there any difference between Control Pre 10 Meter Walk mean and Control Post 10 Meter walk mean?

1. Hypothesis

H_0 = There is no difference between control pre 10 meter walk mean and control post 10 meter walk mean

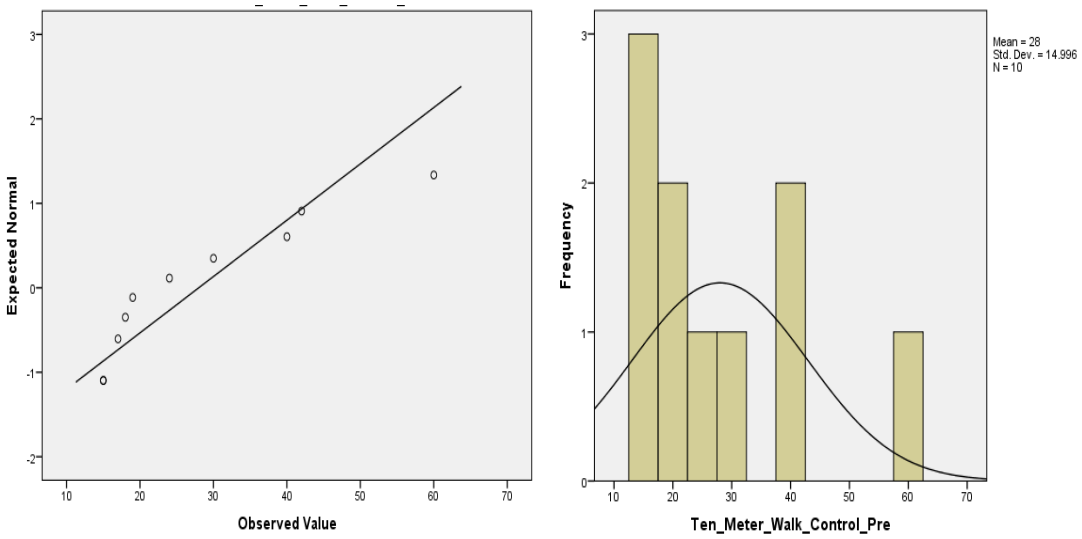
H_A= There is difference between control pre 10 meter walk mean and control post 10 meter walk mean

2. α value

α = 0.05

3. Assumption

- Normality test-BBS score is normally distributed (Kolmogorov- Smirnov = .160, histogram and QQ plot)



- Homogeneity (base line criteria's are similar, table:1)

- Sample size 30<

4. Compute the statistics

- Paired t test

Table 9:

Variable	Control pretest mean	Control posttest mean	Mean Difference	Paired t test		Comment
10 meter walk test	28.00	22.20	5.800	T value: 3.455	Significance (2 tailed) P value: .007	Significant

The table is showing there is difference in actual mean and there is also statistically significant difference between the means (t = 3.455, P = .007). Since the p value is less than 0.05, the result is significant. So null hypothesis is rejected and the alternative hypothesis is accepted. So, it can conclude that Conventional Physiotherapy is effective in individual group to improve walking speed for the patients with stroke.

Q. Is there any difference between Experimental Pre 10 Meter Walk mean and Control Pre 10 Meter Walk mean?

1. Hypothesis

H_0 = There is no difference between experimental pre 10 Meter walk mean and control pre 10 meter walk mean

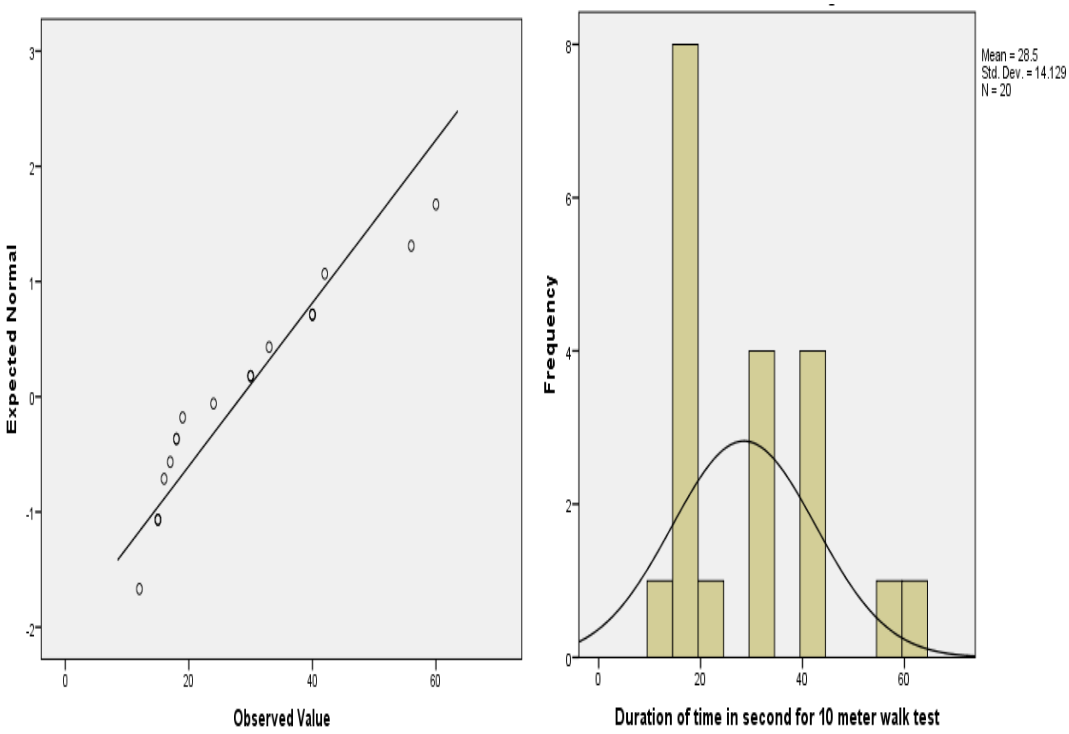
H_A= There is difference between experimental pre 10 meter walk mean and control pre 10 meter walk mean

2. α value

$\alpha = 0.05$

3. Assumption

- Normality test-10 meter walk test score is normally distributed (Kolmogorov- Smirnov = .160, histogram and QQ plot)



- Homogeneity (base line criteria's are similar, table:

- Sample size 30<

4. Compute the statistics

- Unpaired t test

Table 10:

Variable	Experimental pretest mean	Control pretest mean	Mean Difference	Unpaired t test		Comment
				T value	Significance (2 tailed) P value	
10 meter walk test	29.00	28.00	1.000	.154	.879	Not Significant

The table is showing 10 meter walk experimental pretest and control pretest, there is difference in actual mean but there is no statistically significant difference between the two mean (t = .154, P =.879). Since the p value is greater than 0.05, the result is not significant and the null hypothesis cannot be rejected.

Q. Is there any difference between Experimental Post 10 Meter Walk mean and Control Post 10 Meter Walk mean?

1. Hypothesis

H_0 = There is no difference between experimental pre 10 Meter walk mean and control pre 10 meter walk mean

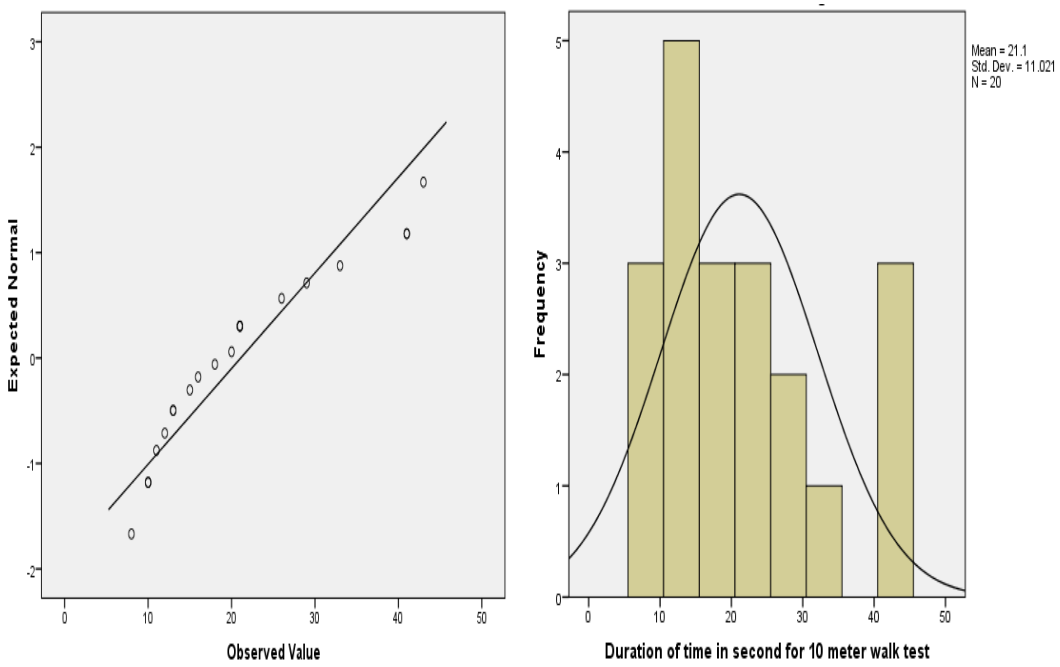
H_A= There is difference between experimental pre 10 meter walk mean and control pre 10 meter walk mean

2. α value

α = 0.05

3. Assumption

- Normality test-10 meter walk test score is normally distributed (Kolmogorov- Smirnov = .029, histogram and QQ plot)



- Homogeneity (base line criteria's are similar, table: 1)

- Sample size 30<

4. Compute the statistics

- Unpaired t test

Table 11:

Variable	Experimental posttest mean	Control postest mean	Mean Difference	Unpaired t test		Comment
				T value	Significance (2 tailed) P value	
10 meter walk test	20.00	22.00	-2.200	-.437	.667	Not Significant

The table is showing 10 meter walk experimental posttest and control posttest there is approximately -2.200 unit actual mean difference but statistical difference is not significant (t = -.437, P =667). Since the p value is greater than 0.05, the result is not significant and the null hypothesis cannot be rejected.

In the individual group, there was a positive effect of treatment. However, in between group analysis no group could be able to bring superior effect in the experimental group and control group. But clinically there is difference, experimental group treatment has little superior effect than control group but statistically the improvement was not significant.

Q. Is there any difference between Experimental Pre Time Up and Go mean and Experimental Post Time Up and Go mean?

1. Hypothesis

H_0 = There is no difference between experimental pre time up and go mean and experimental post time up and go mean

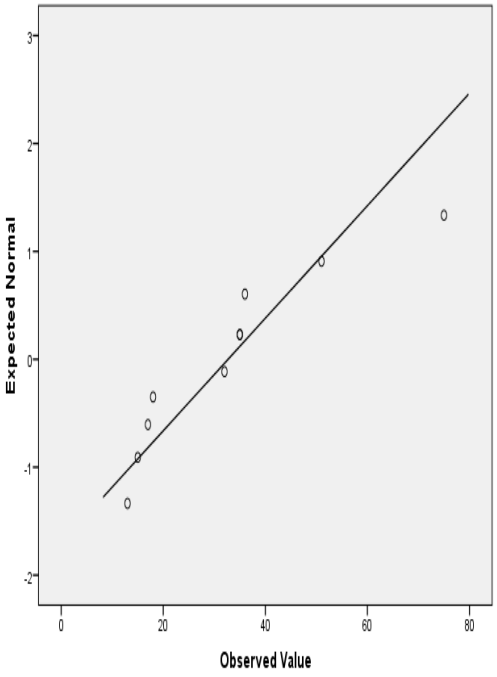
H_A= There is difference between experimental pre time up and go mean and experimental post time up and go mean

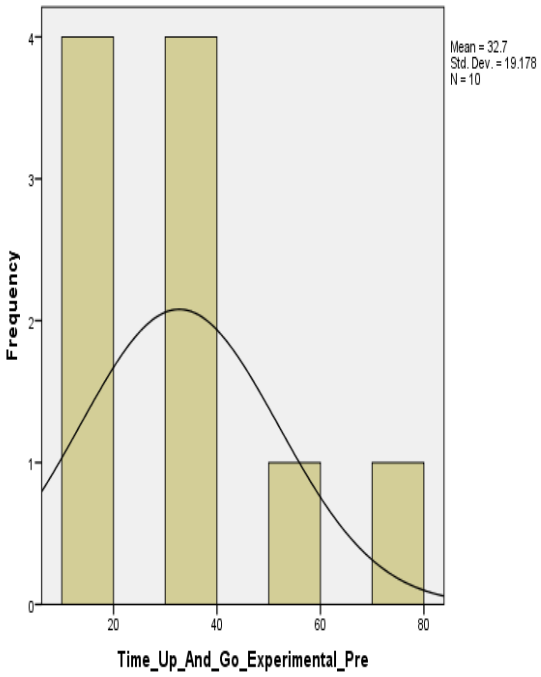
2. α value

$\alpha = 0.05$

3. Assumption

- Normality test-time up and go in second is normally distributed (Kolmogorov- Smirnov = .137, histogram and QQ plot)





- Homogeneity (base line criteria's are similar, table: 1)

- Sample size 30<

4. Compute the statistics

- Paired t test

Table 12:

Variable	Experimental pretest mean	Experimental posttest mean	Mean Difference	Paired t test		Comment
				T value	Significance (2 tailed) P value	
Time up and go	32.70	23.60	9.100	2.658	.026	Significant

The table is showing there is difference in actual mean and there is statistically significant difference between the means (t =2.658, P = .026). Since the p value is less than 0.05, the result is significant. So null hypothesis is rejected and the alternative hypothesis is accepted. So, it can conclude that Mirror Therapy along with conventional physiotherapy is effective in individual group for the patients with stroke.

Q. Is there any difference between Control Pre Time Up and Go mean and Control Post Time Up and Go mean?

1. Hypothesis

H_0 = There is no difference between control pre time up and go mean and control post time up and go mean

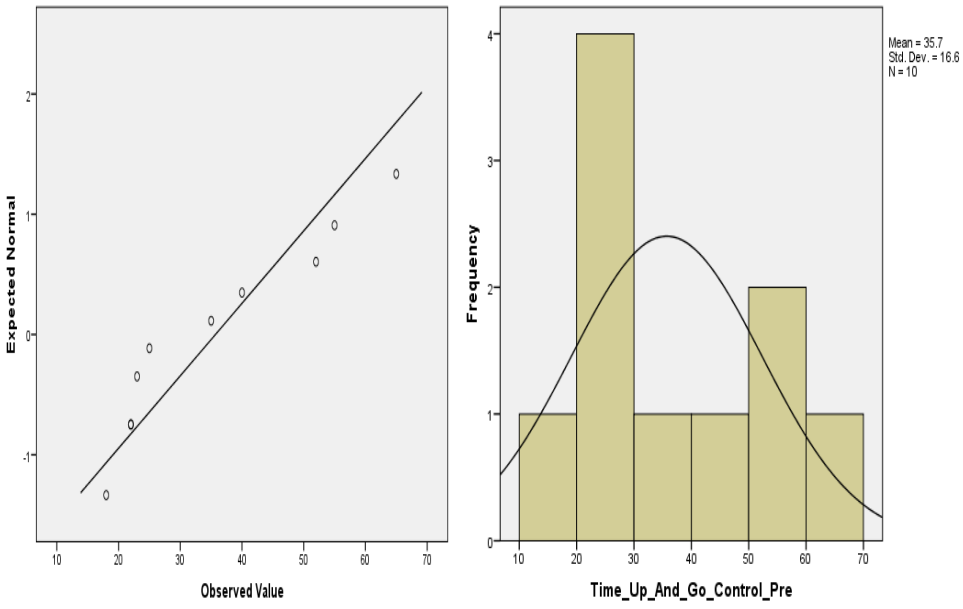
H_A= There is difference between control pre time up and go mean and control post time up and go mean

2. α value

α = 0.05

3. Assumption

- Normality test- time up and go in second is normally distributed (Kolmogorov- Smirnov = .106, histogram and QQ plot)



- Homogeneity (base line criteria's are similar, table: 1)

- Sample size 30<

4. Compute the statistics

- Paired t test

Table 13:

Variable	Control pretest mean	Control posttest mean	Mean Difference	Paired t test		Comment
				T value	Significance (2 tailed) P value	
Time up and go	35.70	28.90	6.800	3.844	.004	Significant

The table is showing there is difference in actual mean and there is also statistically significant difference between the means (t = 3.844, P = .004). Since the p value is less than 0.05, the result is significant. So null hypothesis is rejected and the alternative hypothesis is accepted. So, it can conclude that Conventional Physiotherapy is effective in individual group for the patients with stroke.

Q. Is there any difference between Experimental Pre Time Up and Go mean and Control Pre Time Up and Go mean?

1. Hypothesis

H_0 = There is no difference between experimental pre time up and go mean and control pre time up and go mean

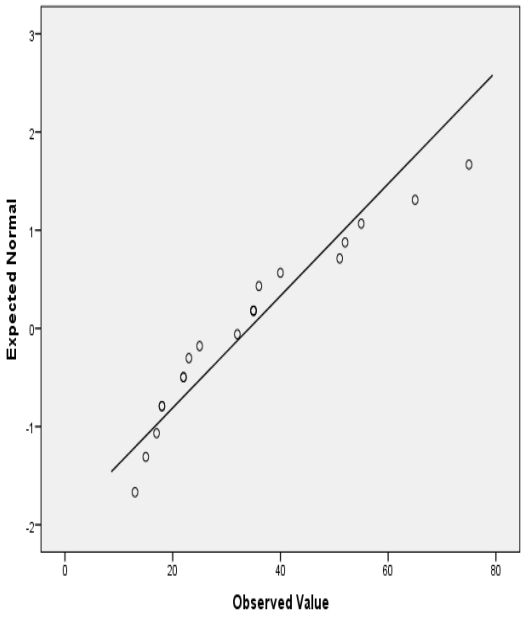
H_A= There is difference between experimental pre time up and go mean and control pre time up and go mean

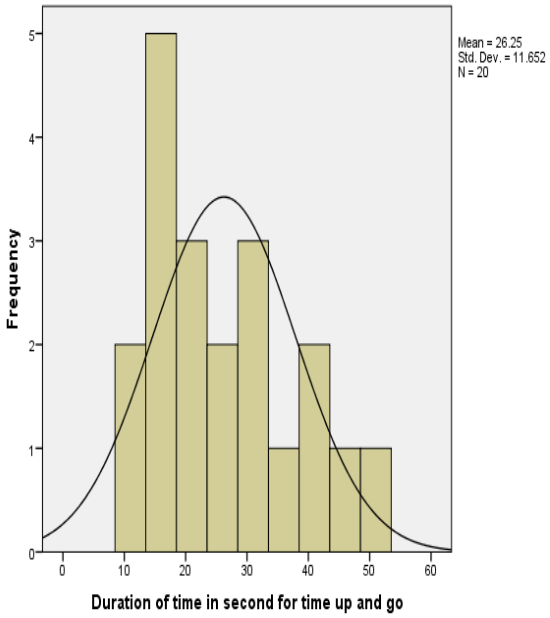
2. α value

$\alpha = 0.05$

3. Assumption

- Normality test-time up and go in second is normally distributed (Kolmogorov- Smirnov = .199, histogram and QQ plot)





- Homogeneity (base line criteria's are similar, table:

- Sample size 30<

4. Compute the statistics

- Unpaired t test

Table 14:

Variable	Experimental pretest mean	Control pretest mean	Mean Difference	Unpaired t test		Comment
				T value	Significance (2 tailed) P value	
Time up and go	32.70	35.70	-3.000	-.374	.713	Not Significant

The table is showing time up and go experimental pretest and control pretest there is little difference in actual mean but there is no statistically significant difference between the two

mean (t = -.374, P =.713). Since the p value is greater than 0.05, the result is not significant and the null hypothesis cannot be rejected.

Q. Is there any difference between Experimental Post Time Up and Go mean and Control Post Time Up and Go mean?

1. Hypothesis

H_0 = There is no difference between experimental post time up and go mean and control post time up and go mean

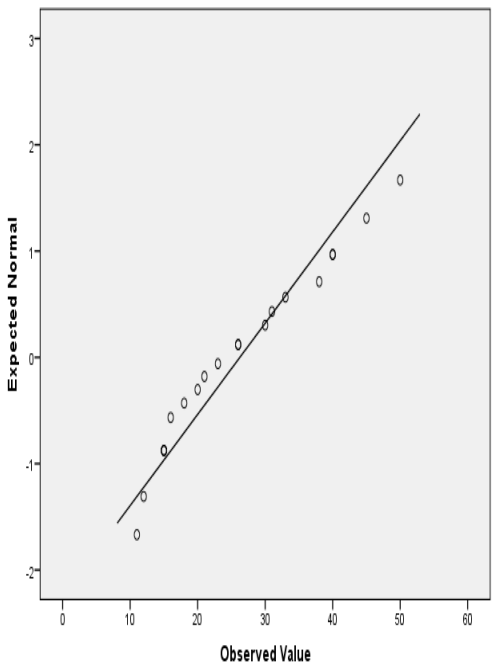
H_A= There is difference between experimental post BBS mean and control post BBS mean

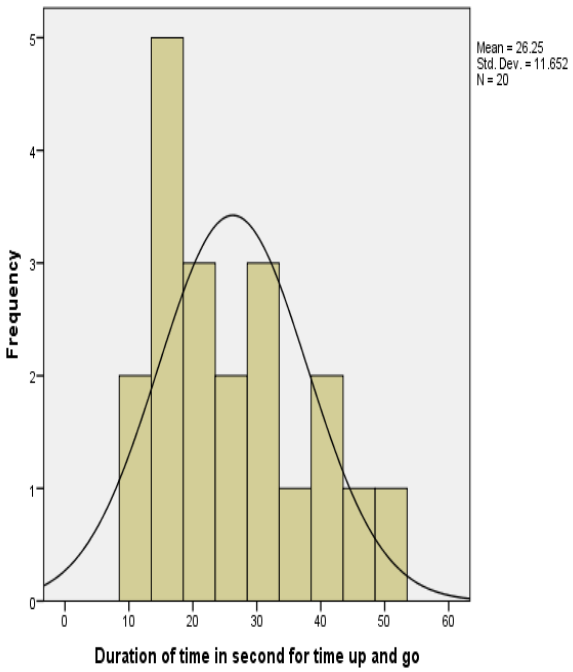
2. α value

α = 0.05

3. Assumption

- Normality test-BBS score is normally distributed (.200, histogram and QQ plot)





- Homogeneity (base line criteria's are similar, table:

- Sample size 30<

4. Compute the statistics

- Unpaired t test

Table 15:

Variable	Experimental posttest mean	Control posttest mean	Mean Difference	Unpaired t test		Comment
					Significance (2 tailed)	
Time up and go	23.60	28.90	-5.300	T value -1.018	P value .322	Not Significant

The table is showing time up and go experimental posttest and control posttest there is approximately -5.300 unit actual mean difference but statistical difference is not significant (t = -1.018, P =.322). Since the p value is greater than 0.05, the result is not significant and the null hypothesis cannot be rejected.

In the individual group, there was a positive effect of treatment. However, in between group analysis no group could be able to bring superior effect in the experimental group and control group. But clinically there is difference, experimental group treatment has little superior effect than control group but statistically the improvement was not significant.

Q. Is there any co-relation between age and berg balance, 10-meter walk, time up and go (TUG)?

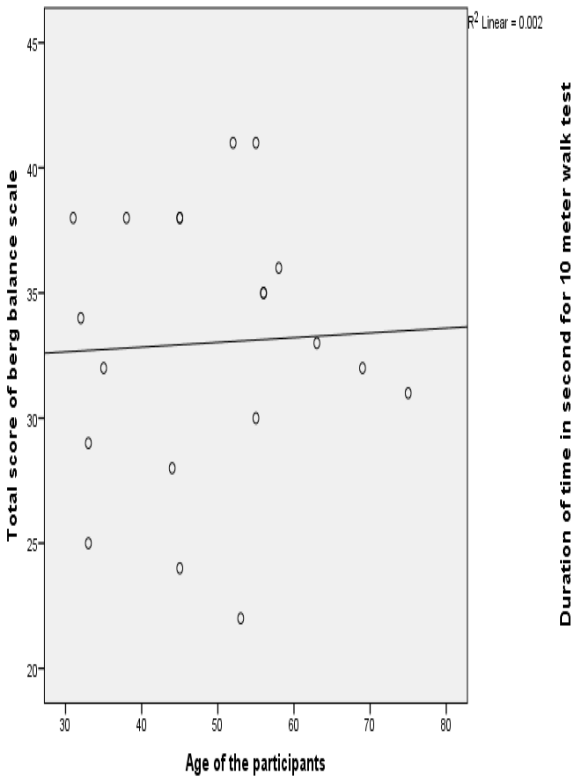
1. Hypothesis

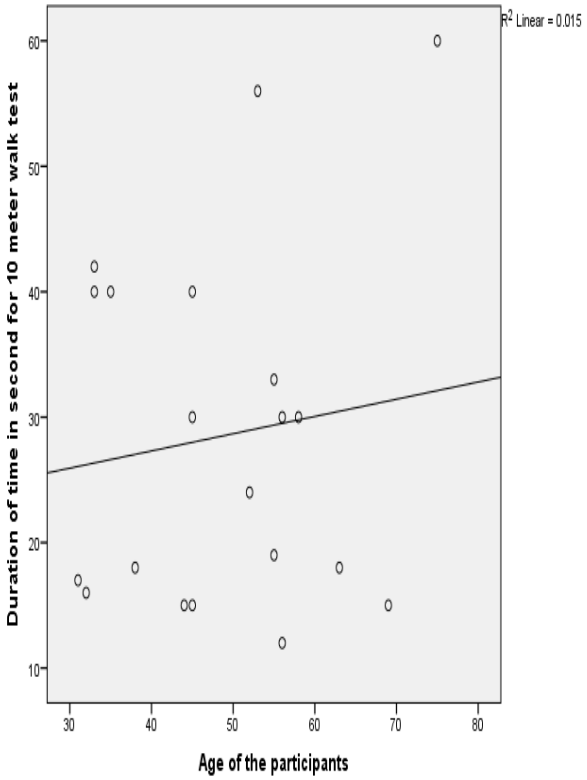
H_0 = There is no co- relation between age and berg balance, 10 meter walk, time up and go (TUG)

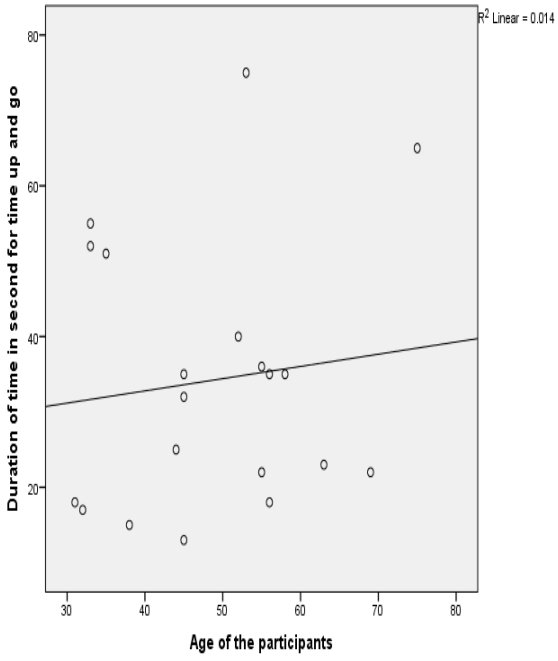
H_A= There is difference between age and berg balance, 10 meter walk, time up and go (TUG)

Test assumption:

1. Two continuous variable
2. Normally distributed
3. Presence of linear association







3. Level of significance (P value < .05)

Table 16:

Variable 1	Variable 2	Pearson correlation coefficient (r)	Sig (2 tailed) P value	Decision
Age	Berg Balance	0.044	0.854	Not significant
	10 meter walk	0.123	0.604	Not significant
	Time up and go	0.117	0.622	Not significant

A negative co-relation relation found between age and berg balance, 10 meter walk, time up and go (TUG). And their significant value were berg balance (.854), 10 meter walk (.604), time up and go (.622). Their correlation co-efficient value (r) were 0.044, 0.123, and 0.117. That means berg balance 10 meter walk and time up and go are not correlate with age. Since the p value is greater than 0.05, the result is not significant and the null hypothesis cannot be rejected.

Q. Is there any co-relation between age and berg balance, 10 meter walk, time up and go (TUG)?

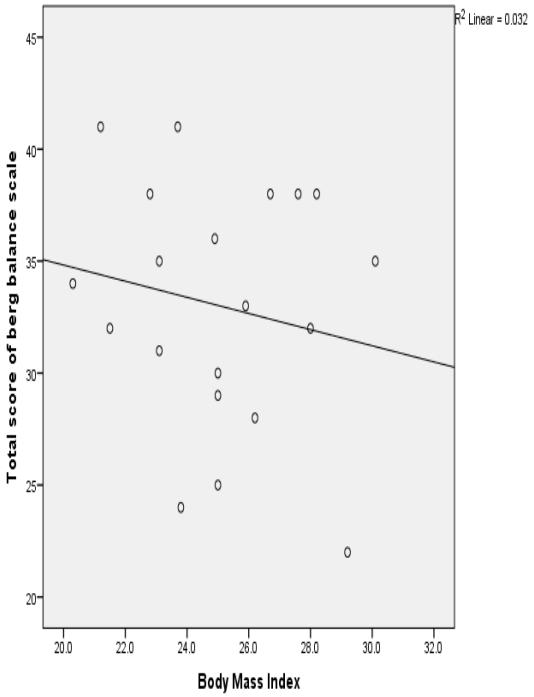
1. Hypothesis

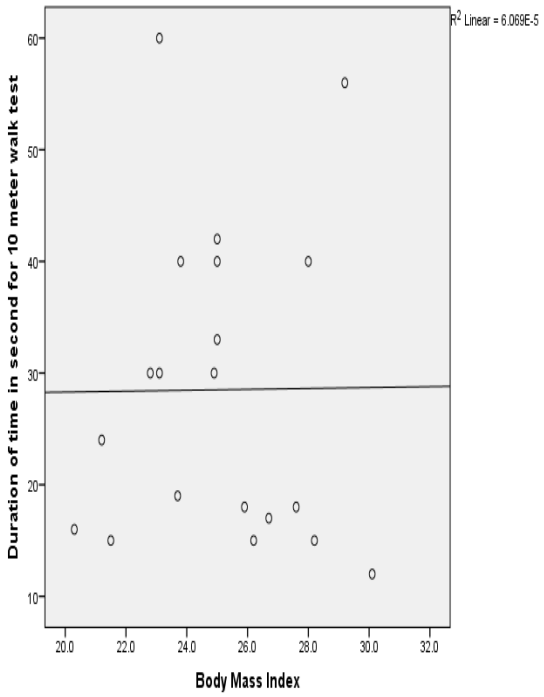
H_0 = There is no co- relation between age and berg balance, 10 meter walk, time up and go (TUG)

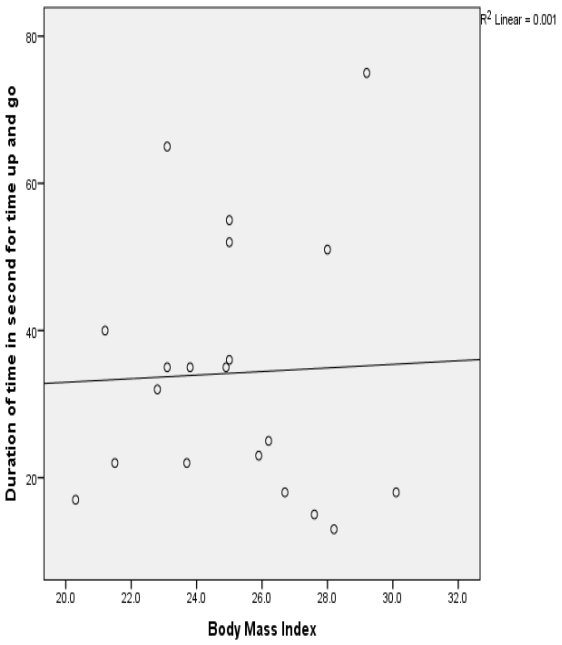
H_A= There is difference between age and berg balance, 10 meter walk, time up and go (TUG)

2. Test assumption:

1. Two continuous variable
2. Normally distributed
3. Presence of linear association







3. Level of significance (P value < .05)

Table 17:

Variable 1	Variable 2	Pearson correlation coefficient (r)	Sig (2 tailed) P value	Decision
BMI	Berg Balance	-.178	.452	Not significant
	10 meter walk	.008	.974	Not significant
	Time up and go	.038	.875	Not significant

A negative co-relation relation found between BMI and berg balance, 10 meter walk, time up and go (TUG). And their significant value were berg balance (.452), 10 meter walk (.974), time up and go (.875). Their correlation co-efficient value (r) were -.178, .008, and .038. That means berg balance 10-meter walk and time up and go are not correlate with age. Since the p value is greater than 0.05, the result is not significant and the null hypothesis cannot be rejected.

Summary of inferential analysis

Table 18: Within group analysis

Variable	Experimental pre test and post test				Control pre test and post test			
Paired t test	Mean difference	t value	p value	Comment	Mean difference	t value	p value	comment
Berg balance scale	16.300	10.471	.000	Significant	11.100	10.589	.000	Significant
10 meter walk test	9.400	5.045	.001	Significant	5.800	3.455	.007	Significant
Time up and go	9.100	2.658	.026	Significant	6.800	3.844	.004	Significant

Table 19: Between group analysis

Variable	Experimental pre test and Control pre test				Experimental post test and Control post test			
Paired t test	Mean difference	t value	p value	Comment	Mean difference	t value	p value	comment
Berg balance scale	.800	.319	.753	Not Significant	4.400	1.548	.139	Not Significant
10 meter walk test	1.00	.154	.879	Not Significant	2.200	.437	.667	Not Significant
Time up and go	3.000	.374	.713	Not Significant	5.300	1.018	.322	Not Significant

CHAPTER-V DISCUSSION

The purpose of this study was to investigate the effectiveness of lower extremity mirror therapy on balance and gait for post stroke patients. In this study, 10 stroke patients were randomly assigned as experimental group and 10 stroke patients were assigned as control group. Among these patients, the experimental group received Mirror therapy with conventional physiotherapy and rest of the 10 patients included in the control group who received only conventional physiotherapy. Both the groups attended the 12 sessions of treatment at the outpatient neurology unit physiotherapy department of CRP, Savar and Mirpur in order to identify the improvement. The functional outcome was measured by using structural type of questionnaire, the Berg Balance Scale (BBS), 10 meter walk test and time up and go.

The base line data demonstrates that there was no significant difference between the group therefore both the groups were homogenous which is a very important component of any clinical trial.

Age is a factor that provokes the test result. In this study, it was found that among 20 participants with stroke the mean age of participants were 48.65 and standard deviation were 12.692 whereas experimental group mean age with standard deviation were 46(8.907) and control group mean age with standard deviation were 51(15.656).

About 80% of the 20 stroke patients in this study were male, whereas only 20% were women. In an epidemiological study in Bangladesh showed that 74% were male patients and 26% were female patients (Islam et al., 2012). So male are more affected.

Result showed that among 20 participants, 2 participants was illiterate in the control group and 2 participants was in experimental group, 1 participants of control group was in primary level and 5 participants was in experimental group. 2 participant of experimental group was in secondary level whereas 1 participant in control group. There were no participants was in higher secondary level in control group and 1 participant was in experimental group. In graduation level 3 participants was from control group and no participant from experimental group. Also no participant of experimental group was in post

graduation level whereas 3 participant in control group. A study by Hossain et al. (2011) in Bangladesh found that approximately received schooling patients were 31%, collage education received were 19%, university going or like similar institution patients were 13%and patients who were not attend school or others was 37%.

Additionally, it was discovered in this study that 40% of patients had left-side involvement whereas 60% of patients had right-side involvement. As a result, the right side was affected more than the left.

The research also revealed that 85% of patients had ischemic strokes, whereas 15% had hemorrhagic strokes. According to an epidemiological study, the majority (61.18%) of patients experienced ischemic stroke, while the remaining patients had intracranial hemorrhages (29.40%), subarachnoid hemorrhages (8.24%), or aneurysms (1.18%) (Islam et al., 2012). Another research revealed that 28.70% of patients had hemorrhagic stroke and 71.29% had ischemic stroke. (Sheffer, 2012).

Among the total 20 participants of control group (n=3) 30% had hypertension, (n=6) 60% were affected by hypertension and diabetes mellitus and (n=1) 10% did not have any comorbidity. On the other hand, among 10 participants in experimental group (n=4) 40% were had hypertension, (n=3) 30% were affected by hypertension and diabetes mellitus and (n=3) 30% did not have any comorbidity. Another study by Mondol et al. (2012) found that 56.7% were affected by hypertension, diabetics was the next common entry 23%, ischemic heart disease was 17.7%, dyslipidemia was 5.1%, rheumatologic condition 6.6%, respiratory disease 3.6% chronic kidney disease 2.4%, electric imbalance 1.2%, dementia 1.2% and malignancy 0.2%.

Among participants, Mean BMI was 25.180 (3.2501) in experimental group and 24.80 (1.9008) in control group. In another study showed that 56.8% participants BMI was less than 25 and 34.3% participants BMI was more than 25 (Choo et al., 2009).

20 patients with stroke were included as sample of the study, among them almost 60% (n=12) lived in urban and 40% (n=8) lived in rural.

The mean difference on the Berg balance scale shows that the Experimental group balance has improved more than the Control group. The mean difference before the test was.800, and after the test, it was 4.400. The study was statistically evaluated using paired t tests and independent sample t tests. At two-tailed hypothesis, a significant difference within group was observed.

But no significant difference between the groups was observed.So it can be said that traditional treatment as well as mirror therapy individually there have a positive effect of each treatment. However, in between group analysis no group could be able to bring superior effect. But clinically there was difference, experimental group treatment (mean difference = 4 unit) has little superior effect than control group but statistically the improvement was not significant.

In a research conducted by Mohan et al. (2013), 22 patients with acute post-stroke were divided in two groups and given a traditional rehabilitation program for 90 minutes per day, six days per week, for a total of two weeks. The additional MT was given to the MT group for 30 minutes each day. Both before and after the two weeks of treatment all patients received evaluation. The Brunel Balance Assessment showed no significant difference (BBA).

Another study by In et al. (2016) 30 chronic stroke patients were divided into two groups, and both groups received a conventional rehabilitation programme, 30 min a day, five days a week, for four weeks. The VRRT (Virtual reality reflection therapy) additionally received VRRT program, 30 minutes a day, five days a week, for four weeks. The control group performed the placebo VRRT program for the same duration. The changes in dynamic balance ability, static balance ability were assessed before and after the intervention. A significant difference was determined in the berg balance scale (BBA).

The result showed for TUG test calculated by Unrelated/independent t test in between group at 5% level of significant described that the calculated *t* value is -1.018 and paired t test for TUG test observed t value was 3.844 in the control group at two tailed paired t test while this same variable for experimental group observed value was 2.658. Pre-test mean difference was 3 and post-test mean difference was 5. This indicate that balance and mobility more improved in Experimental group than the Control group. There was a significant difference found within group at two-tailed hypothesis.But there was no significant difference between the groups.So it can be said that traditional treatment as well as mirror therapy individually there have a positive effect of each treatment. However, in between group analysis no group could be able to bring superior effect.But clinically there was difference, experimental group treatment (mean difference = 2) has little superior effect than control group but statistically the improvement was not significant.

In a research by Mohan et al. (2013), 22 patients with acute post-stroke were divided into two groups and given a traditional rehabilitation program for 90 minutes per day, six days

per week, for a total of two weeks. The additional MT was given to the MT group for 30 minutes each day. Both before and after the two weeks of treatment all patients underwent evaluations. Utilizing the outcome measurement tool FAC, mobility was evaluated (Functional ambulation category). There was a noticeable difference that indicated the mirror group had improved more than the control group.

In this study, the result showed for 10 meter walk test calculated by Unrelated/independent t test in between group at 5% level of significant described that the calculated *t* value is .437 and paired t test for 10 meter walk test observed t value was 5.045 in the experimental group at two tailed hypothesis while this same variable for control group observed value was 3.455. Pre-test mean difference was 1 and post-test mean difference was 2.200. This indicate that gait ability more improved in Experimental group than the Control group. There was a significant difference found within group at two-tailed hypothesis. But there was no significant difference between the groups. So it can be concluded that traditional treatment as well as mirror therapy individually there have a positive effect of each treatment. However, in between group analysis no group could be able to bring superior effect. But clinically there was difference, experimental group treatment (mean difference = 1.200 unit) has little superior effect than control group but statistically the improvement was not significant.

A study by Ji and Kim (2015) The experimental group of 17 stroke patients got comprehensive rehabilitation treatment as well as mirror therapy for the lower limbs. The 17 patients in the control group received both thorough rehabilitation treatment and placebo therapy. For four weeks, participants in both groups got treatment five days a week. Temporospatial gait outcomes include step length, stride length, swing phase, stance phase, velocity, cadence, and step length. Between the experimental group and the control group, there was a significant different in post-training improvements for the single stance, step length, and stride length. The stance phase, swing phase, velocity, cadence, and step width did not significantly vary between the two groups ($P > 0.05$).17 stroke patients in the experimental group underwent comprehensive rehabilitation therapy and mirror therapy for lower limbs.17 patients in the control group underwent sham therapy and comprehensive rehabilitation therapy. Participants in both groups received therapy 5 days per week for four weeks. Outcome measured by temporospatial gait such as step length, stride length, rate of swing phase, rate of stance phase, velocity, cadence, step length. A

significant difference as observed in post-training gains for the single stance, step length, and stride length between the experimental group and the control group. However, there were no significant differences between two groups on stance phase, swing phase, velocity, cadence, and step width ($P > 0.05$).

In this study, no correlation have been found between age and BMI with berg balance, 10 meter walk test and time up and go.

Limitations

The study has several limitations.20 stroke patients with balance and gait issues participated in the study which had a limited sample size in both groups and did not provide enough data to generalize the findings to the larger population with this condition. Researcher only explored the effect of mirror therapy after 12 sessions, so the long-term effect of treatment was not explored in this study. Data was collected two clinical setting CRP Savar and Mirpur, it can influence the result. Sometimes treatment sessions were interrupted due to public holiday mistaken in appointment schedule may interrupt the result. The treatment period was small only 12 sessions of intervention for the two groups that experimental group and control group. Other studies with longer intervention time are required for conclusive results. There was no available research done in this area in Bangladesh. So, relevant information about with Mirror Therapy for Bangladesh was very limited in this study. So, further research is needed to confirm the effectiveness of Mirror therapy along with conventional physiotherapy for patients with stroke.

CHAPTER-VI CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The result of this experimental study have identified the effectiveness of lower extremity mirror therapy on balance and gait for post stroke patients. Participants of the mirror therapy with conventional physiotherapy showed no statistical significant value but there was a mean difference which indicate that mirror therapy with conventional physiotheapy can be an effective therapeutic approach for stroke patients with balance and gait problems.

6.2 Recommendations

- The study period was so short, future studies will need more time to complete.
- Investigator use only 20 participants as the sample of this study, in future the sample size would be more.
- Need more exercise included.
- Sample should collect from different hospital, clinic, institute and organization in different district of Bangladesh to generalize the result.

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Appendix- A

Application for thesis proposal

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

Subject: Application for review and ethical approval.

Dear sir,

With due respect, I am Nusrat Jahan, student of final year B.Sc. in Physiotherapy program at Bangladesh Health Professions Institute (BHPI) the academic institute of Centre for the Rehabilitation of the Paralysed (CRP) under the Faculty of Medicine, University of Dhaka. As per the course curriculum, I have to conduct a research project entitled "**Effectiveness of lower extremity mirror therapy on balance and gait for post stroke patients"** under the supervision of Asma Islam, Assistant Professor, Department of Physiotherapy, BHPI.

The purpose of the study is to determine effectiveness of lower extremity mirror therapy on balance and gait for post stroke patients after receiving both conventional physiotherapy and mirror therapy. The study involves face-to-face interview by using questionnaire to find out the improvement of balance and gait that may take 40 to 50 minutes to fill in the questionnaire and there is no likelihood of any harm to the participants. Related information will be collected from the patients' guide books. Data collectors will receive informed consent from all participants and the collected data will be kept confidential.

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

Sincerely,

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

Recommendation from the Supervisor

Asma Islam 06/02/22
Asma Islam
Assistant Professor
Department of Physiotherapy, BHPI.

Thesis presentation date: 12th October 2021

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

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

Appendix- B

Institutional Review Board (IRB) Letter

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

Ref: Date:

CRP/BHPI/IRB/03/2022/566

02/03/2022

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

Subject: Approval of the research project proposal **"Effectiveness of lower extremity mirror therapy on balance and gait for post stroke patients"** by ethics committee.

Dear Nusrat Jahan,
Congratulations.
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above-mentioned dissertation, with yourself, as the principal investigator and Asma Islam as thesis supervisor. The Following documents have been reviewed and approved:

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

The purpose of the study is to determine effectiveness of lower extremity mirror therapy on balance and gait for post stroke patients after receiving both conventional physiotherapy and mirror therapy. Since the study involves questionnaire that takes maximum 40-50 minutes and have no likelihood of any harm to the participants, the members of the Ethics committee approved the study to be conducted in the presented form at the meeting held at 09:00 AM on 12th October, 2021 at BHPI (30th IRB Meeting).

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

Best regards,

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

CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404
E-mail : principal-bhpi@crp-bangladesh.org, Web: bhpi.edu.bd, www.crp-bangladesh.org

Appendix – C

Application for Data collection

Permission Letter

Date: March 7, 2022

Head

Department of Physiotherapy

Centre for the Rehabilitation of the Paralysed (CRP)

Chapain, Savar, Dhaka-1343

Through: Head, Department of Physiotherapy, BHPI.

Subject: Application for seeking permission to collect data for conducting Research Project.

Respected Sir,

With due to respect and humble submission to state that I am Nusrat Jahan, a student of 4th year B.Sc. in physiotherapy at Bangladesh Health Professions Institute (BHPI). The Ethical committee has approved my research project entitled: **"Effectiveness of lower extremity mirror therapy on balance and gait for post stroke patients attended at CRP"** under the supervision of Asma Islam, Assistant professor, Department of Physiotherapy, BHPI. I want to collect data for my research project from the Department of Physiotherapy at CRP. So, I need permission for data collection from the Neurology Unit of Physiotherapy Department at CRP-Savar and Mirpur from 15th March to 15th July. I would like to assure that anything of the study will not be harmful for the participants and the Department itself.

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

Yours faithfully,

Nusrat Jahan

Nusrat Jahan

4th Year B.Sc. in Physiotherapy

Class Roll: 18; Session: 2015-16

Bangladesh Health Professions Institute (BHPI)

(An academic Institution of CRP)

CRP-Chapain, Savar, Dhaka-1343.

Forewarded to HOD PT BHPI
For his kind Consideration
07/03/22

Recommended
Shofiq
12.03.22
Md. Shofiqul Islam
Associate Professor & Head
Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343

Approved
MUHAMMAD ANWAR HOSSAIN
Senior Consultant &
Head of Physiotherapy Dept
Associate Professor, BHPI
CRP Savar Dhaka-1343

Appendix- D

সম্মতিপত্র

আসসালামুআলাইকুম / নমস্কার

আমি নুসরাত জাহান, বাংলাদেশ হেলথ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই) সি.আর.পি এর বি.এস.সি ইন ফিজিওথেরাপি কোর্সের চতুর্থ বর্ষের শিক্ষার্থী।আমার প্রাতিষ্ঠানিক কাজের অংশ হিসেবে একটি গবেষণা করতে হবে। অংশগ্রহণকারীদের নিম্নলিখিত পড়া পড়ে গবেষণায় অংশগ্রহণের জন্য অনুরোধ করা হচ্ছে।

আমার গবেষণার শিরোনাম হল- **" স্ট্রোক পরবর্তী রোগীদের জন্য ভারসাম্য এবং চলাফেরার উপর মিরর থেরাপির কার্যকারিতা।"** এই অধ্যয়নের লক্ষ্য হল স্ট্রোক পরবর্তী রোগীদের জন্য ভারসাম্য এবং চলাফেরার উপর মিরর থেরাপির কার্যকারিতা সনাক্ত করা।

আমার গবেষণা প্রকল্পটি পূরণ করতে, আমাকে ডেটা সংগ্রহ করতে হবে। আপনাকে কিছু প্রশ্নের উত্তর দিতে হবে যা সংযুক্ত ফর্মে উল্লেখ করা হয়েছে। এটি প্রায় 40-50 মিনিট সময় নেবে।

আমি আপনাকে জানাতে চাই যে এটি একটি সম্পূর্ণরূপে একাডেমিক অধ্যয়ন এবং অন্য কোন উদ্দেশ্যে ব্যবহার করা হবে না। আমি আশ্বাস দিচ্ছি যে সমস্ত তথ্য গোপন রাখা হবে। আপনার অংশগ্রহণ স্বেচ্ছায় হবে অংশগ্রহণকারী কোন অনুদান পাবে না। এটি আপনার চিকিৎসাকে প্রভাবিত করবে না। এই চিকিত্সা আপনার জন্য ক্ষতিকারক হবে না এবং স্বাভাবিক চিকিত্সার সাথে বিরোধিতা করবে না। আপনার সম্মতি প্রত্যাহার করার এবং অংশগ্রহণের তারিখ থেকে এক সপ্তাহের মধ্যে অংশগ্রহণ বন্ধ করার অধিকার থাকতে পারে। আপনি পছন্দ করেন না এমন একটি নির্দিষ্ট প্রশ্নের উত্তর দেওয়ার অধিকারও আপনার আছে। আপনার যদি অধ্যয়ন সম্পর্কে কোনো প্রশ্ন থাকে, আপনি আমার সাথে যোগাযোগ করতে পারেন।

সাক্ষাৎকার শুরু করার আগে আপনার কি কোনো প্রশ্ন আছে?

- ☐ হ্যাঁ
- ☐ না

যদি থাকে……

সুতরাং আমি আপনার অনুমতিতে এই সাক্ষাৎকার শুরু করতে পারি?

- ☐ হ্যাঁ
- ☐ না

অংশগ্রহণকারীর স্বাক্ষর এবং তারিখ……

তথ্য সংগ্রহকারীর স্বাক্ষর এবং তারিখ……

গবেষকের স্বাক্ষর এবং তারিখ……

Consent Form (English)

Assalamu-alaikum / Namaskar,

I am Nusrat Jahan, 4th year B.Sc. in Physiotherapy student of Bangladesh Health Professions Institute (BHPI) under Medicine faculty of University of Dhaka. To obtain my Bachelor degree, I shall have to conduct a research and it is a part of my study. The participants are requested to participate in the study after reading the following.

My research title is "Effectiveness of lower extremity mirror therapy on balance and gait for post stroke patients" Through this experimental research I will test the hypothesis "mirror therapy with conventional physiotherapy is better than only conventional physiotherapy for the treatment of stroke patients." The objective of my study is to identify the effectiveness of lower extremity mirror therapy on balance and gait for post stroke patients.

To fulfill my research project, I need to collect data. You have to answer some questions which are mentioned in the attached form. This will take approximately 40-50 minutes.

I would like to inform you that this is a purely academic study and will not be used for any other purpose. I assure that all data will be kept confidential. Your participation will be voluntary. You may have the right to withdraw consent and discontinue participation within 1 weeks of the experiment. You also have the right to answer a particular question that you don't like.

If you have any query about the study or right as a participant, you may contact with me.

Do you have any questions before I start?

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

Yes …… No……

Signature of the participant/carer with date

Signature of Data collector

Signature of the Interviewer with date

Appendix- E

প্রশ্নাবলী (বাংলা)

রোগীর আইডিঃ **পরীক্ষার তারিখঃ**

মোবাইল নাম্বারঃ

অংশ- ১:সামাজিক -জনসংখ্যা তাত্ত্বিক তথ্য

ব্যক্তিগত বিবরণী

১। রোগীর নাম:	
২। বয়স:	
৩।লিঙ্গ:	☐ পুরুষ ☐ মহিলা
৪। শিক্ষাগত যোগ্যতা:	☐ লেখাপড়া করেন নাই ☐ প্রাথমিক ☐ এস.এস.সি ☐ এইচ.এস.সি ☐ স্নাতক ☐ পোস্ট গ্রাজুয়েট
৫।বৈবাহিক অবস্থা	☐ বিবাহিত ☐ অবিবাহিত ☐ বিবাহ বিচ্ছেদ
৬। বসবাসের স্থান:	☐ গ্রাম ☐ শহর
৭।পরিবারের ধরন:	☐ একক ☐ যৌথ
৮। বর্তমান পরিস্থিতি মোকাবেলা করার জন্য মাসিক ব্যয়:	
৯। হিস্ট্রি অফ পলিফারমাচি	☐ হ্যাঁ ☐ না

স্বাস্থ্যবিষয়ক তথ্যাবলী

১। ওজন	
২। উচ্চতা	
৩। বি. এম. আই.	
৪। শারীরিক প্রকার	☐ মোটা ☐ চিকন ☐ মাঝারি
৫। কো-মরবিডিটি প্রকার	
৬। কো-মরবিডিটির সংখ্যা	☐ একটি ☐ একাধিক

স্টোক সম্পর্কিত তথ্যাবলী

১। স্টোক এর ধরন	☐ ইশ্চেমিক ☐ হেমোরেজিক
২। আক্রান্ত অংশ	☐ ডান ☐ বাম
৩। পরিবারের মধ্যে কারো স্টোক হয়েছে	☐ হ্যাঁ ☐ না
৪। পূর্বে স্টোক হয়েছে	☐ হ্যাঁ ☐ না

পূর্ববর্তী পরীক্ষা

অংশ-২: ভারসাম্য মূল্যায়ন

কাজ	নির্দেশনা	স্কোর
১। বসা থেকে দাঁড়ানো	অনুগ্রহপূর্বক দাঁড়ান। চেষ্টা করুন সাহায্যের জন্য আপনার হাত ব্যবহার না করতে।	☐ ৪- হাতের সাহায্য ছাড়া দাঁড়াতে পারে এবং ভারসাম্য রক্ষা করতে পারে ☐ ৩- হাতের সাহায্য নিয়ে নিজে নিজে দাঁড়াতে পারে ☐ ২-হাতের সাহায্য নিয়ে কয়েক বার চেষ্টার পর দাঁড়াতে পারে ☐ ১- দাঁড়াতে অথবা ভারসাম্য রক্ষা করতে ন্যূনতম সহযোগিতা লাগে ☐ ০- দাঁড়াতে মোটামুটি অথবা সম্পূর্ণ সহযোগিতা লাগে
২। অবলম্বন ছাড়া দাঁড়ানো	অনুগ্রহপূর্বক কোন কিছুর সাহায্য ছাড়া দুই মিনিট দাঁড়ান	☐ ৪- নিরাপদ ভাবে 2 মিনিট দাড়াতে পারে ☐ ৩- পর্যবেক্ষণসহ 2 মিনিট দাঁড়াতে পারে ☐ ২- অবলম্বন ছাড়া 30 সেকেন্ড দাঁড়াতে পারে ☐ ১- কয়েক বার চেষ্টার পর অবলম্বন ছাড়া 30 সেকেন্ড দাঁড়াতে পারে ☐ ০- অবলম্বন ছাড়া 30 সেকেন্ড দাঁড়াতে পারে না

৩। পিঠে অবলম্বন ছাড়া কিন্তু মেঝে অথবা টুল দিয়ে পায়ে অবলম্বন এর সাহায্যে বসা	অনুগ্রহপূর্বক হাত ভাঁজ করে দুই মিনিট বসুন	☐ ৪- নিরাপদ ভাবে 2 মিনিট বসতে পারে ☐ ৩- পর্যবেক্ষণসহ 2 মিনিট বসতে পারে ☐ ২- ৩০ সেকেন্ড বসতে পারে ☐ ১- ১০ সেকেন্ড বসতে পারে ☐ ০- অবলম্বন ছাড়া ১০ সেকেন্ড বসতে পারে না
৪। দাঁড়ানো থেকে বসা	অনুগ্রহপূর্বক বসুন	☐ ৪- ন্যূনতম হাতের সাহায্য তারা নিরাপদে বসতে পারে ☐ ৩- হাতের সাহায্য দ্বারা বসতে পারে ☐ ২- ভারসাম্য রক্ষার জন্য চেয়ার এর বিরুদ্ধে ব্যবহার করে ☐ ১- নিজে নিজে ভারসাম্যহীনভাবে বসতে পারে ☐ ০- বসতে সাহায্যকারীর প্রয়োজন হয়
৫। স্থানান্তর	অনুগ্রহপূর্বক হাতে ভর দিয়ে চেয়ারের একদিকে এবং ভর ছাড়া অন্যদিকে স্থানান্তর হতে চেষ্টা করুন	☐ ৪- ন্যূনতম হাতের সাহায্য দ্বারা নিরাপদে স্থানান্তর হতে পারে ☐ ৩- হাতের সাহায্য দ্বারা নিরাপদে স্থানান্তর হতে পারে ☐ ২- মৌখিক নির্দেশনা অথবা পর্যবেক্ষণ মাধ্যমে স্থানান্তর হতে পারে ☐ ১- একজন সাহায্যকারীর প্রয়োজন হয় ☐ ০- দুইজন সাহায্যকারীর প্রয়োজন হয়

৬। অবলম্বন ছাড়া চোখ বন্ধ অবস্থায় দাঁড়ানো	অনুগ্রহপূর্বক চোখ বন্ধ করুন এবং ১০ সেকেন্ড দাঁড়ান	☐ ৪- ১০ সেকেন্ড নিরাপদে দাঁড়াতে পারে ☐ ৩- পর্যবেক্ষণের মাধ্যমে ১০ সেকেন্ড নিরাপদে দাঁড়াতে পারে ☐ ২- ৩ সেকেন্ড দাঁড়াতে পারে ☐ ১- ৩ সেকেন্ড চোখ বন্ধ রাখতে পারে না কিন্তু দাঁড়াতে পারে ☐ ০- পড়ে যাওয়া রোধ করতে সাহায্য প্রয়োজন
৭। দুই পা একএ করে অবলম্বনহীনভাবে দাঁড়ান	অনুগ্রহপূর্বক দুই পা একএ করুন এবং কোন সাহায্য ছাড়া দাঁড়ান	☐ ৪- দুই পা একএ করে স্বাধীনভাবে ১ মিনিট দাঁড়াতে পারে ☐ ৩- পর্যবেক্ষণসহ দুই পা একএ করে স্বাধীনভাবে ১ মিনিট দাঁড়াতে পারে ☐ ২- দুই পা একএ করে দাঁড়াতে পারে তবে ৩০ সেকেন্ড এর কম ☐ ১- দাঁড়াতে সাহায্যর প্রয়োজন হয় কিন্তু ১৫ সেকেন্ড পা একএ রাখতে পারে ☐ ০- দাঁড়াতে সাহায্যর প্রয়োজন হয় কিন্তু ১৫ সেকেন্ড পা একএ রাখতে পারে না
৮। দাড়ানো অবস্থায় দুই হাত উঁচু করে সামনের দিকে ঝুঁকা	দুই হাত ৯০ ডিগ্রী উঁচু করুন। আঙ্গুল টানটান করুন যতটা সম্ভব সামনে ঝুঁকুন।	☐ ৪- সঠিকভাবে ২৫ সেন্টিমিটার সামনে যেতে পারে ☐ ৩- সঠিকভাবে ১২ সেন্টিমিটার সামনে যেতে পারে ☐ ২- সঠিকভাবে ৫ সেন্টিমিটার সামনে যেতে পারে ☐ ১- সামনে যেতে পারে কিন্তু পর্যবেক্ষণ এর প্রয়োজন হয় ☐ ০- ভারসাম্য হারিয়ে ফেলে অথবা অন্যের সহায়তা লাগে

৯। দাঁড়ানো অবস্থায় মেঝে থেকে কোন বস্তু তোলা	মেঝেতে আপনার পায়ের সামনে রাখা বস্তুটি তুলুন	☐ ৪- সহজে এবং নিরাপদে বস্তুটি তুলতে পারে ☐ ৩- বস্তুটি তুলতে পারে কিন্তু পর্যবেক্ষণ প্রয়োজন হয় ☐ ২- বস্তুর ২-৫ সেন্টিমিটার পর্যন্ত যেতে পারে কিন্তু তুলতে পারেনা তবে ভারসাম্য রক্ষা করতে পারে। ☐ ১- বস্তুটি তুলতে পারে না এবং চেষ্টার সময় পর্যবেক্ষণ প্রয়োজন হয় ☐ ০- চেষ্টা করতে পারে না অথবা ভারসাম্য রক্ষার জন্য সাহায্যকারী প্রয়োজন হয়
১০। দাঁড়ানো অবস্থায় ডান এবং বাম কাঁধ দিয়ে পিছনে তাকানো	আপনার বাম কাঁধ বরাবর পিছনে ঘুরোন। একইভাবে ডানদিকে ঘুরুন	☐ ৪- দুই দিকে ঘুরতে পারে এবং সমানভাবে ভর দেয় ☐ ৩- শুধুমাত্র এক দিকে ঘুরতে পারে এবং অন্যদিকে কম ভর দেয় ☐ ২- শুধুমাত্র পাশে তাকাতে পারে, তবে ভারসাম্য রক্ষা করতে পারে ☐ ১- ঘুরার সময় পর্যবেক্ষণ প্রয়োজন ☐ ০- ভারসাম্য রক্ষার জন্য সাহায্যকারী প্রয়োজন হয়
১১। ৩৬০ ডিগ্রী ঘুরুন	ঘুরে একটি বৃত্ত সম্পন্ন করুন। থামুন এবং অপরদিকে আবার একটি বৃত্ত সম্পন্ন করুন	☐ ৪- ৪ সেকেন্ড অথবা তার কম সময়ে ৩৬০ নিরাপদে ঘুরতে পারে ☐ ৩- ৪ সেকেন্ড অথবা তার কম সময়ে একদিকে নিরাপদে ৩৬০ ডিগ্রী ঘুরতে পারে ☐ ২- ৩৬০ ঘুরতে পারে তবে সময় বেশি লাগে ☐ ১- পর্যবেক্ষণ অথবা মৌখিক নির্দেশনা প্রয়োজন

		☐ ০- ঘুরার সময় সাহায্যকারী প্রয়োজন
১২। অবলম্বন ছাড়া দাঁড়ানোর সময় এক পা সামনে দিন অথবা টুলের উপর রাখুন	বিপরীতভাবে এক পা টুলে রাখুন এবং অন্য পা মেঝেতে রাখুন এভাবে চার বার করুন	☐ ৪- নিজে নিজে নিরাপদে দাঁড়াতে পারে এবং ২০ সেকেন্ডে ৮ টি ধাপ দিতে পারে ☐ ৩- নিজে নিজে নিরাপদে দাঁড়াতে পারে এবং ২০ সেকেন্ডে ৮ টির কম ধাপ দিতে পারে ☐ ২- ৪ টি ধাপ দিতে পারে সাহায্য ছাড়া তবে পর্যবেক্ষণ প্রয়োজন ☐ ১- ২ টির কম ধাপ দিতে পারে এবং ন্যূনতম সাহায্য লাগে ☐ ০- ভারসাম্য রক্ষার জন্য সাহায্যকারী প্রয়োজন হয় অথবা করতে পারে না
১৩। অবলম্বন ছাড়া এক পা সামনে দিয়ে দাঁড়ান	এক পায়ের সামনে আরেক পা দিয়ে দাঁড়ান। যদি না পারেন তবে দুই পায়ের দূরত্ব বাড়িয়ে দাঁড়ান	☐ ৪- ৩০ সেকেন্ড নিজে নিজে এক পা সামনে দিয়ে নিরাপদে দাঁড়াতে পারে ☐ ৩- ৩০ সেকেন্ড নিজে নিজে এক পা সামনে দিয়ে দাঁড়াতে পারে ☐ ২- ছোট ধাপ দিয়ে নিজে নিজে ৩০ সেকেন্ড দাঁড়াতে পারে ☐ ১- ধাপ দিতে সাহায্য লাগে কিন্তু ১৫ সেকেন্ড থাকতে পারে ☐ ০- ধাপ দেওয়া অথবা দাঁড়ানোর সময় ভারসাম্য হারিয়ে ফেলে

১৪। এক পায়ে দাঁড়ানো	অবলম্বন ছাড়া যতক্ষণ সম্ভব এক পায়ে দাঁড়ান	☐ ৪- নিজে নিজের পা তুলতে পারে এবং ১০ সেকেন্ডের বেশি সময় থাকতে পারে ☐ ৩- নিজে নিজে পা তুলতে পারে এবং ৫-১০ সেকেন্ড থাকতে পারে ☐ ২- নিজে নিজের পায়ে চলতে পারে ৩ সেকেন্ড বা কম থাকতে পারে ☐ ১- পা তুলতে চেষ্টা করে কিন্তু ৩ সেকেন্ড রাখতে পারেনা তবে নিজে নিজে দাঁড়াতে পারে ☐ ০- চেষ্টা করতে পারে না এবং পড়ে যাওয়া রোধে সাহায্যের প্রয়োজন
মোট নম্বর:		

অংশ-৩: হাঁটা মূল্যায়ণ

১০-মিটার হাঁটা পরীক্ষাঃ

স্টেপ সংখ্যাঃ

সময়ঃ

টাইম আপ অ্যান্ড গো টেস্টঃ

সময় (সেকেন্ড):

সহায়ক ডিভাইস ব্যবহৃত:

☐ কোনটিই নয়

☐ ক্যান

☐ ক্রাচ

☐ অন্যান্য

পরবর্তী পরীক্ষা

পরীক্ষার তারিখঃ

অংশ-২: ভারসাম্য মূল্যায়ন

কাজ	নির্দেশনা	স্কোর
১। বসা থেকে দাঁড়ানো	অনুগ্রহপূর্বক দাঁড়ান। চেষ্টা করুন সাহায্যের জন্য আপনার হাত ব্যবহার না করতে।	☐ ৪- হাতের সাহায্য ছাড়া দাঁড়াতে পারে এবং ভারসাম্য রক্ষা করতে পারে ☐ ৩- হাতের সাহায্য নিয়ে নিজে নিজে দাঁড়াতে পারে ☐ ২-হাতের সাহায্য নিয়ে কয়েক বার চেষ্টার পর দাঁড়াতে পারে ☐ ১- দাঁড়াতে অথবা ভারসাম্য রক্ষা করতে ন্যূনতম সহযোগিতা লাগে ☐ ০- দাঁড়াতে মোটামুটি অথবা সম্পূর্ণ সহযোগিতা লাগে
২। অবলম্বন ছাড়া দাঁড়ানো	অনুগ্রহপূর্বক কোন কিছুর সাহায্য ছাড়া দুই মিনিট দাঁড়ান	☐ ৪- নিরাপদ ভাবে 2 মিনিট দাড়াতে পারে ☐ ৩- পর্যবেক্ষণসহ 2 মিনিট দাঁড়াতে পারে ☐ ২- অবলম্বন ছাড়া 30 সেকেন্ড দাঁড়াতে পারে ☐ ১- কয়েক বার চেষ্টার পর অবলম্বন ছাড়া 30 সেকেন্ড দাঁড়াতে পারে ☐ ০- অবলম্বন ছাড়া 30 সেকেন্ড দাঁড়াতে পারে না

৩। পিঠে অবলম্বন ছাড়া কিন্তু মেঝে অথবা টুল দিয়ে পায়ে অবলম্বন এর সাহায্যে বসা	অনুগ্রহপূর্বক হাত ভাঁজ করে দুই মিনিট বসুন	☐ ৪- নিরাপদ ভাবে 2 মিনিট বসতে পারে ☐ ৩- পর্যবেক্ষণসহ 2 মিনিট বসতে পারে ☐ ২- ৩০ সেকেন্ড বসতে পারে ☐ ১- ১০ সেকেন্ড বসতে পারে ☐ ০- অবলম্বন ছাড়া ১০ সেকেন্ড বসতে পারে না
৪। দাঁড়ানো থেকে বসা	অনুগ্রহপূর্বক বসুন	☐ ৪- ন্যূনতম হাতের সাহায্য তারা নিরাপদে বসতে পারে ☐ ৩- হাতের সাহায্য দ্বারা বসতে পারে ☐ ২- ভারসাম্য রক্ষার জন্য চেয়ার এর বিরুদ্ধে ব্যবহার করে ☐ ১- নিজে নিজে ভারসাম্যহীনভাবে বসতে পারে ☐ ০- বসতে সাহায্যকারীর প্রয়োজন হয়
৫। স্থানান্তর	অনুগ্রহপূর্বক হাতে ভর দিয়ে চেয়ারের একদিকে এবং ভর ছাড়া অন্যদিকে স্থানান্তর হতে চেষ্টা করুন	☐ ৪- ন্যূনতম হাতের সাহায্য দ্বারা নিরাপদে স্থানান্তর হতে পারে ☐ ৩- হাতের সাহায্য দ্বারা নিরাপদে স্থানান্তর হতে পারে ☐ ২- মৌখিক নির্দেশনা অথবা পর্যবেক্ষণ মাধ্যমে স্থানান্তর হতে পারে ☐ ১- একজন সাহায্যকারীর প্রয়োজন হয় ☐ ০- দুইজন সাহায্যকারীর প্রয়োজন হয়

৬। অবলম্বন ছাড়া চোখ বন্ধ অবস্থায় দাঁড়ানো	অনুগ্রহপূর্বক চোখ বন্ধ করুন এবং ১০ সেকেন্ড দাঁড়ান	☐ ৪- ১০ সেকেন্ড নিরাপদে দাঁড়াতে পারে ☐ ৩- পর্যবেক্ষণের মাধ্যমে ১০ সেকেন্ড নিরাপদে দাঁড়াতে পারে ☐ ২- ৩ সেকেন্ড দাঁড়াতে পারে ☐ ১- ৩ সেকেন্ড চোখ বন্ধ রাখতে পারে না কিন্তু দাঁড়াতে পারে ☐ ০- পড়ে যাওয়া রোধ করতে সাহায্য প্রয়োজন
৭। দুই পা একএ করে অবলম্বনহীনভাবে দাঁড়ান	অনুগ্রহপূর্বক দুই পা একএ করুন এবং কোন সাহায্য ছাড়া দাঁড়ান	☐ ৪- দুই পা একএ করে স্বাধীনভাবে ১ মিনিট দাঁড়াতে পারে ☐ ৩- পর্যবেক্ষণসহ দুই পা একএ করে স্বাধীনভাবে ১ মিনিট দাঁড়াতে পারে ☐ ২- দুই পা একএ করে দাঁড়াতে পারে তবে ৩০ সেকেন্ড এর কম ☐ ১- দাঁড়াতে সাহায্যর প্রয়োজন হয় কিন্তু ১৫ সেকেন্ড পা একএ রাখতে পারে ☐ ০- দাঁড়াতে সাহায্যর প্রয়োজন হয় কিন্তু ১৫ সেকেন্ড পা একএ রাখতে পারে না
৮। দাড়ানো অবস্থায় দুই হাত উঁচু করে সামনের দিকে ঝুঁকা	দুই হাত ৯০ ডিগ্রী উঁচু করুন। আঙ্গুল টানটান করুন যতটা সম্ভব সামনে ঝুঁকুন।	☐ ৪- সঠিকভাবে ২৫ সেন্টিমিটার সামনে যেতে পারে ☐ ৩- সঠিকভাবে ১২ সেন্টিমিটার সামনে যেতে পারে ☐ ২- সঠিকভাবে ৫ সেন্টিমিটার সামনে যেতে পারে ☐ ১- সামনে যেতে পারে কিন্তু পর্যবেক্ষণ এর প্রয়োজন হয় ☐ ০- ভারসাম্য হারিয়ে ফেলে অথবা অন্যের সহায়তা লাগে

৯। দাঁড়ানো অবস্থায় মেঝে থেকে কোন বস্তু তোলা	মেঝেতে আপনার পায়ের সামনে রাখা বস্তুটি তুলুন	☐ ৪- সহজে এবং নিরাপদে বস্তুটি তুলতে পারে ☐ ৩- বস্তুটি তুলতে পারে কিন্তু পর্যবেক্ষণ প্রয়োজন হয় ☐ ২- বস্তুর ২-৫ সেন্টিমিটার পর্যন্ত যেতে পারে কিন্তু তুলতে পারেনা তবে ভারসাম্য রক্ষা করতে পারে। ☐ ১- বস্তুটি তুলতে পারে না এবং চেষ্টার সময় পর্যবেক্ষণ প্রয়োজন হয় ☐ ০- চেষ্টা করতে পারে না অথবা ভারসাম্য রক্ষার জন্য সাহায্যকারী প্রয়োজন হয়
১০। দাঁড়ানো অবস্থায় ডান এবং বাম কাঁধ দিয়ে পিছনে তাকানো	আপনার বাম কাঁধ বরাবর পিছনে ঘুরোন। একইভাবে ডানদিকে ঘুরুন	☐ ৪- দুই দিকে ঘুরতে পারে এবং সমানভাবে ভর দেয় ☐ ৩- শুধুমাত্র এক দিকে ঘুরতে পারে এবং অন্যদিকে কম ভর দেয় ☐ ২- শুধুমাত্র পাশে তাকাতে পারে, তবে ভারসাম্য রক্ষা করতে পারে ☐ ১- ঘুরার সময় পর্যবেক্ষণ প্রয়োজন ☐ ০- ভারসাম্য রক্ষার জন্য সাহায্যকারী প্রয়োজন হয়
১১। ৩৬০ ডিগ্রী ঘুরুন	ঘুরে একটি বৃত্ত সম্পন্ন করুন। থামুন এবং অপরদিকে আবার একটি বৃত্ত সম্পন্ন করুন	☐ ৪- ৪ সেকেন্ড অথবা তার কম সময়ে ৩৬০ নিরাপদে ঘুরতে পারে ☐ ৩- ৪ সেকেন্ড অথবা তার কম সময়ে একদিকে নিরাপদে ৩৬০ ডিগ্রী ঘুরতে পারে ☐ ২- ৩৬০ ঘুরতে পারে তবে সময় বেশি লাগে ☐ ১- পর্যবেক্ষণ অথবা মৌখিক নির্দেশনা প্রয়োজন

		☐ ০- ঘুরার সময় সাহায্যকারী প্রয়োজন
১২। অবলম্বন ছাড়া দাঁড়ানোর সময় এক পা সামনে দিন অথবা টুলের উপর রাখুন	বিপরীতভাবে এক পা টুলে রাখুন এবং অন্য পা মেঝেতে রাখুন এভাবে চার বার করুন	☐ ৪- নিজে নিজে নিরাপদে দাঁড়াতে পারে এবং ২০ সেকেন্ডে ৮ টি ধাপ দিতে পারে ☐ ৩- নিজে নিজে নিরাপদে দাঁড়াতে পারে এবং ২০ সেকেন্ডে ৮ টির কম ধাপ দিতে পারে ☐ ২- ৪ টি ধাপ দিতে পারে সাহায্য ছাড়া তবে পর্যবেক্ষণ প্রয়োজন ☐ ১- ২ টির কম ধাপ দিতে পারে এবং ন্যূনতম সাহায্য লাগে ☐ ০- ভারসাম্য রক্ষার জন্য সাহায্যকারী প্রয়োজন হয় অথবা করতে পারে না
১৩। অবলম্বন ছাড়া এক পা সামনে দিয়ে দাঁড়ান	এক পায়ের সামনে আরেক পা দিয়ে দাঁড়ান। যদি না পারেন তবে দুই পায়ের দূরত্ব বাড়িয়ে দাঁড়ান	☐ ৪- ৩০ সেকেন্ড নিজে নিজে এক পা সামনে দিয়ে নিরাপদে দাঁড়াতে পারে ☐ ৩- ৩০ সেকেন্ড নিজে নিজে এক পা সামনে দিয়ে দাঁড়াতে পারে ☐ ২- ছোট ধাপ দিয়ে নিজে নিজে ৩০ সেকেন্ড দাঁড়াতে পারে ☐ ১- ধাপ দিতে সাহায্য লাগে কিন্তু ১৫ সেকেন্ড থাকতে পারে ☐ ০- ধাপ দেওয়া অথবা দাঁড়ানোর সময় ভারসাম্য হারিয়ে ফেলে

১৪। এক পায়ে দাঁড়ানো	অবলম্বন ছাড়া যতক্ষণ সম্ভব এক পায়ে দাঁড়ান	☐ ৪- নিজে নিজের পা তুলতে পারে এবং ১০ সেকেন্ডের বেশি সময় থাকতে পারে ☐ ৩- নিজে নিজে পা তুলতে পারে এবং ৫-১০ সেকেন্ড থাকতে পারে ☐ ২- নিজে নিজের পায়ে চলতে পারে ৩ সেকেন্ড বা কম থাকতে পারে ☐ ১- পা তুলতে চেষ্টা করে কিন্তু ৩ সেকেন্ড রাখতে পারেনা তবে নিজে নিজে দাঁড়াতে পারে ☐ ০- চেষ্টা করতে পারে না এবং পড়ে যাওয়া রোধে সাহায্যের প্রয়োজন
মোট নম্বর:		

অংশ-৩: হাঁটা মূল্যায়ণ

১০-মিটার হাঁটা পরীক্ষাঃ

স্টেপ সংখ্যাঃ

সময়ঃ

টাইম আপ অ্যান্ড গো টেস্টঃ

সময় (সেকেন্ড):

সহায়ক ডিভাইস ব্যবহৃত:

☐ কোনটিই নয়

☐ ক্যান

☐ ক্রাচ

☐ অন্যান্য

Questionnaire (English)

SECTION-1: Subjective Information

Questionnaires were developing to measure Balance by Berg Balance Scale (BBS), 10 meter walk test to measure gait speed, and to measure mobility by Time Up and Go Test (TUG). Please use a black pen to fill up the answer. Each question should be answer by tick (√) marking.

Patient ID: Date of test:

Part 1: Socio demographic information:

1.1 Patient's name:

1.2 Age: .....years

1.3 Sex:

- ☐ Male
- ☐ Female

1.4 Educational Qualifications:

- ☐ Illiterate
- ☐ Primary
- ☐ Secondary
- ☐ Higher secondary
- ☐ Graduation
- ☐ Post-graduation

1.5 Marital Status

- ☐ Married
- ☐ Unmarried
- ☐ Divorced
- ☐ Separated

1.6 Living area

- ☐ Rural
- ☐ Urban

1.7 Family type:

- ☐ Nuclear Family
- ☐ Combined Family

1.8 Monthly expenditure to deal with the current situation:

1.9 History of polypharmacy:

- ☐ Yes
- ☐ No

Part 2: Physical Parameter

2.1 Weight:

2.2 Height:

2.3 BMI

2.4 Body type:

- ☐ Ectomorph
- ☐ Mesomorph
- ☐ Endomorph

2.5 Comorbidity type:

2.6 Number of Co morbidity:

- ☐ Single
- ☐ Multiple

Part 3: Stroke related information

3.1 Type of lesion:

- ☐ Ischemic
- ☐ Hemorrhagic

3.2 Affected body side:

- ☐ Right
- ☐ Left

3.3 Family history of stroke

- ☐ Yes
- ☐ No

2.11 Previous history of stroke:

- ☐ Yes
- ☐ No

Pre Test

SECTION-3: Assessment of balance

Question	Instructions	Response
2.1. Sitting to standing	Please stand up. Try not to use your hand for support	☐ 4 able to stand without using hands and stabilize independently ☐ 3 able to stand independently using hands ☐ 2 able to stand using hands after several tries ☐ 1 needs minimal aid to stand or stabilize ☐ 0 needs moderate or maximal assist to stand
2.2. Standing unsupported	Please stand for two minutes without holding on	☐ 4 able to stand safely for 2 minutes ☐ 3 able to stand 2 minutes with supervision ☐ 2 able to stand 30 seconds unsupported ☐ 1 needs several tries to stand 30 seconds unsupported ☐ 0 unable to stand 30 seconds unsupported
2.3. Sitting with back unsupported but	Please sit with arms folded for 2 minutes	☐ 4 able to sit safely and securely for 2 minutes

feet supported on floor or on a tool		☐ 3 able to sit 2 minutes under supervision ☐ 2 able to able to sit 30 seconds ☐ 1 able to sit 10 seconds ☐ 0 unable to sit without support 10 seconds
2.4. Standing to sitting	Please sit down	☐ 4 sits safely with minimal use of hands ☐ 3 controls descent by using hands ☐ 2 uses back of legs against chair to control descent ☐ 1 sits independently but has uncontrolled descent ☐ 0 needs assist to sit
2.5. Transfer	Arrange chair 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 a bed and a chair.	☐ 4 able to transfer safely with minor use of hands ☐ 3 able to transfer safely definite need of hands ☐ 2 able to transfer with verbal cuing and/or supervision ☐ 1 needs one person to assist ☐ 0 needs two people to assist or supervise to be safe

2.6. Standing unsupported with eye closed	Please close your eyes and stand still for 10 seconds	☐ 4 able to stand 10 seconds safely ☐ 3 able to stand 10 seconds with supervision ☐ 2 able to stand 3 seconds ☐ 1 unable to keep eyes closed 3 seconds but stays safely ☐ 0 needs help to keep from falling
2.7. Standing unsupported with feet together	Place your feet together and stand without holding on	☐ 4 able to stand 10 seconds safely ☐ 3 able to stand 10 seconds with supervision ☐ 2 able to stand 3 seconds ☐ 1 unable to keep eyes closed 3 seconds but stays safely ☐ 0 needs help to keep from falling
2.8. Reaching forward with outstretched arm while standing	Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Ask subject to use both arms when reaching to avoid rotation of the trunk)	☐ 4 can reach forward confidently 25 cm (10 inches) ☐ 3 can reach forward 12 cm (5 inches) ☐ 2 can reach forward 5 cm (2 inches) ☐ 1 reaches forward but needs supervision ☐ 0 loses balance while trying/requires external support
2.9. Pick up object from the floor from a standing position	Pick up the shoe/slipper, which is place in front of your feet	☐ 4 able to pick up slipper safely and easily ☐ 3 able to pick up slipper but needs supervision

		☐ 2 unable to pick up but reaches 2-5 cm from slipper and keeps balance independently ☐ 1 unable to pick up and needs supervision while trying ☐ 0 unable to try/needs assist to keep from losing balance or falling
2.10. Turning to look behind over left and right shoulder while standing	Turn to look directly behind you over toward the left shoulder. Repeat to the right. Examiner may pick an object to look at directly behind the subject to encourage a better twist turn	☐ 4 looks behind from both sides and weight shifts well ☐ 3 looks behind one side only other side shows less weight shift ☐ 2 turns sideways only but maintains balance ☐ 1 needs supervision when turning ☐ 0 needs assist to keep from losing balance or falling
2.11. Turn 360 degrees	Turn completely around in a full circle. Pause. Then turn a full circle in the other direction	☐ 4 able to turn 360 degrees safely in 4 seconds or less ☐ 3 able to turn 360 degrees safely one side only 4 seconds or less ☐ 2 able to turn 360 degrees safely but slowly ☐ 1 needs close supervision or verbal cuing ☐ 0 needs assistance while turning
2.12. Place alternate foot on	Place each foot alternately on the step/stool. Continue	☐ 4 able to stand independently and safely and complete 8 steps in 20 seconds

step or tool while Standing unsupported	until each foot has touch the step/stool four times	☐ 3 able to stand independently and complete 8 steps in > 20 seconds ☐ 2 able to complete 4 steps without aid with supervision ☐ 1 able to complete > 2 steps need minimal assist ☐ 0 needs assistance to keep from falling/unable to try
2.13. Standing unsupported one foot in front	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.)	☐ 4 able to place foot tandem independently and hold 30 seconds ☐ 3 able to place foot ahead independently and hold 30 seconds ☐ 2 able to take small step independently and hold 30 seconds ☐ 1 needs help to step but can hold 15 seconds ☐ 0 loses balance while stepping or standing

2.14. Standing on one leg	Stand on one leg as long as you can without holding on	☐ able to lift leg independently and hold > 10 seconds ☐ able to lift leg independently and hold 5-10 seconds ☐ 2 able to lift leg independently and hold ≥ 3 seconds ☐ 1 tries to lift leg unable to hold 3 seconds but remains standing independently ☐ 0 unable to try of needs assist to prevent fall
Total Score		

SECTION-3: Assessment of Gait

10-meter walk test: The 10 Meter Walk Test is a performance measure used to assess walking speed in meters per second over a short distance. It can be employed to determine functional mobility and gait.

Number of steps:

Time:

Time Up and Go Test (TUG) :

1. Patient wear their regular footwear and can use a walking aid if needed.

2. The patient starts in a seated position.

3. The patient stands up upon the therapist's command: walks 3 meters, turns around, walks back to the chair, and sits down.

4. The time stops when the patient is seated.

5. Be sure to document the assistive device used.

Time (seconds):

Assistive device used: None

Cane

Walker

Crutch

Others

Risk for Falls: 1. High Risk (>13.5 seconds):

2. None/ low/ moderate (<13.5seconds):

Post Test

Date:

SECTION-3: Assessment of balance

Question	Instructions	Response
2.1. Sitting to standing	Please stand up. Try not to use your hand for support	☐ 4 able to stand without using hands and stabilize independently ☐ 3 able to stand independently using hands ☐ 2 able to stand using hands after several tries ☐ 1 needs minimal aid to stand or stabilize ☐ 0 needs moderate or maximal assist to stand
2.2. Standing unsupported	Please stand for two minutes without holding on	☐ 4 able to stand safely for 2 minutes ☐ 3 able to stand 2 minutes with supervision ☐ 2 able to stand 30 seconds unsupported ☐ 1 needs several tries to stand 30 seconds unsupported ☐ 0 unable to stand 30 seconds unsupported
2.3. Sitting with back unsupported but feet supported on floor or on	Please sit with arms folded for 2 minutes	☐ 4 able to sit safely and securely for 2 minutes ☐ 3 able to sit 2 minutes under supervision ☐ 2 able to able to sit 30 seconds ☐ 1 able to sit 10 seconds

a tool		☐ 0 unable to sit without support 10 seconds
2.4. Standing to sitting	Please sit down	☐ 4 sits safely with minimal use of hands ☐ 3 controls descent by using hands ☐ 2 uses back of legs against chair to control descent ☐ 1 sits independently but has uncontrolled descent ☐ 0 needs assist to sit
2.5. Transfer	Arrange chair 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 a bed and a chair.	☐ 4 able to transfer safely with minor use of hands ☐ 3 able to transfer safely definite need of hands ☐ 2 able to transfer with verbal cuing and/or supervision ☐ 1 needs one person to assist ☐ 0 needs two people to assist or supervise to be safe
2.6. Standing unsupported with eye closed	Please close your eyes and stand still for 10 seconds	☐ 4 able to stand 10 seconds safely ☐ 3 able to stand 10 seconds with supervision ☐ 2 able to stand 3 seconds ☐ 1 unable to keep eyes closed 3 seconds but stays safely

		☐ 0 needs help to keep from falling
2.7. Standing unsupported with feet together	Place your feet together and stand without holding on	☐ 4 able to stand 10 seconds safely ☐ 3 able to stand 10 seconds with supervision ☐ 2 able to stand 3 seconds ☐ 1 unable to keep eyes closed 3 seconds but stays safely ☐ 0 needs help to keep from falling
2.8. Reaching forward with outstretched arm while standing	Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Ask subject to use both arms when reaching to avoid rotation of the trunk)	☐ 4 can reach forward confidently 25 cm (10 inches) ☐ 3 can reach forward 12 cm (5 inches) ☐ 2 can reach forward 5 cm (2 inches) ☐ 1 reaches forward but needs supervision ☐ 0 loses balance while trying/requires external support
2.9. Pick up object from the floor from a standing position	Pick up the shoe/slipper, which is place in front of your feet	☐ 4 able to pick up slipper safely and easily ☐ 3 able to pick up slipper but needs supervision ☐ 2 unable to pick up but reaches 2-5 cm from slipper and keeps balance independently ☐ 1 unable to pick up and needs supervision while trying ☐ 0 unable to try/needs assist to keep from losing balance or falling

2.10. Turning to look behind over left and right shoulder while standing	Turn to look directly behind you over toward the left shoulder. Repeat to the right. Examiner may pick an object to look at directly behind the subject to encourage a better twist turn	☐ 4 looks behind from both sides and weight shifts well ☐ 3 looks behind one side only other side shows less weight shift ☐ 2 turns sideways only but maintains balance ☐ 1 needs supervision when turning ☐ 0 needs assist to keep from losing balance or falling
2.11. Turn 360 degrees	Turn completely around in a full circle. Pause. Then turn a full circle in the other direction	☐ 4 able to turn 360 degrees safely in 4 seconds or less ☐ 3 able to turn 360 degrees safely one side only 4 seconds or less ☐ 2 able to turn 360 degrees safely but slowly ☐ 1 needs close supervision or verbal cuing ☐ 0 needs assistance while turning
2.12. Place alternate foot on step or tool while Standing unsupported	Place each foot alternately on the step/stool. Continue until each foot has touch the step/stool four times	☐ 4 able to stand independently and safely and complete 8 steps in 20 seconds ☐ 3 able to stand independently and complete 8 steps in > 20 seconds ☐ 2 able to complete 4 steps without aid with supervision ☐ 1 able to complete > 2 steps need minimal assist

		☐ 0 needs assistance to keep from falling/unable to try
2.13. Standing unsupported one foot in front	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.)	☐ 4 able to place foot tandem independently and hold 30 seconds ☐ 3 able to place foot ahead independently and hold 30 seconds ☐ 2 able to take small step independently and hold 30 seconds ☐ 1 needs help to step but can hold 15 seconds ☐ 0 loses balance while stepping or standing
2.14. Standing on one leg	Stand on one leg as long as you can without holding on	☐ able to lift leg independently and hold > 10 seconds ☐ able to lift leg independently and hold 5-10 seconds ☐ 2 able to lift leg independently and hold ≥ 3 seconds

		☐ 1 tries to lift leg unable to hold 3 seconds but remains standing independently ☐ 0 unable to try of needs assist to prevent fall
Total Score		

SECTION-3: Assessment of Gait

10-meter walk test: The 10 Meter Walk Test is a performance measure used to assess walking speed in meters per second over a short distance. It can be employed to determine functional mobility and gait.

Number of steps:

Time:

Time Up and Go Test (TUG) :

1. Patient wear their regular footwear and can use a walking aid if needed.

2. The patient starts in a seated position.

3. The patient stands up upon the therapist's command: walks 3 meters, turns around, walks back to the chair, and sits down.

4. The time stops when the patient is seated.

5. Be sure to document the assistive device used.

Time (seconds):

Assistive device used: None

Cane

Walker

Crutch

Others

Risk for Falls: 1. High Risk (>13.5 seconds):

2. None/ low/ moderate (<13.5seconds):

Appendix- F

Treatment Protocol of Control Group

Conventional physiotherapy treatments for balance and gait

- Weight bearing & shifting exercise.
- Forward stepping
- Sit to stand exercise
- Soft surface weight bearing
- Static balance practice.
- Dynamic balance practice.
- Reaching.
- Reaching with object holding.
- Turning.
- Sensory motor stimulation.
- Single leg bridging practice.
- Double leg bridging practice.
- Trunk bridging practice with gym ball support.
- High kneeling.
- Half kneeling.
- Pelvic balance practice on gym ball.
- Wobble board exercise.
- Squatting.
- Trunk control exercise
- Ankle dorsiflexion
- Ankle planterflexion.
- Selective knee flexion.
- Parallel bar walking.
- Frankle exercise.
- Adductor muscle strengthening.
- Hamstring muscle strengthening.
- Quadriceps muscle strengthening.
- Core muscle strengthening.
- Pelvic flexion.
- Foot mobilization according to bobath.
- Eccentric exercise of lower limb.
- TA stretching.
- Pelvic tilting in standing position.
- Gait practice in ledder.
- Unstable surface walking.
- Straight line walking.
- Single leg standing with knee flexion & extension.

14.03.22

Signature: Mayasa Nujhat

15.03.22

Tahmena Akter Seema

Seema

15.03.22

Tuhin Ahammed

15.03.22

Richard Bairagi

15.3.22

Appendix- G

Treatment Protocol of Experimental Group

No.	Exercise	Frequency dose	Duration
1.	Hip, knee and ankle flexion exercise	5 rep x 2set	3 days/week
2.	Hip medial rotation and lateral rotation exercise	5 rep x 2set	3 days/week
3.	Hip abduction with external rotation by hip adduction with internal rotation	5 rep x 2set	3 days/week
4.	Ankle Dorsiflexion exercise	5 rep x 2set	3 days/week
5.	Ankle Planter flexion exercise	5 rep x 2set	3 days/week
6.	Squatting	5 rep x 2set	3 days/week
7.	Forward stepping	5 rep x 2set	3 days/week
8.	Weight shifting exercise	5 rep x 2set	3 days/week
9.	Wobble board exercise	30 sec x 2set	3 days/week
10.	Sit to Stand	5 rep x 2set	3 days/week