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Effect of Bilateral Arm Training Versus Dual Task Training with Conventional Therapy in Improving Upper Extremity Function and Adls in Stroke Patients

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ABSTRACT

Introduction: The term stroke was coined and introduced to medicine by William Cole in the late 17th century (Cole 1689). Physiologically stroke is an acute, focal injury of the central nervous system of a vascular origin, contributing to a local or systematic neurological insult. Stroke is one of the largest causes of disability, half of the stroke survivors have a disability and approximately one third of all stroke patients suffer from a severe arm paresis. Functional loss of upper extremity causes difficulty in performing activities of daily living and causes to become dependent. The main aim of stroke rehabilitation is to enable the highest functional independence level possible for individual and to increase the quality of life.

Sujective: 30 subjects having radiological diagnosis of stroke were selected according to the inclusion criteria. Functional ability was evaluated with the help of UEFI and Fugl-Meyer score for paretic upper limb. The subjects of group A received bilateral arm training with conventional therapy and the subjects of group B received dual task training with conventional therapy to improve upper extremities function performance of ADL in stroke. The post intervention data was compared with pre-intervention data and improvement in the functional activity of upper extremity is measured.

Procedure: All the participants were explained about the purpose of study. the subjects were screened for inclusion and exclusion criteria and then the baseline measurement was taken. An informed consent was taken from patients who were willing to participate in the study. Eligible subjects were randomly allocated into two groups. GroupA received bilateral arm training with conventional therapy and the subjects of group B received dual task training with conventional therapy to improve upper extremities function performance of ADL in stroke. The study was of 8 week, 5 days per week at department of physiotherapy in SMIH.

Conclusion: Bilateral arm training and dual task training along with conventional therapy both shows improvement in upper extremity function in stroke patients. But dual task training along with conventional therapy shows more improvement in reaching forward, grasping, manipulating objects and also improves other fine motor functions of hand after 8 weeks of therapy.

Keywords: Stroke; Bilateral arm training; Dual task training; Conventional therapy; Upper extremity function.

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INTRODUCTION

Stroke is a serious condition that occur when the blood supply to the brain is blocked causing ischemia, loss of brain function that leads to functional disability.

Stroke commonly causes loss of motor function due to weakening of upper and lower extremity muscles.[1]

Some of the common symptoms of a stroke include loss of function of the upper limb due to weaken muscles, difficulty in trunk control, unstable balance and gait, and instability to perform basic daily activities.[2]

Stroke falls under the category of one of the leading causes of persistent long term disability. Stroke survivors experience extensive sensory motor defect sets in affected upper and lower extremities , the most common being the upper extremity t[UE], affected approximately 80% of the acute stroke patients and 40% of the chronic stroke survivors. Common manifestations included compromised including compromised motor control, muscle paresis, alternations in muscle tone, stiffness, spasticity and contractors which consequently leads to impaired ability to perform activities of daily livings and therefore, increased dependence.[3]

Stroke is a clinically defined syndrome of acute, focal neurological deficit attributed to vascular injury (infarction, haemorrhage) of the central nervous system; in modern clinical practice, neuroimaging is increasingly used to confirm the exact pattern of tissue injury. Hypertension is the most important modifiable risk factor for stroke overall (though probably contributes to different extents depending on the stroke mechanism). Approximately 85% of strokes are ischaemic and are caused by cerebral small vessel disease, cardioembolism and large artery atherosclerosis related thromboembolism.

Bilateral activities have been discussed as measures to improve the body symmetry and to reduce abnormal muscle tone.[1]

Bilateral movement therapy, which encourages simultaneous use of the limbs on both the affected and non affected sides, is known to help in motor function recovery in hemiplegic patients. However, studies on the effectiveness of of bilateral arm training for improving upper limb functions and activities of daily living [ADL] performance in hemiplegic stroke patients are lacking. The present study investigated the effectiveness of bilateral arm training for improving upper limb function and ADL performance in hemiplegic stroke patients.[4] Bilateral arm training (BAT) presents as a promising approach in upper extremity (UE) rehabilitation after a stroke as it may facilitate neuroplasticity.[5]

Dual task training is one way to structure rehabilitation activities to maximize motor relearning and minimize long term disability. This type of training is extremely effective in relearning motor skills. dual task training is when two activities are performed at the same time. In most cases the motor skill (ex-walking) is combined with a cognitive (thinking) activity.[6]

1.1 BACKGROUND OF STUDY

The stroke is one of the major diseases that may cause disabilities. patients with stroke experiences difficulties in performing activities of daily living due to impairment caused by muscle weakness and stiffness, sensory abnormalities, imbalance and tension in the upper limb. Impairment of hand function that is required for performing delicate movement make it difficult to perform activities of daily living (for example; dressing, eating, and writing) and to return to work. Impaired muscle strength after stroke makes life difficult for patients, specially the learned non-use phenomena of the affected upper extremity and is characterized by the tendency to use the less affected upper extremity for functional task performance. If hemiplegic patient uses the unaffected upper extremity, they will lose functional independence. This leads to the supposition that the patient would increasingly use the hemiplegic upper extremity and eventually would achieve a functional recovery.[7] The important of motor rehabilitation for arm and hand function was underline by hauwink *et al* (2013) who found that only 38% their conventionally treated patient with high degree arm paresis regained partial motor control of their fingers and only 6% regained complete hand function at six months post-stroke they also found that patients with early proximal hand function hand function had a better prognosis than did patients with or without only minimal function of the impaired arm, 60% of whom had no distal hand function upon discharge from the hospital.[8]

1.2 EPIDEMIOLOGY

Stroke is the second leading cause of both disability and death worldwide[1] and poses a staggering burden at both individual and societal levels.

In 2010, the estimated number of incident ischemic strokes (IS) and HS across the globe was 11.6 million and 5.3 million, respectively; 63% of IS and 80% of HS occurred in low and middle-income countries. In 2016, the number of incident new strokes increased to 13.7 million confidence interval 1 In the same year, 5.5 million deaths worldwide were attributed to stroke; IS and HS accounted for 2.7 million and 2.8 million deaths, respectively.[1] A geographic distribution of the burden of stroke can be constructed with methodologic limitations including variability in research approaches for reporting incidence of stroke in different countries as well as a lack of information for many. Worldwide stroke prevalence in 2016 was 80.1 million (95% CI 74.1–86.3): 41.1 million (38.0–44.3) in women and 39.0 million (36.1–42.1) in men.[1] In the United States, the prevalence of stroke is about 3% in adults 20 years or older, which accounts for ≈7 million strokes in the population.[4] Annually, ≈795,000 people experience a new or recurrent stroke in the United States; ≈610,000 of these are first time strokes.[4] This translates to a global stroke prevalence and incidence of ≈1,322 and 156 per 100,000 persons, respectively, in 2016, and US stroke prevalence and incidence of ≈2,320 and 184 per 100,000 persons, respectively, in 2016.[1,5] The stroke case fatality rate at 30 days ranged from ≈10% in Dijon, France (2000–2004) to as high as 42% in Kolkata, India (2003–2010).[6] This highlights the disparity in availability of resources to mitigate stroke burden and hence outcomes of stroke around the world.

Stroke is the second leading cause of disability and accounted for ≈116 million global disability adjusted life-years (DALYs) lost in 2016.[1] From 1990 to 2010, although the age standardized mortality rates for IS and HS decreased, the absolute number of people with incident IS and HS increased by 37% and 47%, respectively; the number of associated deaths increased by 21% and 20%, respectively; and DALYs lost increased by 18% and 14%, respectively.[3] Recent data from 2010 to 2017 continue to show alarming increase in stroke incidence and mortality by 5.3% each, prevalence by 19.3%, and DALYs lost by 2.7%.[9]

1.2 PATHOPHYSIOLOGY

In thrombosis, the blood flow is affected by narrowing of vessels due to atherosclerosis. The build-up of plaque will eventually constrict the vascular chamber and form clots, causing thrombotic stroke. In an embolic stroke, decreased blood flow to the brain region causes an embolism; the blood flow to the brain reduces, causing severe stress and untimely cell death (necrosis). Necrosis is followed by disruption of the plasma membrane, organelle swelling and leaking of cellular contents into extracellular space, and loss of neuronal function. Other key events contributing to stroke pathology are inflammation, energy failure, loss of homeostasis, acidosis, increased intracellular calcium levels, excitotoxicity, free radical-mediated toxicity, cytokine-mediated cytotoxicity, complement activation, impairment of the blood–brain barrier, activation of glial cells, oxidative stress and infiltration of leukocytes. Haemorrhagic stroke accounts for approximately 10–15% of all strokes and has a high mortality rate. In this condition, stress in the brain tissue and internal injury cause blood vessels to rupture. It produces toxic effects in the vascular system, resulting in infarction. It is classified into intracerebral and subarachnoid haemorrhage.[10]

1.3 ETIOLOGY

Stroke is defined as an abrupt neurological outburst caused by impaired perfusion through the blood vessels to the brain. The blood flow to the brain is managed by two internal carotids anteriorly and two vertebral arteries posteriorly (the circle of Willis). Ischemic stroke is caused by deficient blood and oxygen supply to the brain; haemorrhagic stroke is caused by bleeding or leaky blood vessels. ischemic occlusions contribute to around 85% of casualties in stroke patients, with the remainder due to intracerebral bleeding. Ischemic occlusion generates thrombotic and embolic conditions in the brain.[10]

1.4 RISK FACTOR

Causes and risk factor of stroke are well understood. That occur when blood flow is interrupted or reduce.[11]

Non-modifiable risk factors

Age: this is the most important contributor to stroke risk. The incidence doubles for each decade after age 55 years.

Sex: because of the risks of pregnancy and oral contraceptive use, premenopausal women have a stroke risk that is as high as or higher than the risk in men.

Ethnicity: African Caribbean individuals in the UK and USA have twice the risk of incident stroke compared with their white counterparts. In younger black adults the risk of ICH is twice that of age matched white people.

Genetics: In addition to the single gene disorders that are associated with stroke (CADASIL, CARASIL, Fabry's disease, homocystinuria, sickle cell disease, connective tissue disorder)

Modifiable Risk Factors

Hypertension: This is the most important modifiable risk factor overall for stroke. Approximately half of all stroke patients, and an even greater proportion of those with ICH, have a history of hypertension.

Diabetes mellitus: This is an independent risk factor for stroke, associated with a 2-fold increased risk. Stroke accounts for 20% of all deaths in people with diabetes.

Cardiac factors: Cardioembolic infarction [mainly from atrial fibrillation (AF)] is the most severe ischaemic stroke subtype, with high disability and mortality. The presence of AF increases with age, causing 20–25% of strokes in patients >80 years old.

Smoking: This doubles the risk of stroke. Smoking cessation rapidly reduces the risk, with excess risk nearly disappearing 2–4 years after stopping.

Hyperlipidaemia: The relationship between dyslipidaemia and stroke is complex.

Alcohol consumption and substance abuse: Light and moderate alcohol consumption (<4 units/day) has been reported to be associated with a lower risk of ischaemic stroke, whereas higher quantities are clearly associated with increased stroke risk.

Obesity and sedentary behaviour: Most of the effect of body mass index on stroke risk is mediated by blood pressure, cholesterol and glucose concentrations.

Inflammation: Raised inflammatory biomarkers have a modest association with increased risk of arteriosclerosis and stroke.[12]

1.5 CLINICAL FEATURES

Upper limb neuromuscular weakness occurs frequently after stroke with loss of muscle strength and dexterity together considered to produce the largest impact on functional recovery. Muscle strength may be related to functional ability and may contribute more to loss of functional ability than impaired dexterity, muscle tone, sensation, or pain. The underlying mechanisms of neuromuscular weakness after stroke possibly include atrophy of type II fibres, increased proportion of type I fibres, loss of motor units, collateral reinnervation, and altered firing of motor unit groups. As substantial remodelling of motor units may occur between 2 and 6 months after stroke. [13]

OPERATIONAL DEFINATIONS

Stroke: The WHO defined stroke as rapidly developed clinical signs of focal (global) disturbance of cerebral function, lasting more than 24 hrs.[14]

Bilateral Arm Training: Bilateral arm training is a type of rehabilitation that uses symmetrical same or alternating opposite movements of both arms. The goal of by little arm training is to improve strength and use of the arm that was affected by the stroke.

Bilateral arm training comprises repetitive practice of bilateral arm movement in symmetrical or alternating patterns. Traditionally bilateral arm training was performed by linking both hands together so that the less affected limb facilitated passive movements of the affected limb.[15]

Dual Task Training: Is a practical interventional method for actual daily activities of a patient beyond the clinic, that helps to reduce dual task interference. Generally dual task training refers to performing [1] task whilst been engaged in another, or performing[2] or more tasks simultaneously.[2]

1.8 AIM OF THE STUDY

To compare the effectiveness of the bilateral arm training Vs dual task training combined with conventional therapy in improving upper extremity function and performance of ADLs in stroke patients.

1.9 PURPOSE

The purpose of the study to improve the effect of treatment with bilateral arm training than compare to dual task training combined with conventional therapy in improving upper extremity functions and performance of ADLs in stroke patients.

1.10 HYPOTHESIS

Experimental Hypothesis

There may be a significant improvement in upper extremity function and ADLs performance with bilateral arm training and conventional therapy versus dual task training with conventional therapy in stroke.

Null Hypothesis

There may not be a significant improvement in upper extremity function and ADLs performance with bilateral arm training and conventional therapy versus dual task training with conventional therapy in stroke.

The research will be done to compare the effectiveness of the bilateral arm training Vs dual task training combined with conventional therapy in improving upper extremity function and performance of ADLs in stroke.

REVIEW OF LITERATURE

J Phys Ther Sci *et al.* (2015) conducted a study on the effect of task oriented versus repetitive bilateral arm training on upper limb function and activities of daily living in stroke patients. He concluded that bilateral arm training as well as adding functional task training as a clinical intervention to improve upper limb function activities of daily living in patients with hemiplegia.[1]

Juhyung Park osong public health res perspect ***et al.* (2019)** conducted a study dual task training effects on upper extremity functions and performance of daily activities of chronic stroke patients. In which he reveled that dual task training effectively improved upper extremity function, and the performance of daily activities in chronic stroke patients.[2]

Mary Ellen Stoykov, Lewis, and Daniel M. Corcos, *et al.* (2009) conducted a study on comparison of bilateral and unilateral training for upper extremity hemiparesis in stroke. Reveled that both bilateral and unilateral training are efficacious for moderately impaired chronic stroke survivors.[21]

Hume Ra Ambreen, Hina Tariq, Imran Amjad *et al.* (2021) conducted a study on effects of bilateral arm training on upper extremity function in right and left hemispheric stroke. Revealed that bilateral arm training showed beneficial effects in improving UE function in both right hemispheric stroke and left hemispheric stroke patients. Distal UE function in left hemispheric stroke and coordination and speed of movement in right hemispheric stroke patients did not show any significant improvement.[3]

Annabel Mcdermott(Ot), Nicol Korner-Bitensky (Phd Ot), Tatiana Ogourtsova (PHD OT) *et. al* (11.06.2018) Conducted a study on bilateral arm training and he concluded that there is a moderate evidence from one high quality RCT that bilateral arm training is not more effective than a comparison intervention in improving mood/ affect in patient with acute stroke.[15]

Diji Kuriakose and Zhicheng Xiao, 15 October 2020, International Journal of Molecular Sciences, pp 1 of 24, conducted study on Pathophysiology and Treatment of Stroke: Present Status and Future Perspectives, and concluded Stroke is the second leading cause of death and contributor to disability worldwide and has significant economic costs. Thus, more effective therapeutic interventions and improved poststroke management are global health priorities. The last 25 years of stroke research has brought considerable progress with respect to animal experimental models, therapeutic drugs, clinical trials and post-stroke rehabilitation studies, but large gaps of knowledge about stroke. treatment remain. Despite our increased understanding of stroke pathophysiology and the large number of studies targeting multiple pathways causing stroke, the inability to translate research into clinical settings has significantly hampered advances in stroke research. Most research has focused on restoring blood flow to the brain and minimizing neuronal deficits after ischemic insult. The major challenges for stroke investigators are to characterize the key mechanisms underlying therapies, generate reproducible data, perform multicentre pre-clinical trials and increase the translational value of their data before proceeding to clinical studies.[10]

Alexander P Coupl and, Ankur Thapar *et al.* (2016) Conducted a study on the definition of stroke. He concluded that the definition of stroke now endorsed by the American heart association follows in the footsteps of history and places fath in tissue findings reminiscent of the scientific advances made by wepfer, bonet and morgagni. What separates this definition from history precedent is the inclusion of silent cerebral haemorrhages, thereby removing an association with clearly defined clinical symptoms. The inclusion of silent pathology within stroke epidermiology has the potential to dramatically alter incidence and the potential to dramatically alter incidence and prevalence rates in US and willhave an impact on mortality and morbidity data. It will be important in the coming years for international bodies to arrive at a consensus in order to standardize data reporting and research endpoint.[14]

Min-Jae Lee *et al.* J Stroke Cerebrovasc Dis. (2017) conducted a study on effectiveness of bilateral arm training for improving extremity function and activities of daily living performance in hemiplegic patient he reveled that bilateral arm training along with general OT might be more effective than OT along for improving upper limb function and ADL performance in hemiplegic stroke patients.[4]

Siyun Chen *et. al* (2022) Conducted a study on Effectiveness and Success Factors of Bilateral Arm Training After Stroke: A Systematic Review and Meta-Analysis. He concluded that the present systematic review and meta-analysis suggested that BAT might be more beneficial than conventional therapy CT to improve upper limb (UL) motor impairment post-stroke. The current study also highlighted stroke chronicity, the severity of impairment, type of treatment, and intervention dose were critical factors in choosing an optimal rehabilitation program for restoring UE motor function. BAT might be especially more efficacious than CT in addressing motor impairment if a higher dose of intervention was applied or recruited patients in the chronic phase post-stroke had mild UL paresis. It is also suggested that BFTT may be a valuable form of BAT as it may facilitate both motor and functional recovery; therefore, due to its low cost, simplicity, and variety of activities, it is highly recommended to be integrated into stroke rehabilitation programs. BAT and UAT are generally equivalent in improving UL motor impairments and functional performance post-stroke. However, future comparisons based on a larger number of high-quality studies are needed to precisely capture the differential effects of UAT and BAT.[5]

Gui Bin Sung *et. al* (2015) Conducted the study on the effects of task-oriented versus repetitive bilateral arm training on upper limb function and activities of daily living in stroke patients. He concluded that recommend bilateral arm training as well as adding functional task training as a clinical intervention to improve upper limb function activities of daily living in patients with hemiplegia.[22]

METHODOLOGY

Sample Size

30 patients of the age between 18-80 with stroke who was willing to take treatment for 8 weeks session after a written consent were taken according to inclusion and exclusion criteria.[15] patients were included in the group first and 15 in second group.

4.2 Sample Technique

Simple random sampling technique was applied and 30 patients were divided into two groups.[15] patients were selected randomly and was included in group A and 15 patients in group B.

4.3 Study Centre

Shri Mahant Indresh hospital, Patel Nagar, Dehradun Uttarakhand.

4.4 Treatment Duration

Each patients will receive the treatment for 5 days /week for 8 weeks.

4.5 Study Group

Study group was divided into two groups (A & B). First group A consist of patient in which treatment was given with bilateral arm training and second group B consist of patients in which treatment was given with dual task training. Both groups received conventional therapy on their respective upper extremity.

4.6 Sample Selection

Inclusion Criteria:

- No visual field defect
- No abnormality in the vestibular organs
- No orthopedic disease
- Unrestricted ROM
- Chronic at least 6 months
- Age 18-80 year

Exlusion Criteria:

- Symptomatic cardiac failure
- Lesion in cerebellum or brainstem
- Uncontrolled hypertension
- Orthopedic or pain conditions in affected upper extremity

4.7 Materials Used

- Chair and desk
- Beans
- Data collection sheet and recording
- Patient consent form
- Ball
- Cup
- glass
- spoon
- Sanitizer
- Bottle

- Paper

4.7 Outcome Measures

- Fugl-Meyer Assessment score
- UEFI

Fugl-Meyer Assessment Score

Fugl-Meyer scale was developed as the first quantitative evaluative instrument for measuring sensorimotor stroke recovery, based on Twitchell and Brunnstrom's concept of sequential stages of motor return in hemiplegic stroke patient. It is designed to asses reflex activity, movement control and muscle strength in upper extremity people with post-stroke hemiplegic.

Fig 4.1: Image of materials

Scoring is based on direct observation of performance. Scale items are scored on the basis of ability to complete the item using a 3 point ordinal scale where

0=cannot performs partially,

2=performs fully[23]

Upper extremity functional independence score (UEFIS)

The UEFI is based on 2001 study by Stratford et al, UEFI is patient reported outcome measure used to assess the functional impairment in individual with musculoskeletal upper limb dysfunction.

The original UEFI consist of 20 questions on a 5-point rating scale assessing level of difficulty in performing activities of daily living using the upper extremities including household and work activities, hobbies, lifting a bag of groceries, washing scalp, driving etc.[24]

VARIABLES

Independent Variables

- Bilateral arm training
- Dual task training
- Conventional therapy

Dependent Variables

- ADLs
- Upper extremity motor functions

Procedure

Study design: Comparative All the participants were explained about the purpose of study. the subjects were screened for inclusion and exclusion criteria and then the baseline measurement was taken. An informed consent was taken from patients who were willing to participate in the study. Eligible subjects were randomly allocated into two groups. Group A participants receiving bilateral arm training along with conventional therapy. group B participants receiving dual task training along with conventional therapy. Both groups had received exercise program for upper extremity motor function. The study was of 8 week, 5 days per week at department of physiotherapy in SMIH.

Group A: Will perform bilateral arm training exercises along with conventional therapy which include:

1. Pushing/pulling with both arms (open and close two identical drawers).
2. Wipe a table with both arms using both arms symmetrically.
3. Bilateral reaching and placing objects. Moving two identical small or medium sized grocery objects from counter top to shelf with both hands.
4. Bilateral shoulder and elbow coupling. Aim with both hands to parallel target (using varying level of arm support, postural sets and positions in respect to gravity) includes a total of four subtasks.
5. Bilateral elbow extension during horizontal reach.
6. Dowel rod shoulder.

7. Lateral raise with dumbbell.

Group B: Will perform dual task training along with conventional therapy Which include:

1. Moving beans with a spoon, classifying wooden blocks by color, and opening bottle caps reaching objects
2. All activities will perform by the patient standing on a balance board.
3. Combine walking with talking (that required thinking) for example, recite the alphabet backwards count by multiple (for example 3,6,9,12 etc.)
4. Combine walking with carry an empty cup.
5. Combine walking with carry a cup with water; this requires thinking to make sure you do not spill the water.
6. Combine walking with toes a bowl from one hand to the other.
7. Combine walking with bounce a ball.

RESULT

This chapter deals with the result of data analysis of two outcome measures that is with UEFI and

Fig. 4.2: Group-A: A patient performing bilateral arm training

Fig. 4.3a: Showing patient moving beans with counting numbers

Fig. 4.2 Group A**:** A patient performing bilateral arm training

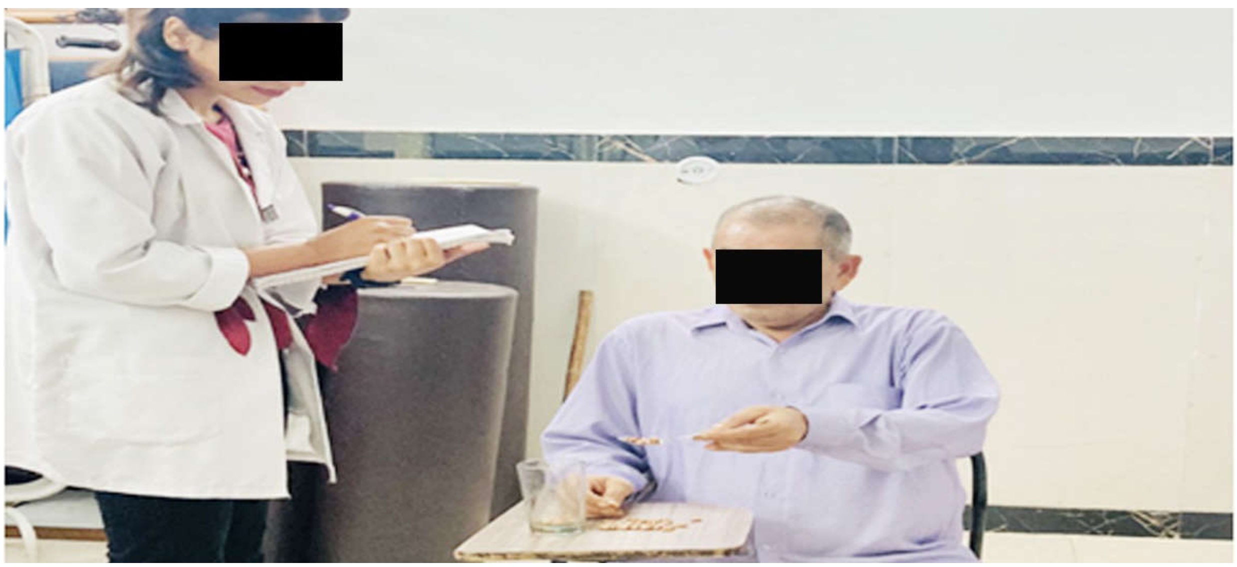

Fig. 4.3 a: Showing patient moving beans with counting numbers

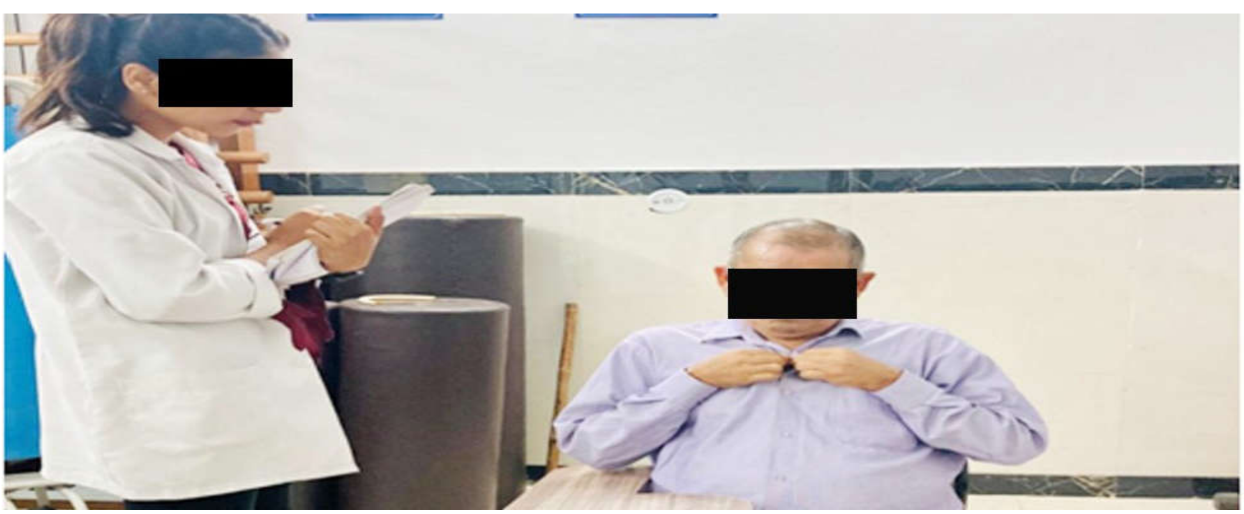

Fig. 4.3 b: Showing patient opening shirt buttons with counting numbers

Fig. 4.4 a: Showing patient doing reaching activity

Fig. 4.4 b: Showing patient opening box

Fig. 4.4 c: Showing active ROM exercise

Fig. 4.5 b: Showing patient throwing the ball

Fig. 4.5 a: Showing patient combing the hair

FMA-UE, within group A and group B and between group A and group B. The score was analyzed and interpreted to determine which intervention is more effective in improving upper extremity function and performance of ADLs in stroke patients.

Unpaired t-test was used to analyze and compared pre and post treatment score within the group A and group B. Analyzing UEFI revealed significant difference in group A post treatment, mean and standard error of mean (16.60+0.821) when compared to group A pre-treatment, Mean and standard error of mean (12.80+0.812) Analyzing w/h FMA-UE revealed significant difference in group A post treatment, mean and standard error of mean (12.87+0.376) when compared with group A pretreatment, mean and standard mean (6.80+0.460)(Table 6.1)

Analyzing UEFI revealed slightly significant difference in group B post treatment, mean and standard error of mean (17.27+0.897) when compared to group B pre-treatment, Mean and standard error of mean (13.40+0.945)

Table 6.1: Within group comparison of pre and post data of both outcome measure in Group A

Upper extremity function Measured by	Pre (mean +SEM)	Pre (mean +SD)	Post (mean +SEM))	Post (mean +SD)	t-Value	P-Value
UEFI	12.80+0.812	12.80+3.144	16.60+0.821	16.60+3.180	3.291	0.0027
W/h FMA-UE	6.80+0.460	6.80+1.781	12.87+0.376	12.87+1.457	10.21	<0.0001

Analyzing/h FMA-UE revealed slight significant difference in group B post treatment, mean and standard error of mean (15.73+0.693) when compared with group B pre-treatment, mean and standard mean (7.20+0.595)(Table 6.2)

The data were analysed using the statistical software SPSS 15 version. To analyse the difference of UEFI and w/h FMUE of Group-A (bilateral arm training) and Group-B (Dual Task Training) the unpaired t- test was applied.

Table 6.2: Within group comparison of pre and post data of both outcome measure in Group B

Upper extremity function Measured By	Pre (mean +SEM)	Pre (mean +SD)	Post (mean +SEM))	Post (mean +SD)	t-Value	P-Value
UEFI	13.40+0.945	13.40+3.661	17.27+0.897	17.27+3.474	2.968	0.0061
W/h FMA-UE	7.20+0.595	7.20+2.305	15.73+0.693	15.73+2.685	9.339	<0.0001

As comparing the mean difference between both the groups, the mean difference in UEFI for Group-A is 3.8 and Group-B is 3.87. On the other hand, while comparing the mean difference between both the Group A and Group-B in w/h FMUE, Group-A showed 6.07 and Group-B showed 8.53 that indicated that the Group-B is more effective in w/h FMUE than Group-A. (Table 6.3)

Table 6.3: Mean difference in UEFI AND w/h FMUE in between Group A and Group B

	Group A (bilateral arm training)		Group B (dual task training)	
	UEFI	w/h FMUE	UEFI	w/h FMUE
Mean difference	3.8	6.07	3.87	8.53
SD	0.036	-0.324	-0.187	0.38
T-value	3.291	10.21	2.968	9.339
P-value	0.0027	<0.0001	0.0061	<0.0001

Therefore, result suggest that after 8 week of bilateral arm training and dual task training along with conventional therapy, both groups shows improvement in upper extremity function but dual task training with conventional therapy shows more improvement.

DISCUSSION

The weakened upper limb is a common issue among stroke survivors and can significantly

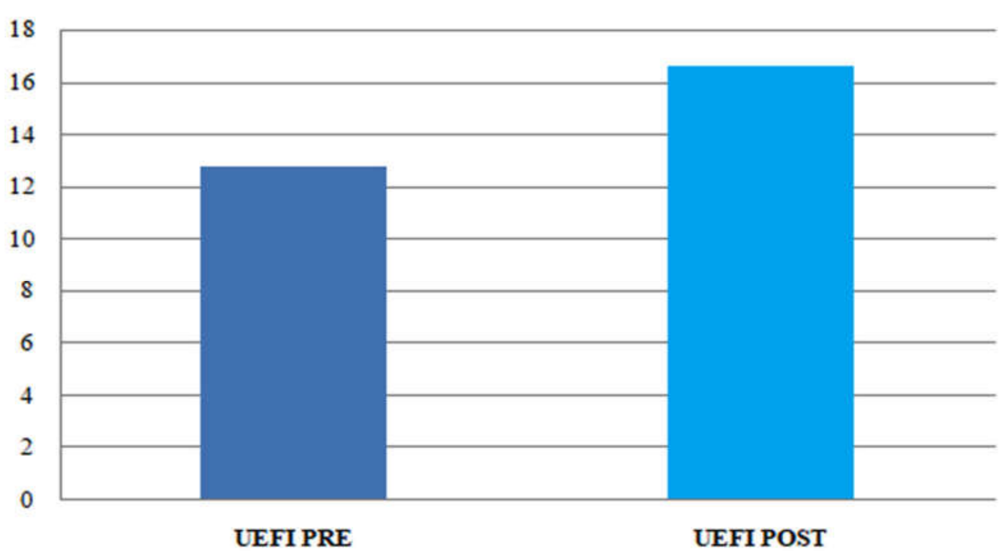

Fig. 6.1: Mean of Group A(UEFI)

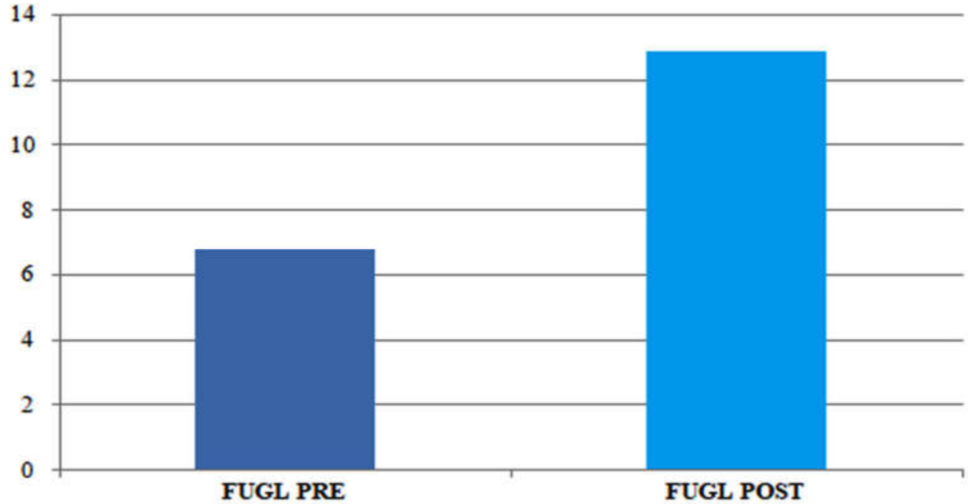

Fig. 6.2: Mean of Group A (w/h **FMUE)**

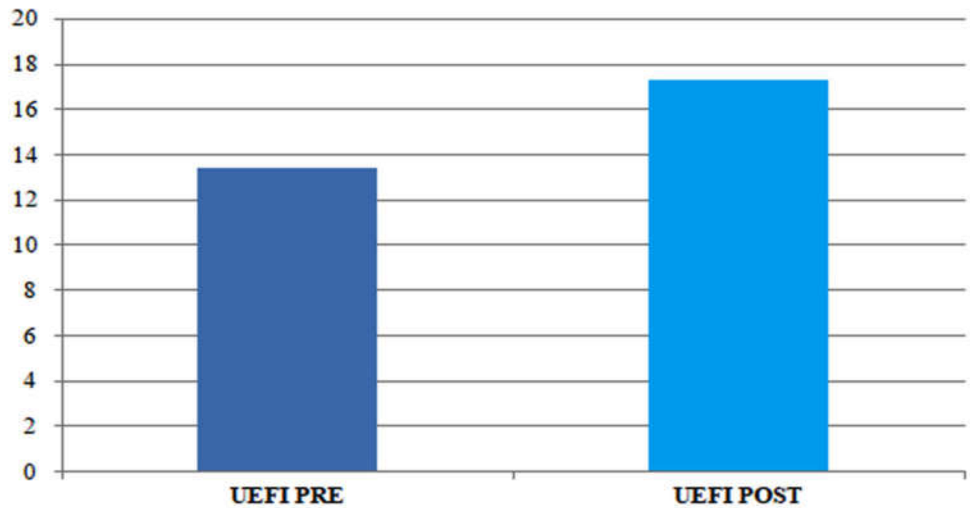

Fig. 6.3: Mean of Group B (UEFI)

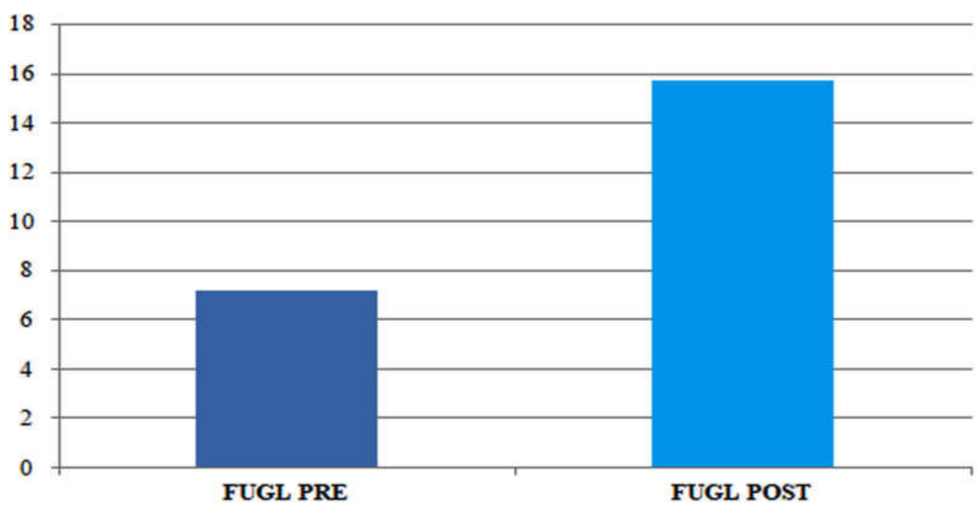

Fig. 6.4: Mean of Group B (w/h FMUE)

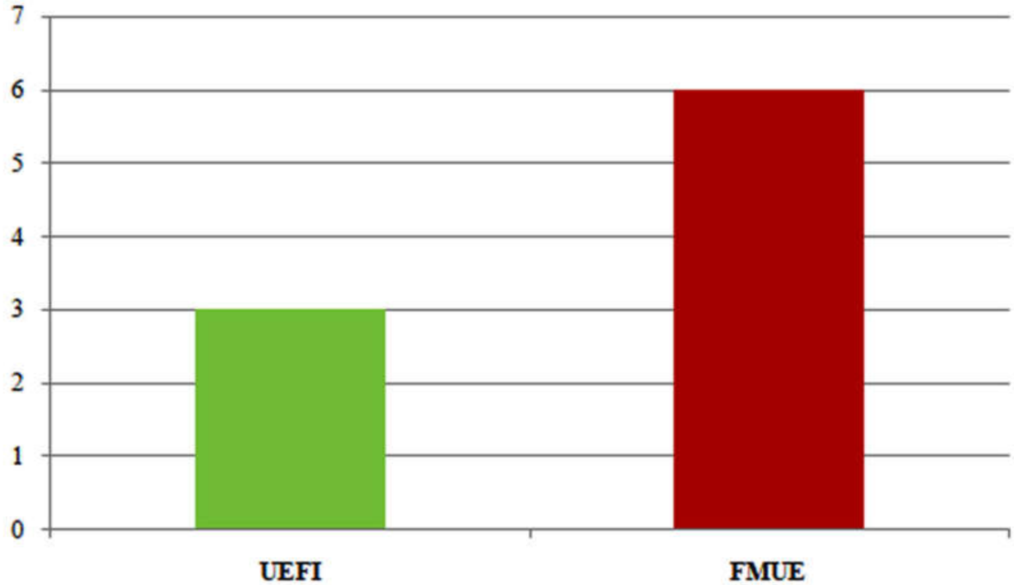

Fig. 6.5: Mean difference Group A

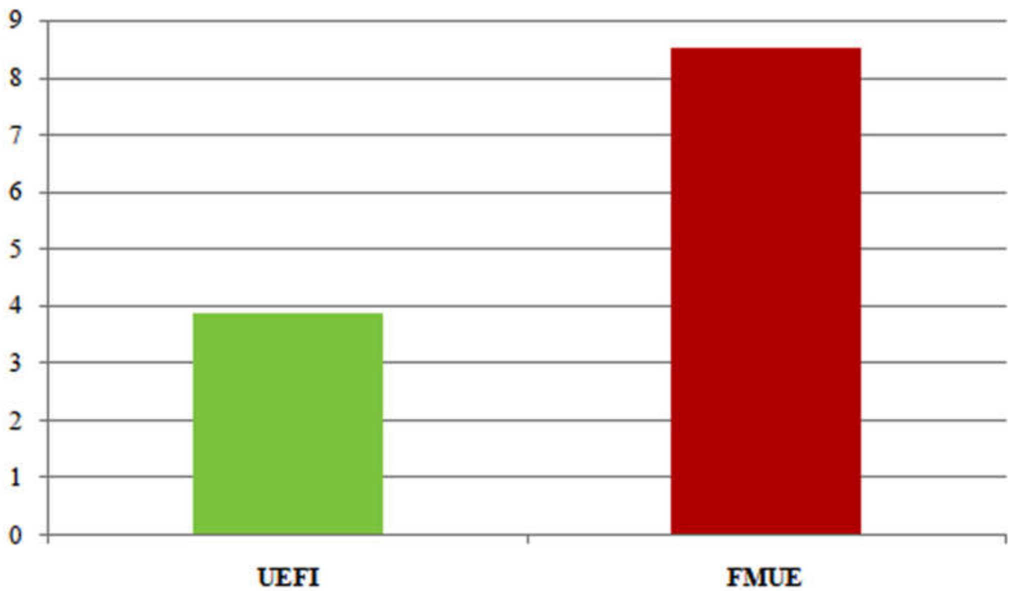

Fig. 6.6: Mean difference Group B

impact their daily activities and quality of life. Hemiparesis, which refers to weakness on one side of the body, often affects the upper extremities after a stroke. Many treatments are available to improve upper limb functions of stroke such as functional electrical stimulation, PNF, tapping etc.

Bilateral arm training and Dual task training a new treatment technique developed to promote upper extremity recovery in stroke patients. Previous studies in stroke suggested that the bilateral arm training and dual task training may be beneficial for motor function and is simple, inexpensive and most important patient directed treatment that may improve upper extremity function.

Result of the present study concluded that both the bilateral arm training and dual task training were effective for function of upper extremity and activity in daily livings. However, statistically it was concluded that the dual task training is more effective than the bilateral arm training. There was statistically significant in improve function and ADLs for Group B that was treated by dual task training as compared to those who received bilateral arm training for Group A.

Fugl-Meyer scale was developed as the first quantitative evaluative instrument for measuring sensorimotor stroke recovery, based on Twitchell and Brunnstrom's concept of sequential stages of motor return in stroke patient. It has been extensively used as an outcome measure in rehabilitation trials. The result of the study confirms that upper extremity. UEFI and FMA-UE are preferred upper limb regional tool due to its superior characteristics and clinical utility and comparable psychometric properties.

Group A shows non-significant results. In this group bilateral arm training along with conventional therapy was given to patient and shows non-significant results after 8 weeks when compared to pre intervention scores. This states that bilateral arm training with conventional therapy in the form of active and active assisted exercise are not sufficient for speedy and significant out comes. This result also place stress on proper treatment protocol with proper treatment modalities for patient for expected outcome hence proving experimental hypothesis.

Group B shows significant change in post intervention which approves improvement in functional activity according to UEFI and FMA-UE. This study applied dual-task training on both upper limb function and the ability to perform daily activities. This could include improvements in muscle strength, coordination, cognitive function, and overall functional independence. The result signify the positive effect of dual task training on upper limb function and ADLs of stroke patients, in addition to the positive effects on the walking ability, trunk control, and balancing of stroke patients. Generally Physical therapy plays a crucial role in the rehabilitation process after a stroke, aiming to help patients regain as much function and independence as possible. Stroke often leads to various degrees of functional impairment, including motor deficits, muscle weakness, coordination issues, and sensory changes. Physical therapy focuses on addressing these impairments through targeted exercises, movement retraining and techniques. The goal is to help individuals regain lost functions, such as walking, reaching, grasping, and other essential movements.

Clinically this study demonstrated that by using dual task training along with conventional therapy as a treatment tool, the improvement was seen in upper extremity function and performance of ADLs in stroke.

LIMITATION OF STUDY

The duration of the study was only 8 weeks, so further prognosis and long term benefits could not be recorded.

Sample size is small with less than 30 patients.

Training depends on functional levels of patients.

Task specify and stroke severity are important factors in rehabilitation of upperlimb.

The study was limited only to upper limb function.

FUTURE RESEARCH

Further Studies are recommended to minimize this limitation in such a way that larger sample size of both sexes that include various age groups of people are studied.

The duration of the study can be increased.

Various outcome measures can be used in order to record functional independence in better way. The study can be done to see the improvement of upper extremity as a whole.

The study can be done to improve lower extremity functions.

CONCLUSION

Bilateral arm training and dual task training along with conventional therapy both shows improvement in upper extremity function in stroke patients. But dual task training along with conventional therapy shows more improvement in reaching forward, grasping, manipulating objects and also improves other fine motor functions of hand after 8 weeks of therapy.

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