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Effectiveness of Functional Electrical Stimulation (FES) on Upper Limb Motor Functional Recovery in Stroke Patients: A Randomized Controlled Trial

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ABSTRACT

Introduction:
Stroke is a global health problem that persists with sometimes serious or mild comorbidities, and disabling. Stroke, in many countries, is the second or third most common cause of mortality and one of the foremost causes of acquired adult disability (Langhorne et al., 2011). “The word stroke used to be possibly first introduced into medicine through William Cole in 1689 in a physio-medical article regarding the late frequencies of apoplexies”. Before Cole, the most popular phrase used to describe acute non-traumatic brain damage used to be apoplexy. It was used by Hippocrates circa 400 BC for more than 2000 years (Alharbi et al., 2019). To assist stroke survivors in reducing complications and residual post-stroke functional disabilities, rehabilitation initiated immediately after a stroke has been highly recommended. By reducing functional disability and incidence of complications, rehabilitation through a suitably qualified person helps to augment the quality of life for stroke survivors and slowly but surely declines the expenses of long-term care (Whitehead & Baalbergen, 2019).
Recent evidence suggests that exercise therapy is a prominent component of stroke rehabilitation. Exercises carried out after stroke may vary with regard to their goals such as goal-directed, task-oriented, repetitive task training, or their technical traits such as duration, training load, and kind of feedback. To guide sufferers through the starting and ending of intended tasks, the Bobath treatment aims at the normalizing tone and facilitating volitional movement by dealing with specific points such as the trunk, pelvis, shoulders, hands, and feet. During the intervention, the affected person and the therapist both need to cooperate actively (Hatem et al., 2016).

Rationale

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In Bangladesh, there is a paucity of complete-phase rehabilitation centers where a person with a stroke finds suitable physiotherapy intervention. Joint compassion and weight-bearing training are generally applied in stroke rehabilitation to mitigate muscle tone and proliferate functional activities. Hence, there is certainly aresearch gap in the usual physiotherapy for stroke, including the guideline for practicing each component. From the different studies, it is evident that the functional status of the upper limb is a significant portion of the rehabilitation of a person with a stroke. The individual functional and disability status may be varied according to the determinants like age, gender, type of stroke, phases of the stroke, and chronicity of stroke. It is imperative to find out the functional and disability status of upper limb function while a physiotherapy management team works towards the improvement or the recovery of the functional and disability status of stroke patients; otherwise, physiotherapy is insignificant. Moreover, there, in general practice, is limited use of functional electrical stimulation (FES) for stroke people. Some evidence supports the FES for stroke recovery but in Bangladesh, there is a scarcity of evidence for the application of FES. As in Bangladesh, CRP has the facility to rehabilitate people living with stroke for a prolonged period of time; there is a scope to introduce FES training in individualized structures for people with stroke. The scope of practicing FES is fitted with the cultural context and organizational policy of CRP. The study results may help definitely guide the physiotherapist and will give valuable information about stroke survivors' functional and disability status, which will be beneficial for both stroke survivors and for generating evidence for the physiotherapy profession.

The study is intended to elicit the effectiveness of FES on upper limb motor functional recovery in Patients with stroke patients.

Aim and Objectives:

General objective:
The aim of the study is to elucidate the effectiveness of FES on upper limb motor functional recovery in patients with stroke.

Objectives of the program:
●To delineate the demographic physical status of the people with stroke.
●To inspect the effectiveness of FES on ROM activity of shoulder and wrist joints of stroke patients during compare to conventional physiotherapy.
●To analyze the ability to perform upper limb functional activities like grasping, and gripping before and after FES application.
●To compare the ability to do certain upper limb activities of the previous week and the following week before and after total treatment sessions.

Research hypothesis:

Null Hypothesis:
Null Hypothesis $H0$ = □1 − □1 = 0 or □1 = □2, where the post-test and pretest initial and the final mean difference is the same will be meant the outcome of FES

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are not significant upon the problems associated with upper limb motor functional recovery in Patients with Stroke.

Alternative Hypothesis:
Alternative Hypothesis H = 1 − 1 ≠ 0 or 1 ≠ 2, where the post-test and pretest initial and the final mean difference is not the same will be meant the outcome of FES are significant upon the problems associated with upper limb motor functional recovery in Patients with Stroke.

Methodology
This study will be a randomized controlled trial study consisting of two parallel arms. One arm will receive functional electrical stimulation along with usual physiotherapy entitled as the experimental group and another arm will receive only usual physiotherapy which is entitled as a control group.

Study Population
●Stroke Patients with disability who will receive rehabilitation services from the Centre for the Rehabilitation of the Paralysed (CRP).

Study area
●Neurology and Stroke Rehabilitation Unit, CRP where stroke patients will be received physiotherapy treatment.

Study period
The study period will be from September 2022 to May 2023.

Sampling technique
The researcher will use a simple random sampling technique for a sample collection from the population and computer-generated concealed allocation will be used for group allocation.

Inclusion criteria
Diagnosis of a first- ever stroke confirmed by CT or MRI scanning of the Head
Well general condition with stabilized vital signs and normal consciousness
Age 30~85 years
Brunnstrom recovery stage one to four for the affected upper limb
2 months to 4 months after stroke onset
Unilateral lesion indicated by CT or MRI,
Attend voluntarily for this study with signed informed consent.

Exclusion criteria
Reversible stroke.
Hemorrhagic stroke
Severe visceral organ (e.g., heart, lung, liver, and kidney) dysfunction
Severe cognitive dysfunction
History of mental disease and cannot cooperate in rehabilitation treatment
Deaf and mutes both are excluded

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Unable to receive treatment in designated hospital at specific time or unable to be followed up regularly
Implanted with a cardiac pacemaker with upper limb dysfunction due to other causes

Outcome measurements tools
●FUGL-MEYER Assessment Upper Extremity (FMA-UE)
●Modified Ashworth Scale
●Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire

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