Development and validation of stage wise physical therapy module for rehabilitation of Parkinson's patients

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Abstract

Background: Parkinson's disease is a complex and progressive disorder characterized by various motor and non-motor symptoms. Movement disorders are the hallmark of PD and can severely compromise an individual's ability to perform well-learned motor skills such as walking, writing, turning around, and transferring in and out of bed. Methodologies applied in patients are highly variable and many different approaches are used as per the stages of recovery. This limitation needs to be addressed by understanding and establishing a unique protocol that can be applied to these patients for better outcomes.

Method: A 18 months study was conducted where patients diagnosed with Parkinson's disease underwent physical therapy with validated module. The stage wise physical therapy module was prepared and validated with help of content validity, logical thinking and sensitivity analysis. Sample size was calculated and was 26 (By Thanchanok Pumprasart et al, With 95 % confidence and 80% power n= 26) . Functional independence measure, Modified Barthal index was assessed for functional independency and mobility.

Result: Our results shower statistical significant improvement with stage wise rehabilitation protocol on various domains of mobility and cognitive functions. More ever it was also useful for maintaining the progress of disease.

Conclusion: Stage wise physical therapy module was effective medium to reduce progression of disease and enhance mobility in Parkinson's patients.

Key words: Parkinson, physical therapy, module, stage wise.

INTRODUCTION

Parkinsonism is a group of neurological disorder in which the commonest form is Parkinson disease. It is characterized by both motor and non motor symptoms1. For diagnosis, cardinal features must be present. These include rigidity, bradykinesia, tremor, abnormal postural reactions. The disease has a diverse way of progression. In initial stage these symptoms don't affect activities of daily living. But with progression, the level of dependency increases and in chronic stage patient becomes bed ridden and is fully dependent on others. Parkinson is the second common neurodegenerative disease2. With aging the prevalence of having Parkinson increases. In 2016, 6.1 million (95% uncertainty interval [UI] 5.0–7.3) individuals had Parkinson's disease globally, compared with 2.5 million (2.0–3.0) in 1990. Parkinsonism results from the decline of neurons in the region of the brain named substantia nigra. These neurons produce neurotransmitter called dopamine. Dopamine inhibits fluky movements. Nowadays diagnosis is based on clinical symptoms where minimum two symptoms must be present for a period of more than six months. Definitive diagnosis requires α-synuclein-containing Lewy bodies or Lewy neurites. Good response to levodaopa is also one way to confirm the diagnosis. Non motor symptoms precede over motor for a period of more than 12-14 years for actual diagnosis. There are wide range of symptoms which may include Tremor, Slowed movement, rigid muscles, impaired posture and balance, Loss of automatic movements, Speech changes, Micrographia etc. Movement disorders are the hallmark of PD and can severely compromise an individual's ability to perform well-learned motor skills such as walking, writing, turning around, and transferring in and out of bed. The risk factors may include age of more than 60 years, exposure to toxins, hereditary and men's having more prevalence than women. Parkinson is often characterized by many negative features that affect the overall outcome which includes swallowing issues, depression and emotional changes sleep

disorders, constipation, bladder problems, thinking issues. These factors are the main barriers for recovery of an individual. Non motor symptoms have contribute significantly for disability and impacts the quality of life3

Parkinson patients have an increased risk of falls, even in the early disease stages, which may have widespread consequences, such as fractures, hospitalization, and death. Methodologies applied in patients are highly variable and many different approaches are used as per the stages of recovery. Modified Hoehn and Yahr scale is universal scale used to learn and understand progression and outcome of Parkinson's disease4. This limitations needs to be addressed by understanding and establishing a unique protocol that can be applied to these patients for better outcomes. The Functional Independence Measure (FIM) scale assesses physical and cognitive disability5. Items are scored on the level of assistance required for an individual to perform activities of daily living. Modified Barthel ADL index is also Measure of physical disability used widely to assess behaviour relating to activities of daily living for disabling conditions. It is considered an internationally standardized ADL assessment tool6. Physiotherapy consists of many different treatment modalities, and novel physiotherapy interventions are continuously being developed7.

MATERIALS AND METHODS:

In this experimental study, a total of 26 subjects diagnosed with Parkinson disease were included. The study was conducted between December 2020 to June 2022. The study was approved by institutional ethics committee. Patients were recruited from Department of Neurology, Krishna institute of medical sciences deemed to be university. Consent form was taken from each one of them. Age group of 30 and above with Subjects falling under the category of Modified Hoehn and Yahr scale stage 1and below were included. Both male and females were the part of this study. We excluded subjects having medical illness other than Parkinson. Subject was given detail information about the study. The subject was told about the treatment process and detail procedure. Pre treatment score of functional independence measure and modified barthal index was noted. Then treatment was given for 30-45 minutes as per the protocol decided8. Rest period was given as and when necessary. After the session is over, the subject was explained about maintenance program. Every session began with pre assessment followed by treatment.

Data collection:

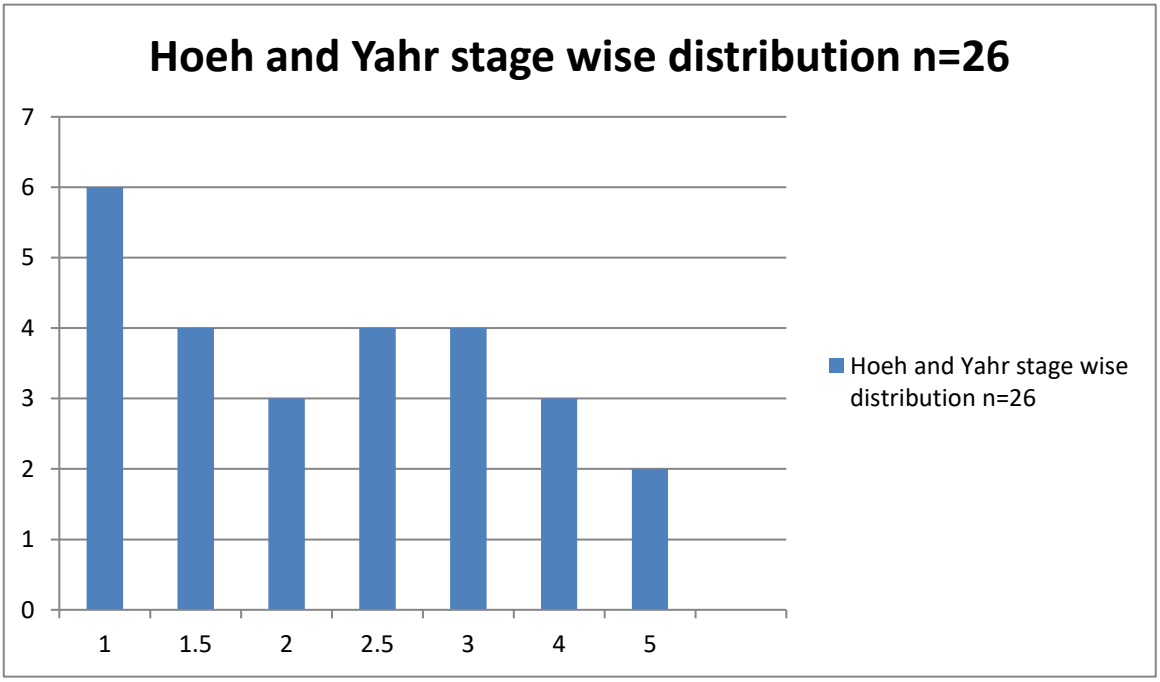
Stage wise Physical therapy module was applied on all 26 patients considering their stage of recovery. Each subject received treatment for 8 weeks. Data was collected based on outcome measures at beginning and after 8 weeks.

RESULTS:

A total of 26 subjects (mean age of 65.5 and mean years of disease was 4.5) were included in this study.

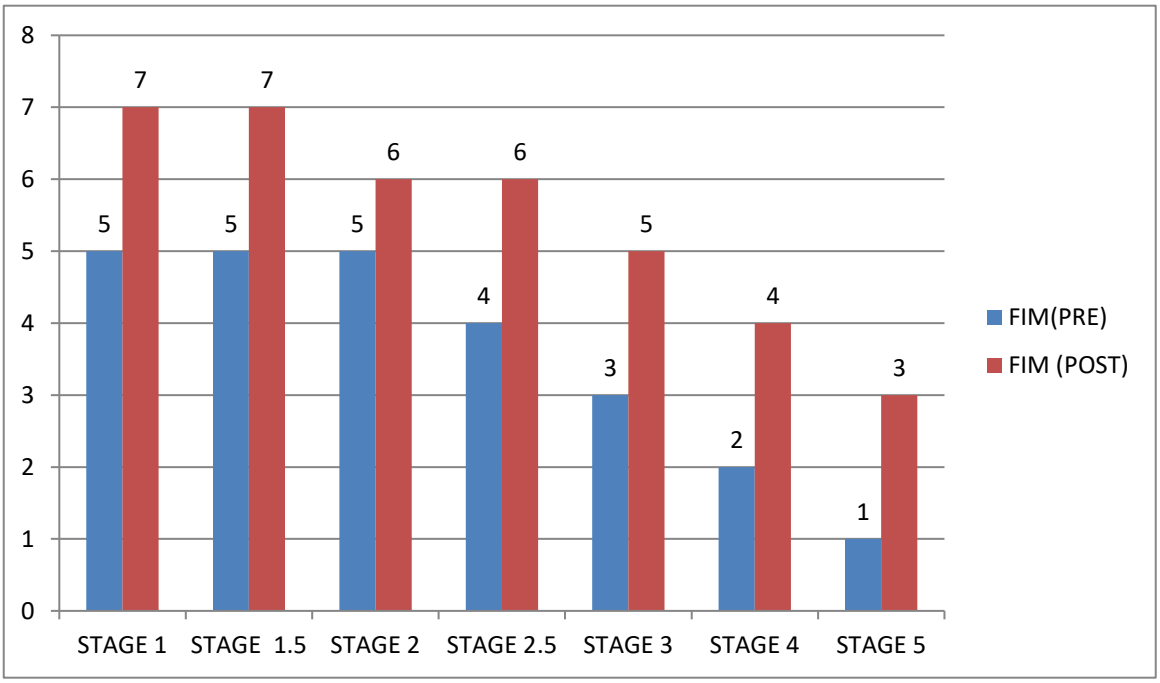
a. Modified Hoeh and Yahr stage wise distribution:

Graph 1: Modified Hoeh and Yahr stage wise distribution. Graphical representation of subjects and their stage of recovery.



b. Functional Independence Measure:

Graph 2: Functional independence measure score after application of stage wise physical therapy module (Changes in stage of recovery)

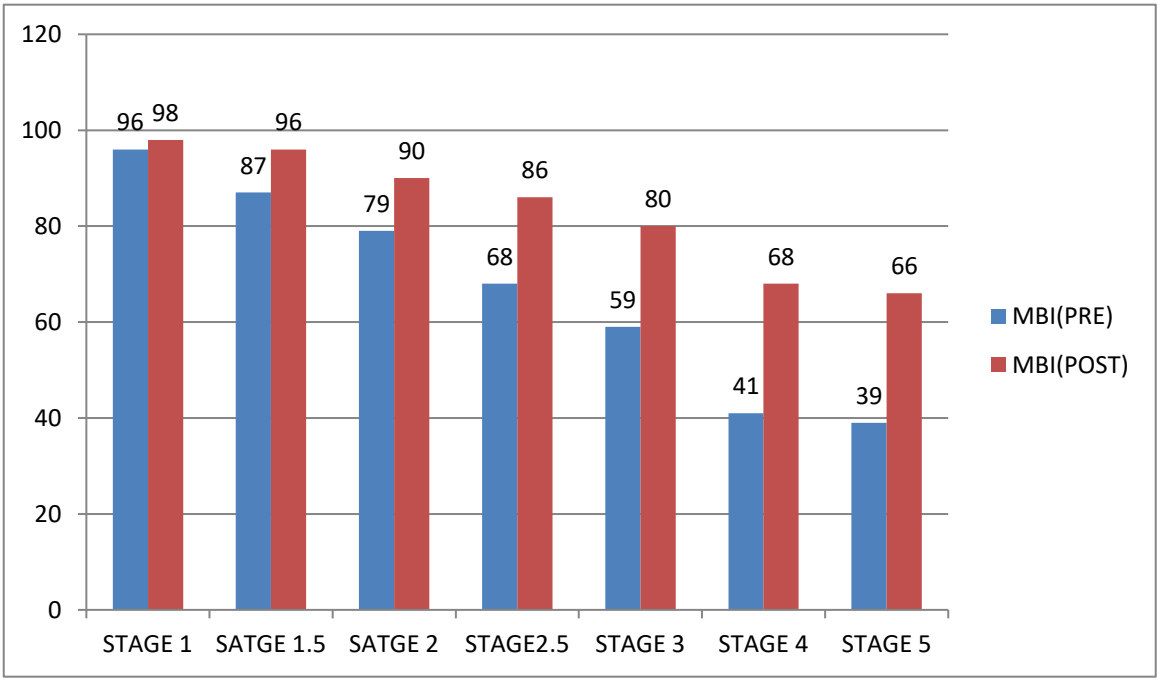


P value is < 0.0001, considered extremely significant.

Mean stage of recovery included was 3.57. With application of stage wise physical therapy module the stage was improved to 5.42.

c. Modified Barthal index:

Graph 3: Modified berthal index after application of stage wise physical therapy module.



P value is < 0.0001, considered extremely significant

Mean score of activity of daily living was 67. After application of stage wise physical therapy module the stage was improved to 83.4

DISCUSSION:

Clinical diagnosis of Parkinson disease is a challenging part in practice. Three levels of diagnostic confidence are differentiated: Definite, Probable, and Possible. Neuropathologic confirmation is required for the diagnosis of Definite Parkinson Disease in patients with the clinical diagnosis of Possible or Probable PD9. Diversified presentation requires changes in interventions accordingly10. In this study total 26 subjects were included according to Modified Hoeh and Yahr stages of recovery. This stage wise module was designed as per the functional impairments in subjects with Parkinson. Results have shown statistical improvement in both functional as well as cognitive level.

Functional independence measure:

Stage wise module has shown improvement in mobility, communication, social participation, self care domains which detoriaties as the disease progresses. Exercise therapy has shown to promote cell proliferation and neuronal differentiation in animal models with Parkinson11. Exercise has potential to help both motor and non motor symptoms of the disease. There are neurochemical and neuroplastic changes within the body following exercises. Subject Specificity of this module might have improved the functions. Subjects with early stage have been benefitted more. The effects could be through various mechanisms such as neuroprotection, neurotransmission, plasticity, neurogenesis, homeostasis, and neurotrophic factors12. Overall effect was improved in quality of life in these subjects13. Exercise has shown to have benefits for cognitive functioning by improving frontal lobe based executive function. Strength and aerobic training intervention leads to greater benefits for Executive function14.

Modified berthal index:

It is a measure of activities of daily living, which shows the degree of independence of a patient from any assistance. The exercise therapy module showed improvement in transfers especially bed to chairs. The improvement may stem from the conscious activation of motor cortex overriding the loss of basal ganglia function15. As tone was been normalized, it showed changes in ambulatory pattern from full assistance to minimal assistance. Close chain exercises on modalities like treadmill have shown to improve motor performance and ambulation16. A short-term bout of physiotherapy is feasible, safe and improves gait performance in patients with multiple system atrophy. Freezing of gait is improved by timely changing of protocol. This improvement of neuronal firing has showed positive impact on functions like stair climbing, dressing and bathing.

This stage wise module is subject specific and adds task specificity in practice. Exercises have shown to slow the progress of disease. Pain associated with rigidity is reduced. It also improves sleep which is important for well being of a person. Studies have shown that people with Parkinson's who start exercising earlier and a minimum of 2.5 hours a week experience a slowed decline in quality of life compared those who start later. Impact of motor and non motor symptoms on quality of life is very high17. This stage wise protocol is proved to improve the quality of performance thereby enhancing quality of life.

CONCLUSION:

The study concluded that stage wise physical therapy module has shown to be very effective in slowing down the progression and improving functional and cognitive status in subjects with Parkinson.

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