Effectiveness of Home - based Physiotherapy on Berg Balance Scale Scores in Parkinson's Disease in India: An Observational Study

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Abstract

Background: Parkinson's disease (PD) is a progressive, neurodegenerative disease which leads to postural and gait disorders, limitation in mobility, activities of daily living and disability. Although a number of studies have shown that supervised exercise programs have short-term beneficial effects, there are few studies addressing the effectiveness of home-based physiotherapy. Therefore, this study was done to analyze the effects of home-based physiotherapy on balance in participants with Parkinson's disease.

Material and Method: From January 2018 to December 2018, 44 participants who were recipients of HealthCare at Home physiotherapy (HCAH) services across various locations were included in the main analysis. The age ranges from 63 years to 87 years (mean age 75.18 years), average treatment cycle duration was 74.2 days. Physiotherapy was performed for approximately 45-60 min aiming to improve general mobility, static and dynamic balance. Berg Balance Scale (BBS) were taken as an outcome and were recorded fortnightly.

Findings: Statistically significant improvement was seen in Berg Balance score (BBS) with mean difference of 6.09.

Conclusion: The results of the study shows that home- based physiotherapy interventions like stretching exercises, active assisted, active exercises, strengthening exercises, balance and gait training. were found to have a positive effect on Berg balance scores among patients with PD.

Keywords*: Parkinson's Disease, Berg Balance Scale, Home-Based Physiotherapy.*

Introduction

Parkinson's disease is a progressive neurodegenerative condition with both motor and non-motor symptoms. Progressive loss of substantia nigra neurons, which produce dopamine, results in neurotransmitter imbalances in basal ganglia. Patient begin to experience a vide variety of difficulties if around 80% of neurons have been lost. [1] It is the second most common neurological disease in the world that affects neurophysiologic function, movement abilities, and quality of life[2]. The mean age of onset is between 58 and 62 years. Prevalence rises from 1% with those with 60 years age to 4% in population over 80 years. Males are slightly more at risk than females[3]

The most clinical features of Parkinson disease are motor symptoms including tremors at rest, rigidity and bradykinesia. These impairments cause difficulty for the

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patients to cope with the functional task such as walking, rising from a chair, moving in bed, eating, or putting on shoes[1]. Impaired balance is one of the cardinal signs of Parkinson's disease (PD). Balance control and postural control are often used interchangeably. Posture instability and reduced mobility are result of the abnormal sensory integration within the basal ganglia, poor neuromuscular coordination and muscle tone[4]. This increased postural instability is considered one of the most incapacitating symptoms that directly threaten independent living[5] and promotes an inactive lifestyle. Characteristic stooped PD posture together with decreased joint range of motion, narrow foot stance and axial rigidity add on to this posture instability[6]. Untreated balance dysfunction can lead to increased frequency of falls and injuries which in turn increases the chance of developing comorbidity and disability by causing alterations in postural control strategies during standing tasks and when performing voluntary movements[2].

Depending on the individual's PD severity, Parkinsonism is typically symptomatically managed throughout the individual's life with pharmacologic and non-pharmacologic treatment such as surgical, physical and psychosocial interventions[7].Although the gold standard dopaminergic pharmacological interventions are effective in reducing bradykinesia, rigidity, and tremor, but there is limited literature about the effect of medications on improving balance deficits and reducing falls in people with PD[2]. Recent findings recommend that intensive and challenging exercises induces neuroplasticity, suggesting that exercise should be essential in PD treatment [5,8]. Physiotherapy intervention, that focus on balance exercises specifically, have shown positive effect in improving balance[9], and reducing fall risk[10].

Home-based exercises may be more practical and accessible for individuals with PD as previously been found[11]. On the other hand the researchers also suggested that, due to other comorbidities often found in individuals with PD, a therapist supervised programme is best, and that group or individual sessions have different benefits. Home-based physiotherapy has several advantages because it not only increases independence and teaches self-management, but also promotes empowerment. Home-based services with regular visits from health care professionals, consistent monitoring, and follow-up ensures continuity of patient care and patient satisfaction[12,13]

Keeping in mind that the standardized home care physiotherapy services is an evolving model of care in India that can help bridge the gap in accessibility and possibly meet the functional rehabilitation needs of Parkinson's patients, this study was therefore conducted to analyze the effectiveness of home-based physiotherapy on balance in patient suffering from Parkinson's disease across various location in India

Material and Method

Out of 63 individuals with Parkinson's disease receiving HealthCare at Home physiotherapy services across various locations in India from January 2018 to December 2018, 44 individuals (32 males and 12 females) who consented with age ≥ 60 years (mean age 71.63±6.19 years) were included in the study.

The study enrollment is described in the flow chart (Figure-1).

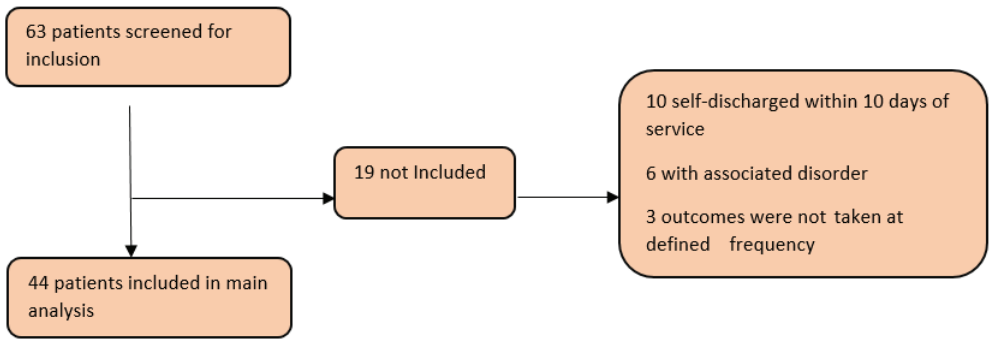

Fig 1: Cohort Chart

Individuals with any associated disorders like Alzheimer's disease, stroke, patients who didn't sign the informed consent, self discharge within 10days of service were excluded from the study. Before starting the therapy, problems and expectations of the participants were clearly understood, and a goal was set individually, which was documented as part of a standard process of HealthCare at Home. All physiotherapists were trained on skills and techniques required to manage participants with stroke. Individual care plans were designed for all patients which were reviewed and modified as per change in the patient's condition by the physiotherapists.The study was conducted in agreement with the principles of the Helsinki Declaration of 1975, as revised in 1996.

To analyze the impact of home-based physiotherapy on balance, the Berg Balance scale (BBS) score as a functional outcome was taken at the time of initial assessment and reviewed fortnightly. In the present study the BBS consists of 14 items that are scored on a scale of 0 to 4. A score of 0 is given if the participant is unable to do the task, and a score of 4 is given if the participant is able to complete the task based on the criterion that has been assigned to it. The maximum total score on the test is 56[14]. Studies have reported the minimal detectable change for berg balance scores is values of 6.3 points, 4.9 points and 3.3 points for the ranges of 25–34, 35–44 and 45–56 on the BBS, respectively[15]

All the outcomes were documented in a HealthCare at Home registered platform patient care system (PCS). The individual supervised home physiotherapy program of 45–60 min was delivered to each patient. The duration and frequency of treatment was decided by the treating physiotherapist based upon acuteness and severity of patient condition. The mean treatment cycle duration was 74.2 days (mean number of sessions delivered, 66.8). The main goals of physiotherapy were to improve general mobility, static and dynamic balance in participants with Parkinson's disease and delivered in the form of stretching exercises, active assisted, active exercises, strengthening exercises, balance and Gait training.

Care giver and family members were explained about the condition, its outcomes, precautions, risks involved as well as about the home exercise program. Progression in the exercise program was done basis the patient's performance and feedback during the sessions.

Findings

Data was meaningfully assorted through calculation of Mean and Standard Deviation (SD). Later on paired t-test was applied for comparison of values obtained from berg balance scale scores.

The Mean ± Standard Deviation value for age was 75.18±7.42. Out of 44, 32 (73%) were males with the Mean ± Standard Deviation value for age 75.97±7.59 and 12 (27%) were females with the Mean ± Standard Deviation value for age 71.63±6.19.

Table 1: shows the number patients in different age groups.

Age (Yrs)	Number of Patients	Percentage
60-69	10	23%
70-79	20	45%
80-90	14	32%

Table 2 shows paired t-test results for comparison of initial and final values of Berg balance scale scores. The Mean ± Standard Deviation value for initial BBS score was 31.40 ± 16.2 and final BBS score was 37.49 ± 17.15. T test value for comparison of initial and final values of BBS scores was 5.97 which was statistically significant at $p<0.001$.

Table 2: Shows comparison of Initial and Final Values of Berg Balance scale

Paired Samples Statistics	Mean	SD	N	Mean Diff	t Test	p value	p value
BBS Score Initial Value	31.40	16.22	44	6.09	5.973	<0.001	Significant
BBS Score Final Value	37.49	17.15	44				

BBS: Berg Balance Scale, *Significant Difference at $p<0.001$

Table 3: Shows the mean point improvement in BBS scores in different age groups. The mean point improvement in BBS in age group 60-69 yrs was 3.3, 70-79 yrs was 7.4 and 80-90 yrs was 6.7.

Table 3: Shows Mean point improvement in BBS scores in different age groups

Age Group (yrs)	Mean ± SD of BBS Score Initial Value	Mean ± SD of BBS Score Final Value	Mean point improvement in BBS
60-69	33.5± 9.1	36.7±11.7	3.3
70-79	39.7±14.7	47.2±14.9	7.4
80-90	21.1±13.8	27.8±16.5	6.7
Mean Total	31.4±16.22	37.49±17.15	6.09

BBS: Berg Balance Scale

Discussion

Poor balance control and postural instability are among the most disabling features of PD. The sensorimotor control of posture involves a complex integration of proprioceptive, vestibular, and visual channels. All or some of these systems may be dysfunctional in Parkinson's patients. The increased muscle stiffness and inflexibility of postural reflexes contribute to balance control impairment[4]. Exercise in general can facilitate neuronal transmission and motor coordination that are essential for improved balance and overall function[11]. However, PD research seldom indicates what the best practices are to deliver exercise interventions[16].

The present study reflected that the home-based physiotherapy interventions like stretching exercises, active assisted, active exercises, strengthening exercises, balance and Gait training. were found to have a positive effect on Berg balance scores among patients with PD with the mean difference of 6.09 in berg balance score which is higher than what MDC reported in previous studies[15,17]. In other study the MDC95 values of 6.3 points, 4.9 points and 3.3 points for the ranges of 25–34, 35–44 and 45–56 on the BBS, respectively were reported[15]. Whereas in our population 8.8 points, 7 points and 1.8 points for the ranges of 25–34, 35–44 and 45–56 on the BBS, respectively were observed.

The findings were in accordance with the results of other studies those have found that interventions including muscle strengthening, range of movement, balance training, walking training shows improvement in BBS immediately after intervention period by 5.98[2]. Nicola Smania et al concluded that the out patient balance training improves the berg balance scores in patients with idiopathic Parkinson's disease with mean diffrence improvement of 5.4[18]. In a smiliar study 4 weeks intervention including cardiovascular warm up, balance and gait training were found to have a positive effect on balance dysfunction but at 1 year of follow up BBS does not show significant improvement as compared with the initial value[1].

Family support, the home environment of rehabilitation, an individually designed treatment plan and close follow-up have been considered to be the key factors in facilitating functional improvement. Literature suggests that physiotherapy provided at home shows effective improvement in function in Parkinson's disease patients[19,20].

A Systemic review has concluded that Home-based prescribed exercise improves balance-related activities in people with Parkinson's disease and has benefits similar to centre-based exercise[21]. Frazzitta G et al in a study founded that group physical therapy program improves the balance in patients with parkinson disease but not much studies are done on the effectiveness of home based physiotherapy on balance in PD[22].

We observed a mean BBS value changed from 39.7 to 47.1 in the age group 70-79yrs. This change shifted from medium risk of fall to low risk of fall based on BBS[23]. The average duration of treatment was minimum in age group 70-79 years (63.2 days) as compared with 60-69 years (85.5 days) and 80-90 years (78 days).

The present study had certain limitations, such as lack of assessment of some parameters like Hoehn and Yahr stage and quality of life. We also could not track the long-term outcome of home -based physiotherapy. Future research should focus on measuring quality of life in terms of tracking overall impact of home-based physiotherapy services. In conclusion, Home-based physiotherapy treatment can be effectively used for the improvement in balance in people suffering from Parkinson's disease. Age group 70-79yrs shows greater improvement in BBS scores with lesser average duration of treatment as compared with other age groups although this needs to be tested in future under well-controlled trials.

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Ethical Clearance: Ethical clearance was not required in this study.

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