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Effectiveness of Bobath Approach on Improving Balance in Patient with Stroke: A Quasi-Experimental Study Design

—Impact of Bobath Approach on Enhanced Balance Patient with Post-Stroke

Rumi Akter, Suchitra Rani Das*, Manna Papia, Nabila Tasnin, Nazmul Haq

Department of Physiotherapy, Centre for the Rehabilitation of the Paralyzed, Dhaka, Bangladesh
Email: rumimpt@gmail.com, *suchitramirpur14@gmail.com, papiapt92@gmail.com, tasninnabila@gmail.com, nazmul.sawon2021@gmail.com

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Abstract

Post-stroke sensory-motor issues often lead to postural instability, affecting gait and daily living activities. Around 83% of stroke survivors experience balance impairments, increasing fall risk. The Bobath approach focuses on motor recovery through postural control. At CRP, it is used to enhance alignment, neuromuscular function, and independence in stroke patients. A total of 162 stroke patients were selected through purposive sampling from CRP-Mirpur. They received Bobath technique for 6 weeks (5 days/week, 40 minutes/session) from certified practitioners. The Berg Balance Scale (BBS) was used to assess balance before and after treatment. Data were analyzed using paired t-tests. The study showed that the Bobath approach significantly improves sitting and standing balance, and mobility in stroke patients. The Bobath approach significantly improves balance and mobility in stroke patients, promoting greater independence and improving overall functional outcomes in stroke rehabilitation.

Keywords

Stroke, Bobath, Balance & Impact

1. Introduction

Due to sensory-motor consequences postural instability after stroke has the greatest impact on gait and independency in activities of daily living (ADLs). Standing balance is more important than leg strength to achieving independent walking or ADL's [1]. Balance impairment considered as a major risk factor for fall. It is re-

ported that about 83% of stroke survivors suffer from balance impairment. Balance impairment is characterized by short supporting time and differences between two sides of the body and slow walking speed, which may increase the risk of falls. After stroke falling is the common complication, around 50% - 70%. Therefore, management of balance impairment is challenging for patients who had a stroke [2].

Trunk control is necessary in order to change the body position to control movements against gravity and to shift the weight to free the limbs for function. In sitting, normal trunk control maintains the stability of trunk and enables us to shift weight and balance and to reach with the arms. Stroke is a global public health problem that leads to significant disabilities [3]. In CRP we use Bobath approach for stroke patient which aims is the restoration of maximum independence by improving alignment and neuromuscular activity. Very few researches has done on balance besides that there is no research published on treatment approach in Bangladesh. So based on the evidence and interest we choose this topic.

The control of human balance is a comprehensive process relying on the integration of visual, vestibular and somato-sensory inputs to the central nervous system. It is reported that about 83% of stroke survivors suffer from balance impairment [4].

Ischemic stroke is more often diagnosed in the left hemisphere than in the right [5]. Several hospital-based studies have reported that left sided strokes are more frequent than right sided. A possible cause for the left sided strokes is more frequent is the characteristics of the atherosclerotic plaque in the left carotid artery. Another hypothesis is that the strokes in hospitals are selections of strokes with symptoms are that are better recognized or perceived as more severe. Balance is complex, multi-dimensional concept requiring integration of the vestibular, visual, somato-sensory, musculoskeletal and cognitive processing systems involving the reception and integration of sensory input, planning and execution of movement to achieve a good upright posture [6].

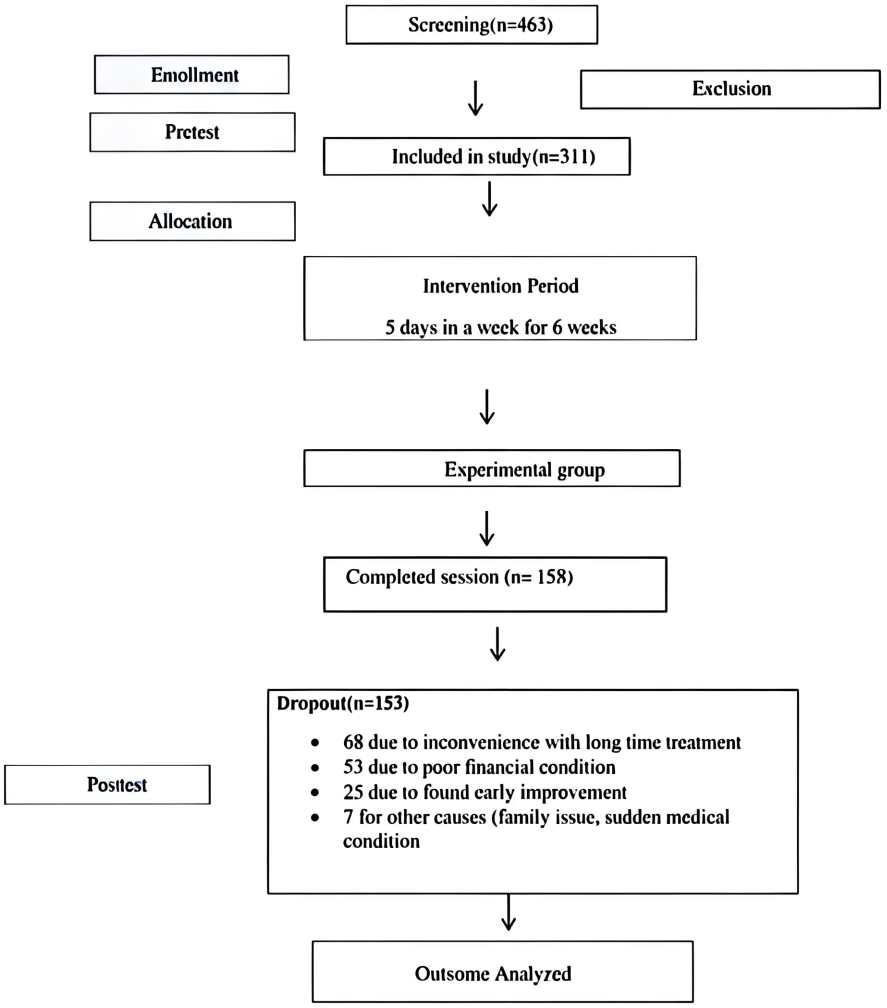
The first is the ability to maintain an efficient tone and an appropriate relationship between body-segments and body-environment respect to gravity, support surface, visual and internal references. The second involves the coordination of movement strategies to stabilize the COM during self-initiated activities or external disturbances of stability. The most important aspect of dynamic stabilization of trunk correlated with postural control and postural stability [7]. The aim of this study is to explore the effectiveness of Bobath techniques to improve balance in patient with Stroke.

2. Methods

Study Design: A total of 158 samples with stroke. Experimental group received Bobath technique from certified Bobath practitioner. Each patient was received the treatment for 5 days a week for 6 weeks. The time duration will be given 40 minutes for each session. All the participants took in the experiments on a voluntary basis after signing a consent form a demographic data was collected from each subject.

The purpose of the study was explained to all the participants. In this study purposive sampling was used. These subjects were taken from the stroke rehabilitation unit CRP-Mirpur and selected according to inclusion and exclusion criteria. The Inclusion criteria of this study are age 18 to 80years old, both genders, definite diagnosis of stroke by CT/ MRI. Exclusion criteriafor this research aremedical unstable patient, psychiatric patient, and anyorthopedic or other neurological condition. Outcome measurement is Berg balances scale (BBS). Material used as couch, chair, pillow, data collection sheet and patient consent form. Procedure-58 patients between the age group of 18 to 80 years were included in study after a written consent forms either the patient or the relatives. Patients were aware about the research study and the procedure of the followed patients would receive Bobath approach under the supervision of expert who was completed Basic Bobath Certificate course. The study was of 6 weeks 5 days per weeks at Stroke Rehabilitation Unit (SRU) in CRP-Mirpur. Examination included assessment which was performed on first and last day of treatment and data was recorded. Data was collected from September, 2024 and this study was conducted for 1year period.

Intervention Description and Replication flowflow chart:



Treatment:

Activation of foot in supine: In supine lying at first patient position is in active supine that means the alignment of body position is like active from head to feet. Then start mobilize the first metatarsal of the foot and extensor hallucis longus, then 2nd metatarsal, 3rd, 4th and 5th metatarsal of the foot. Then mobilize the longitudinal arch and shaping the foot. Then flex the fingers at first by the therapist then patient will try with therapist 5 - 10 repetitions. After that planter flex and dorsi flex the ankle.

Stop standing: This exercise is for activate the gravireceptors by contracting abdominals. This technique start from standing position alignment would be symmetrical and therapist palpate abdominals by both thumb give upward pressure and patient both knees flex before the sitting position. In this position pelvis ant and post tilt 5 - 10 reps then go to standing position.

Linear extension lumbar: In sitting position both arms place on the table therapist hand place under the posterior superior iliac spine then hip flexors, facilitate the pelvic into posterior tilt. Then use thumbs bilateral upward facilitation or use the thumbs laterally to get the extensor response through this.

Activation of foot in sitting: this technique is same as in activation of foot in supine. At first active sitting position and foot flat on the floor then start from calf muscles gastrocnemius and soleus muscles mobilize one side fixed and other side mobilize and go to downward mobilize the tendo-achilis. Gradually mobilize the extensor hallucis longus, then start mobilize the first metatarsal of the foot and extensor hallucis longus, then 2nd metatarsal, 3rd, 4th and 5th metatarsal of the foot. Then mobilize the longitudinal arch and shaping the foot. Then flex the fingers at first by the therapist then patient will try with therapist 5 - 10 repetitions. After that planter flex and dorsi flex the ankle. 5 - 10 reps

Sit to stand: Patient is in active sitting position then bends forward and trunk extension and stand up 5 - 10 reps.

Data analysis

This chapter deals with the statistical analysis of the socio demographic frequency and the measure the BBS within group. The data analyzed by SPSS software. Paired T-test used to compare pre and post treatment score of the BBS within group.

3. Results

This chapter deals with the result of data analysis of the data of BBS and Socio-demographic data. The score was analyzed and interpreted to determine the Bobath intervention is effective to improve balance in patients with stroke. Paired T test was used to analyze and compare Pre and Post treatment score within the group. Significant value of 0.05 was used for data analysis. One hundred and sixty-two stroke patients were participating in this study. The demographic and co-morbid characteristics of the included patients were illustrated in Table 1. Among 158 participants slightly more than half of the participants were aged 28

- 57 years (51.8%), while 48.2% were aged 58 - 87 years. Regarding diagnosis, CVA with left-sided involvement was most common 50.6%, whereas right-sided CVA accounted for 48.1%, with only 1.2% having bilateral hemiparesis. The most frequent co-morbidity was DM with HTN (37%), followed by HTN alone (31.5%) (Table 1).

Table 1. Socio-demographic data.

Characteristics of Research Subjects	Frequency (n)	Percentage (%)
Gender		
Men	83	51%
Women	79	49%
Age		
28 - 57	84	51.8%
58 - 87	78	48.2%
Diagnosis		
CVA with Rt	78	48.1%
CVA with Lt	82	50.6%
CVA with Bilateral hemi peresis	2	1.2%
PMH		
HTN	51	31.5%
DM + HTN	60	37%
DM + HTN + IHD	23	14.2%
Others	21	12.9%
None	7	4.3%

The mean pre-test score increased from 8.30 to 28.30 at post-test, with a mean difference of −20.00 (SD = 11.91) which indicates a substantial improvement after the intervention. This improvement was statistically highly significant ($p < 0.001$), suggesting paired sample analysis highlighted a significant improvement in BBS scores following Bobath exercises (Table 2).

Table 2. Paired samples statistics.

Paired samples statistics				
Treatment	**Mean pre-test**	**Mean post-test**	**Std. Deviation**	**p**
Bobath exercises	8.30	28.30	11.909	0.000

In Berg balance scale initially 138 no. of patients were wheelchair bounded, 16 patients were walking with assistance and 6 patients were independent and during discharge 44 patients were independent and 73 patients were walking with assistance (Figure 1).

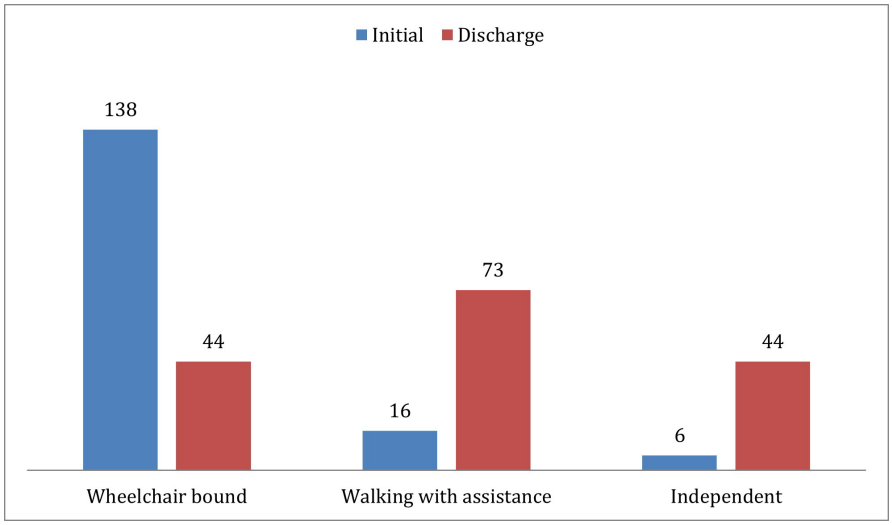


Figure 1. Difference between BBS outcome.

Among patients with DM and HTN, the majority, 31 patients were walking with assistance, followed by 15 wheelchair-bound and independent 13. In the DM, HTN, and IHD group, most patients required assistance for walking (n = 13), with fewer being wheelchair-bound (n = 7) and only a small proportion of 3 are independent (**Figure 2**).

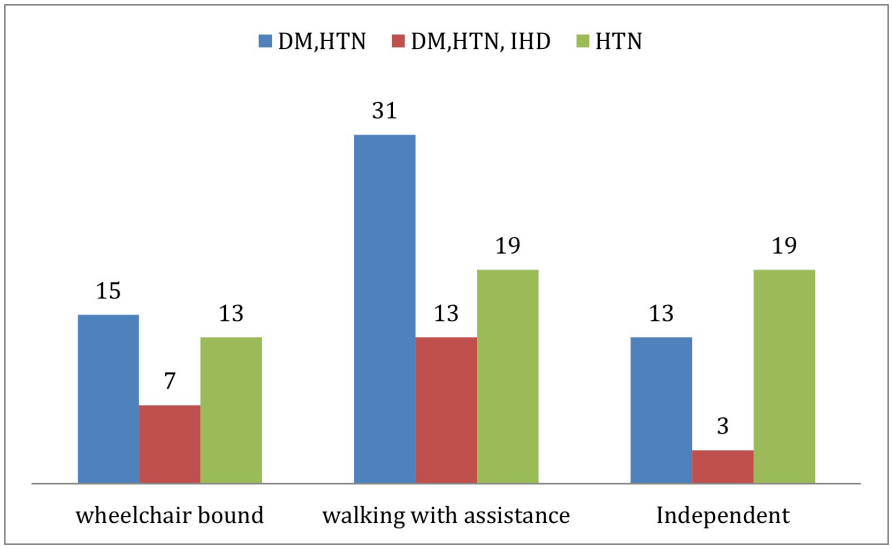


Figure 2. Correlation between comorbidities.

4. Discussion

The study was conducted to evaluate the effectiveness of Bobath approach on improving balance in patient with stroke. The study was carried out among 158 patients, age range from 18 to 80 years according to inclusion criteria and purposive sampling was used to allocate the subject.

In age specific prevalence showed that 28 - 57 years age range patients are more than those younger than 58 - 87 years of age range. The similar result we have got

in another research in Bangladesh. In 2022 Mondal, M., et al has done the research about prevalence and risk factors of stroke in Bangladesh. They have got majority of patients age were more than 60 years [8].

In case of balance sitting balance is the first step during assessment. In this study majority of patients need assistance during sitting. After applying Bobath approach majority of patient achieved sitting balance**.** Moni, S. (2019) has found the effectiveness of Bobath approach in sitting balance.

The results of the present study have shown that Bobath-based trunk exercises improve trunk function and have a positive impact on balance and walking activities. The most important feature of our study is that the trunk training was individually planned and functionally oriented. The trunk training totally depends on postural control, postural stability as well as the centre of mass of the body according to posture.

In Berg Balance Scale here we have found that initially most of the patients were wheelchair bound but after 6 weeks nearly 50% patients could walk with assistance and 27% patients were independent. This was the outcome of Bobath concept. In 2016 Kilinc, M. *et al.* investigate the effect of Bobath based trunk exercises on trunk control, functional capacity, balance, and gait: a pilot randomized controlled trial. In their study individually developed exercise programs in the Bobath concept improved in trunk performance, Balance and walking ability in stroke patients.

According to Verma, S. *et al.* (2023) tried to find out the effectiveness of Bobath approach along with core stability training in stroke patient. The result of this study showed that Bobath approach along with core stability training improves trunk function and have a positive impact on balance and mobility.

Here we have got majority of patients are left sided hemiplegia than right side.

Cerebrovascular disease is an important health problem in worldwide [9]. After stroke majority of patients have balance problem and others have higher postural sway, asymmetric weight distribution, impaired weight shifting ability and equilibrium reactions may be delayed or disrupted [10]. There is also an increased risk of falling, resulting in high economic costs and social problems. Hemiplegia can cause reduction in patient's limits of stability, which are defined as the area where the individual can shift his center of mass without loss of balance and without changing the support base. Therefore, it's essential to rapidly achieve postural control in order to improve independence, social participation and general health. The aim of balance rehabilitation is to ensure safe ambulation [11]. In spite of the multiple therapeutic approaches to promote recovery of postural control, no definitive conclusions can be drawn on which one is the best.

Balance is essential to all functional activities during sitting and standing [12]. Postural control is fundamental to maintain balance. The important resources for postural control are movement strategies, biomechanical constraints, cognitive processing, perception of the verticality (visual and postural), sensory modalities (somatosensory, visual and vestibular) and the sensory reintegration and reweighting in central nervous system (CNS) [13], which can be impaired after a

stroke. Postural control is one of the important components of Bobath concept Included physiotherapy treatment approaches that were aimed at promoting the recovery of postural control and lower limb function (including gait), and also interventions that had a more comprehensive stated aim, such as recovering functional ability [14].

Simulate postural control activities requires a fundamental understanding of the human body's internal processes that are dependable for balancing. We would like to use postural control simulations to give Physiotherapy recommendations to patients suffering from postural control disorders in the future, by tailoring targeted exercises for return of body functions or to estimate the influence of task specific-exercises [15].

Practicing of balance' is one of the most important physiotherapeutic interventions in inpatient rehabilitation facilities. Even if the survivors of stroke are ambulatory, there is an increased risk of falling mainly on paretic side, difficulty in walking on uneven surface and difficulty in using public transport. Bobath described "walking as a constant losing and regaining of balance" [16].

By using various interventions, we can improve balance. The Berg Balance Scale (BBS) measures both static and dynamic aspects of balance [17]. The BBS is a psychometrically sound measure of balance impairment which can be used in post-stroke assessment [16]. It is a 14-item list with each item consisting of a 5 point ordinal scale ranging from 0 to 4, with 0 indicating the lowest functional level and 4 the highest functional level. A score of 56 indicates functional balance while score < 45 indicates individuals may be a greater risk of falling. It has good high intra-rater & inter-rater reliability (ICC = 0.98 and 0.96 respectively Postural control involves controlling the body's position in space for the dual purposes of stability and orientation) [18]. It maintains a specific body orientation and equilibrium during standing & during locomotion in the presence of many factors [19] Studies of balance impairments consistently have shown that people with stroke have greater postural sway than age-matched volunteers who are healthy. They also have altered weight distribution patterns, so that less weight is taken through the weak leg, and they have smaller excursions when moving their weight around the base of support, especially in the direction of the weaker leg. This pattern is seen in all aspects of balance static, dynamic, or responses to external perturbations and even in people with stroke with high levels of function, such as those who are ambulatory in the community. In fact, the Central Nervous System utilizes feedforward and feedback mechanisms to prevent the position and velocity of the COM from exceeding stability limits. Feedforward postural responses can be divided into preparatory and accompanying APAs, which occur prior and during movement. These mechanisms adapt motor and sensory systems based on previous experience and motor learning Trunk control is the ability of the trunk muscles to allow the body to remain upright, adjust weight shifts and perform selective movements of the trunk that maintains the base of support during static and dynamic postural adjustments. It is one of the most important indicators of

functional recovery. There is a strong correlation between trunk control and balance. It is one of the most important parts of the treatment of stroke patient by using Bobath approach.

The study was conducted in a single center with purposive sampling, which may limit generalizability. The sample size was relatively small and only Berg Balance Scale was used as the outcome measure. Long-term prognosis and sustainability of effects could not be recorded as no follow-up was done.

Further studies are recommended with larger sample size including both sexes and various age groups. Longer duration of intervention with long-term follow-up should be conducted to assess lasting effects. Multi-centered randomized controlled trials are needed for stronger evidence. Comparative studies with other rehabilitation techniques may help clarify the relative effectiveness of Bobath approach.

5. Conclusion

This study presents that significant improvement in sitting balance, and standing balance was achieved in stroke patients through the Bobath approach. Thus, the Bobath concept can be considered an effective intervention for improving balance and functional independence in stroke rehabilitation.

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AI Disclosure

AI tools were used only for language editing and conceptual clarification. The study design, data collection, analysis, interpretation, and final conclusions were entirely performed by the author.

Ethical Approval

Researcher followed the Bangladesh Medical Research Council (BMRC) and World Health Organization (WHO) research guide line. In addition, for data collection purpose, permission was also obtained from head of physiotherapy department, CRP-Mirpur. The study was approved on 25 August, 2024 (IRB reference no: BPA-IPRR/IRB/25/05/2024/1007). Researcher maintained the confidentiality of the collected data from the individuals. All the care givers and also patients will be informed about the purpose of the study.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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