*Original Article*

# *Motor outcome of stroke patient with low dose levodopa therapy*

*Islam MS[1], Uddin MJ[2], Sultana N[3]*

1. **Dr. Muhammad Shamsul Islam, Assistant professor, Department of Medicine, Jahurul Islam Medical College & Hospital.*
2. *Dr. Mohammed Jamal Uddin, Assistant Professor, Department of Paediatrics, Jahurul Islam Medical College & Hospital.*
3. *Dr. Nasrin Sultana, Medical officer, Haluaghat upazila Health complex.*

**** Address of Correspondence***

## Abstract

***Background:*** *Motor deficit was measured by simple muscle power grading, Rivermead Mobility Index (RMI) score and Orgogozo scale (Clinical stoke Scale).*

***Objective:*** *To observe functional motor outcome after stroke with low dose Levodopa therapy.*

***Methods:*** *This prospective study was carried out in the Department of Medicine, Jahurul Islam Medical College Hospital from July 2021 to June 2023. Two groups were selected by simple random method, consisted of both ischemic and hemorrhagic stroke. All the patients of both the groups were suffering from at least some post stroke motor disability and attended full course of physiotherapy. Group I received Levodopa for 2 months along with physiotherapy whereas Group II received only physiotherapy for 2 months. All of the patients were followed up 4 times during this study period.*

***Results:*** *Out of 120 acute stroke patients, ischemic stroke was 93 (77.50%) and haemorrhagic stroke 27(22.50%). Males were predominant than females (2.6:1) and mean age was 59.03±11.56 years and 57.10±12.41 years in Levodopa and non-Levodopa group respectively. Most common risk factors were hypertension (64.17%), smoking (58.33%), IHD (27.5%) and DM (25.83%). Most of the patients 48.3% and their family members has no knowledge about rehabilitation and physiotherapy. Each score improved with each subsequent visit. The Levodopa group, however, has significantly greater gains than the Non-Levodopa group.Again the pattern of recovery was similar in both ischemic and hemorrhagic stroke patients who were taken Levodopa.*

***Conclusion:*** *A single modest dose of Levodopa is well tolerated and, when combined with physiotherapy, enhances functional motor recovery in hemiplegics with ischemic or haemorrhagic stroke.*

***Keywords:*** *Stroke, Motor function, Levodopa.*

## Introduction

After cancer and ischemic heart disease, stroke is the third leading cause of mortality in developed countries and the leading cause of severe physical disability[1]. Stroke is among the primary causes of death in both the developed and developing worlds. It can cause permanent disability and consumes a significant portion of the health care budget in addition to causing personal economic ruin[2]. Each year, more than 700,000 Americans endure a stroke, and roughly two-thirds of them survive with a physical disability (post-stroke-rehabilitation -NINDS). In the United Kingdom, approximately 90,000 women and 60,000 men die

annually from a stroke. In Bangladesh, the incidence is significantly higher than in the United Kingdom or the United States[3]. Approximately 30% of the hundreds of thousands of stroke survivors each year require assistance with activities of daily living, 20% require assistance with ambulation, and 16% require institutional care.[4]

Stroke is a condition that can be prevented and treated. It can be devastating for the victims and their families[5]. Due to the high risk of death, long-term disability, and recurrence after a first stroke, prevention is still the preferable method for reducing the stroke's impact on public health. Numerous risk factors have been identified, and our comprehension of their relative contributions to the incidence of stroke is continually evolving. Our ability to modify stroke risk factors in high-risk individuals in order to reduce the incidence of stroke has increased over time.[6]

A stroke damages the upper motor neurons. This injury can cause spasticity and hemiplegia, resulting in disability[7]. Only physiotherapy could improve motor functions in such patients. Other pharmacological agents enhance motor recovery when administered in conjunction with physical therapy.[8] Levodopa combined with Carbidopa is one of the essential medicines for Parkinson's disease. The drug is metabolized in the body to Dopamine and norepinephrine, both of which stimulate brain plasticity.

After a stroke, brain plasticity within cortical connections leads to a partial recovery of motor function.[9] Anatomical brain lesions induce axonal outgrowth within intracortical local projections and interhemispheric long-distance projections. This post-ischemic axonal sprouting establishes significantly novel patterns of cortical connections with areas of the brain that have been partially damaged. After a stroke, partial motor recovery occurs in this manner.[9] Low-dose Levodopa (100 mg) is well tolerated and significantly enhances motor function when combined with physiotherapy. In addition, levodopa has no antiplatelet or anticoagulant properties. Therefore, low-dose Levodopa can ameliorate stroke disability in both ischemic and hemorrhagic strokes.[10] Levodopa-treated patients demonstrated a greater improvement in verbal fluency than placebo-treated patients. Levodopa may be useful in the treatment of Abulia by increasing the availability of dopamine in the prefrontal cortex or a related brain region.[11] The purpose of the current study was to examine the effects of low-dose levodopa in conjunction with physiotherapy on the motor outcome of various types of stroke.

## Methods

This prospective observational study was conducted in the Department of Medicine, Jahurul Islam Medical College Hospital from July 2021 to June 2023 over a period of 2 years. Within the study period, 203 patients with ischemic and hemorrhagic stroke attended in the Department of Medicine, JIMCH were registered. Among them 156 patients participated in this study. Out of 156 patients, 120 fulfilled selection criteria and had completed the full follow up along with physiotherapy. Patients were divided into two groups matching age, sex, type of stroke and initial grading of muscle power. Group I received Levodopa for 2 months along with physiotherapy whereas Group II received only physiotherapy for 2 months. All of the patients were followed up 4 times during this study period.

**Inclusion criteria:**

- Patients of first ever stroke within 14 days
- Age above 18 years and both sexes
- Definite motor deficit in the form of hemiplegia
- Evidence of infarction or haemorrhage
- Who gave consent

**Exclusion criteria:**

- Unconscious or terminally ill patients
- Other neurological, surgical or gynecological problem
- Isolated or global aphasia
- Patients getting selective serotonin reuptake inhibitor or tricyclic antidepressant, any muscle relaxants or sedative.

Data were obtained from several sources, including historical records, basic clinical examinations, laboratory investigations, and outcome measures. These data were then recorded, processed, and analyzed using the Statistical Package for the Social Sciences (SPSS version 12.0) software. The qualitative data were depicted in terms of frequency and percentage, while the quantitative data were presented using the mean and standard deviation. The Chi-Square test was conducted to analysis qualitative data, while the unpaired t-test was chosen for quantitative data analysis. A significance level of less than 0.05 was chosen for determining statistical significance.

## Results

**Table I: Demographic profile of the study subjects in Levodopa and Non Levodopa groups.**

| | Group I (Levodopa with physiotherapy) (n=60) | Group II (Only physiotherapy) (n=60) | p value |
|---|---|---|---|
| Gender | | | |
| Male | 43 (71.7) | 44 (73.3) | 0.838 |
| Female | 17 (28.3) | 16 (26.7) | |
| Age (years) | | | |
| 35-44 | 7 (11.7) | 12 (20.0) | |
| 45-54 | 20 (33.3) | 18 (30.0) | |
| 55-64 | 14 (23.3) | 13 (21.7) | |
| 65-74 | 15 (25.0) | 13 (21.7) | |
| 75-84 | 4 (6.7) | 4 (6.7) | |
| Mean ± SD | 59.03±11.56 | 57.10±12.41 | 0.393 |
| Min - max | 38 - 80 | 35 - 80 | |

Mean age was 59.03±11.56 years and 57.10±12.41 years in Levodopa with physiotherapy and only physiotherapy group respectively. There was no significant difference in age between the two groups (p >0.05). Males were predominant than females.

**Table II: Pathological types of stroke (N=120)**

| Types of stroke | Group I (Levodopa with physiotherapy) (n=60) | Group II (Only physiotherapy) (n=60) | p value |
|---|---|---|---|
| Ischemic | 47 (78.3) | 46 (76.7) | 93 (77.5) |
| Haemorrhagic | 13 (21.7) | 14 (23.3) | 27 (22.5) |

Out of 120 Patients ischemic stroke were 93 (77.50%) and haemorrhagic stroke 27(22.50%). In Levodopa group 47 (78.3%) were ischemic stroke and 13 (21.7%) were haemorrhagic stroke. In non-levodopa group, 46 (76.7%) were ischemic stroke and 14 (23.3%) were haemorrhagic stroke.

**Table III: Risk factors of study subjects (N=120)**

| Risk factors | Number of patient | Percentage ( % ) |
|---|---|---|
| Hypertension | 77 | 64.17 |
| Smoking | 70 | 58.33 |
| Ischemic heart disease | 33 | 27.50 |
| Diabetes mellitus (DM) | 31 | 25.83 |
| Family history of stroke | 19 | 15.83 |
| OCP | 11 | 9.17 |
| Hyperlipidaemia | 10 | 8.33 |
| Alcohol intake | 09 | 7.50 |
| TIA | 05 | 4.17 |

Among the patients 112 (93.3%) had one or more risk factors but 8 (6.7%) had no risk factors.

**Table IV: Rehabilitation knowledge among the study subjects and attendants (N=120)**

| **Status of knowledge regarding rehabilitation** | Number of patient | Percentage ( % ) |
|---|---|---|
| No knowledge | 58 | 48.3 |
| Partial knowledge | 23 | 19.2 |
| Complete knowledge | 11 | 9.2 |
| Negative attitude (harmful or expensive) | 28 | 23.3 |

Most of the patients 48.3% and their family members has no knowledge about rehabilitation and physiotherapy.

**Table V: Initial Muscle power grading of Levodopa and Non Levodopa group on River Mead mobility Index (RMI) Score:**

| Types of stroke | Group I (Levodopa with physiotherapy) (n=60) | Group II (Only physiotherapy) (n=60) | p value |
|---|---|---|---|
| 1-5 | 44 (73.3) | 42 (70.0) | 0.814 |
| 6-10 | 15 (25.0) | 16 (26.7) | |
| 11-15 | 1 (1.7) | 2 (3.3) | |

There were no significant differences in Initial River Mead Mobility Index (RMI) Score between the groups ($p > 0.05$).

**Table VI: Mean muscle power of upper and lower limb at different visit of both levodopa and non-levodopa groups**

| No. of visit | Mean Muscle power | | | | | |
|---|---|---|---|---|---|---|
| | Upper Limb | | | Lower Limb | | |
| | Group I (Levodopa with physiotherapy) | Group II (Only physiotherapy) | p-value | Group I (Levodopa with physiotherapy) | Group II (Only physiotherapy) | p-value |
| Ischemic Stroke (n=93) | | | | | | |
| 1st | 3.41±0.83 | 3.19±0.71 | 0.173 | 3.10±0.89 | 3.12±0.75 | 0.907 |
| 2nd | 3.80±1.17 | 3.31±1.15 | 0.045 | 3.90±0.89 | 3.40±1.29 | 0.033 |
| 3rd | 4.20±1.19 | 3.65±1.17 | 0.048 | 4.35±0.99 | 3.85±1.25 | 0.036 |
| 4th | 4.59 ± 1.40 | 4.02 ± 1.14 | 0.034 | 4.60 ± 1.23 | 4.02 ± 1.17 | 0.022 |
| Haemorrhagic Stroke (n=27) | | | | | | |
| 1st | 3.07 | 3.07 | | 2.92±0.81 | 2.86±0.69 | 0.838 |
| 2nd | 3.84±0.82 | 3.22±0.91 | 0.074 | 3.62±0.77 | 3.14±0.55 | 0.078 |
| 3rd | 4.07±0.71 | 3.86±0.67 | 0.438 | 4.39±0.85 | 3.25±0.91 | 0.002 |
| 4th | 4.85 ± 0.65 | 4.07 ± 0.40 | 0.001 | 4.62 ± 0.48 | 4.07 ± 0.19 | 0.001 |

Each following visit resulted in an upward trend for all of the scores. The Levodopa group's increments, on the other hand, are noticeably better than those seen in the Non-Levodopa group.

## Discussion

A total of 120 acute stroke cases were included in this investigation. Patients who were between the ages of 45 and 54 made up the majority (26.67%). Masihuzzaman et al.[12] found that thirty-five percent of their patients were in the 50–54 age range. Bhuiyan et al.[13] revealed that the majority of patients (50%) were in their 50s to 59s. The findings of this investigation were consistent with Mannan et al.[14].

In this study, there were 27.50% female participants and 72.50% male participants. The findings of Bhuiyan et al.[13] was consistent with this male predominance. One possible explanation for the study's male prevalence could be the pervasive social stigma in our nation. Usually, women are not brought to hospitals.

Hypertension was the most common risk factor in this study, accounting for 64.17 percent. Hypertension was similarly found to be the primary risk factor by Rahman[15] and Bhuiyan et al.[13] in their individual investigations. Rahman et al. found that 59.09% of stroke patients had hypertension and Bhuiyan et al.[13] reported 60%. These outcomes mirror those of the current investigation.

According to the current study, smoking ranks as the second most common risk factor (58.33%). While Rahman[15] reported that 66.67% of patients did so. This could point to a changing smoking trend in our community brought on by anti-smoking campaigns and increased public knowledge of the harmful effects of smoking.

Nineteen individuals (15.83%) in the current study had a positive family history of stroke. Anwarullah[16] (1993) calculated it to be about 26% in his study.

In this analysis, diabetes mellitus (DM) ranked as the fourth most common risk factor (25.83%). According to

Anwarullah[16] and Bhuiyan et al.[13], 21%and 25% of their subjects, respectively, had diabetes mellitus. Another unusual risk factor in our study was alcohol intake. Of the patients, only nine (7.50%) were male alcoholics. Masihuzzaman et al.[12] reported that 5.10 percent were alcoholics. Among young women, the oral contraceptive pill, or OCP, is a common risk factor. There were 11 patients (9.17%) who had previously consumed OCP. Rahman[15] reported that it was 5.71%. Ten patients (8.33%) were diagnosed with hyperlipidemia on their initial visit.

Only 11 (9.17%) patients or their family members had complete understanding of rehabilitation, whereas 58 (48.33%) had no idea what physiotherapy was. Only 23 (19.17%) patients or their family members had partial knowledge of rehabilitation. Even 23.33% thought this was a bad idea. Bhuiyan et al.[13]revealed similar outcomes.

In the event of an ischemic stroke, the mean muscle power grading (MRC) in the afflicted upper limb (either the right or the left) for the levodopa group at the initial visit was 3.41, and at subsequent visits it was 3.80, 4.20, and 4.59. Again, the muscle power rating for the non-Levodopa group at the first visit was 3.19, and at the second, third, and fourth visits it was 3.31, 3.65, and 4.02, respectively. At the fourth visit, muscle power was significantly higher in the Levodopa group than in the non-levodopa group ($p < 0.05$). This finding is consistent with the research conducted by Masihuzzaman et al.[12]

In the levodopa group, the mean muscle power grading (MRC) in the affected lower limb of ischemic stroke patients (either right or left) was 3.01 on the initial visit, and 3.90, 4.35, and 4.50 on subsequent visits, respectively. Again, the muscle power rating for non-Levodopa was 3.12 on the first visit, 3.40 on the second, 3.85 on the third, and 4.02 on the fourth. At the fourth visit, muscle power was significantly higher in the Levodopa group than in the non-levodopa group (p 0.05). Masihuzzaman et al.[12] discovered nearly identical outcomes in their respective studies.

In the event of a haemorrhagic stroke, the mean muscle power grading (MRC) in the afflicted upper limb (either the right or the left) for the levodopa group at the 1st visit was 3.07, whereas at the subsequent visits, it was 3.84, 4.07, and 4.85. Again, the muscle power rating for the non-Levodopa group at the first visit was 3.07, and at the second, third, and fourth visits it was 3.22, 3.86, and 4.07, respectively. At the fourth visit, muscle power was significantly higher in the Levodopa group than in the non-levodopa group ($p < 0.05$). This finding is consistent with the research conducted by Masihuzzaman et al.[12]

In the levodopa group, the mean muscle power grading (MRC) in the afflicted lower limb of haemorrhagic stroke patients (either right or left) was 2.92 on the initial visit, and 3.62, 4.07, and 4.50 on subsequent visits, respectively. Again, the muscle power rating for non-Levodopa was 3.07 on the first visit, 3.22 on the second, 3.86 on the third, and 4.07 on the fourth. At the fourth visit, muscle power was significantly higher in the Levodopa group than in the non-levodopa group ($p < 0.05$). Masihuzzaman et al.[12] discovered nearly identical outcomes in their respective studies.

## Conclusion

It can be concluded that a single modest dose of Levodopa is well tolerated and, when combined with physiotherapy, improves functional motor recovery in hemiplegics suffering from ischemic or haemorrhagic stroke.

## References

1. Govan L, Weir CJ, Langhorne P. Organized inpatient (stroke unit) care for stroke. Stroke. 2008;39(8):2402-3.

2. Aboderin I, Venables G. Stroke management in Europe. Journal of Internal Medicine. 1996;240(4):173-80.

3. Hayee A, Haque A, Anwarullah AK, Haque A, Akhtar N. Analysis of Risk factors of Stroke in 472 Cases. Bangladesh journal of Neuroscience. 1999;14(2):41-54.

4. Mollah AS, Rahman SW, Das KK, Hassanuzzaman M. Characteristics of patients admitted with stroke. Mymensingh medical journal: MMJ. 2007 Jan 1;16(1):20-4.

5. Nedeltchev K, der Maur TA, Georgiadis D, Arnold M, Caso V, Mattle HP, Schroth G, Remonda L, Sturzenegger M, Fischer U,

Baumgartner RW. Ischaemic stroke in young adults: predictors of outcome and recurrence. Journal of Neurology, Neurosurgery & Psychiatry. 2005 Feb 1;76(2):191-5.

6. Sacco RL, Wolf PA, Gorelick PB. Risk factors and their management for stroke prevention: outlook for 1999 and beyond. Neurology. 1999 Jan 1;53(7 Suppl 4):S15-24.

7. Bogey RA, Geis CC, Bryant PR, Moroz A, O'Neill BJ. Stroke and neurodegenerative disorders. 3. Stroke: rehabilitation management. Archives of Physical Medicine and Rehabilitation. 2004;85:15-20.

8. Stroke Trial Directory, International stroke center. 2005; 1-8.

9. Carmichael, S.T., 2003. Plasticity of cortical projections after stroke. The Neuroscientist, 9(1), pp.64-75.

10. Seniów J, Litwin M, Litwin T, Leśniak M, Członkowska A. New approach to the rehabilitation of post-stroke focal cognitive syndrome: effect of levodopa combined with speech and language therapy on functional recovery from aphasia. Journal of the neurological sciences. 2009 Aug 15;283(1-2):214-8.

11. Drubach DA, Zeilig G, Perez J, Peralta L, Makley M. Treatment of abulia with carbidopa/levodopa. Journal of Neurologic Rehabilitation. 1995 Sep;9(3):151-5.

12. Masihuzzaman AM, Uddin MJ, Majumder S, Barman KK, Ullah MA. Effect of low dose levodopa on motor outcome of different types of stroke. Mymensingh Medical Journal: MMJ. 2011 Oct 1;20(4):689-93.

13. Bhuiyan MM, Rahman HZ, Islam MR, Ullah AK, Haque AK. Four years evaluation of stroke patients in stroke clinic. Bangladesh Journal of Neuroscience. 2004;20(2):50-5.

14. Mannan MA, and Haque A. Treatment of stroke, Bangladesh Journal of Neuroscience, 1986,;1(03):1-5

15. Rahman MS. Rehabilitation early intervention expedite recovery. International Neurology seminar 2002 (Bangladesh).

16. Anwarullah AK, Habib M, Mohammed QD, Ahmed S, Nahar S. Review of risk factors for stroke: study of 100 cases. Bangladesh J Neurosci. 1993;9:11-20.