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Level of Impairment and Disability in Stroke Survivor: A Cross Sectional Survey

Kaynat Meharban[1], Sidra Asghar[2], Aruba Saeed[3]

[1,2]Riphah College of Rehabilitation and Allied Health Sciences, Riphah International University, Islamabad;[3]Riphah College of Rehabilitation and Allied Health Sciences, Riphah International University, Lahore Campus

Corresponding Author: Dr. Aruba Saeed, Assistant Professor, Riphah College of Rehabilitation and Allied Health Sciences, Riphah International University, Lahore Campus
Email: aruba.saeed@riphah.edu.pk

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ABSTRACT

Background: Stroke is the major cause of disability which results from impaired blood supply to the brain because of obstruction of arteries or because of the rupture of arteries likely due to high blood pressure or because of some other disorder called hemorrhagic stroke which leads to the severe loss of brain tissues.
Objective: The purpose of this study was to determine the level of impairment in patients with ischemic and hemorrhagic stroke, with acute, sub-acute, and chronic stroke with right and left-sided stroke, with middle cerebral artery (MCA), with anterior cerebral artery (ACA) and with posterior cerebral artery (PCA) involvement.
Methods: This cross-sectional study was conducted from August 2019 to December 2019 in the Hospitals of Rawalpindi and Islamabad. Non-probability convenience sampling technique was used for sample collection. A total of 246, three to twenty-four months post-stroke male and female patients, from 50 to 80 years of age were included in this study. Patients with Global aphasia, post-procedural stroke like CABG, angiography, and post-operative stroke were excluded. Three assessment scales were used to measure impairment level and disability including functional ambulation category (FAC), motricity index, and river mead motor function assessment. Data was analyzed by using SPSS version 21. Independent t-test was used to determine between-group differences.
Results: The mean ±SD of the mortictiy index of arm function, leg, and side function was 43.93 ± 21.28, 44.15 ± 23.44, and 49.47±24.27 respectively. In river mead motor assessment mean ±SD score of gross motor function was 5.88 ±3.83 out of 13, leg and trunk function was 5.17 ±3.27 out of 10 and river mead arm function was 5.99 ± 4.21 out of 15. A significant difference in the level of impairment was observed for the functional ambulatory category and sub-acute and chronic stroke (p-value <0.001).
Conclusion: Post-stroke patients, especially with right-sided strokes and ischemic/MCA involvement, exhibit heightened impairments in gross motor, arm, leg, and trunk functions, leading to increased dependency on ambulation, with acute stroke cases showing greater disability.

Keywords: *Arm function, Disability, Functional ambulation, Gross motor function, Impairments, Leg and Trunk function, Mortictiy index, River mead, Stroke*

INTRODUCTION

Stroke is the major cause of disability which results from impaired blood supply to the brain because of obstruction of arteries or because of the rupture of arteries likely due to high blood pressure or because of some other disorder called hemorrhagic stroke which leads to the severe loss of brain tissues.[1] Ischemic stroke is most common stroke and accounts for (87%) of all strokes and the second less common but most devastating is hemorrhagic (13%).[2]

According to the National Institute of Neurological Disorder and Stroke (NINDS) 2005, there are five most recognizable signs of cerebrovascular accident, these are sudden paresis of one side of the body, altered sensation, altered level of consciousness, patient experience difficulty in walking, and their is a loss of balance, temporary loss of vision and severe headache with unknown reason. NSF 2005 includes six signs that are trouble gulping.[4,5] Unusual sensory feedback can damage force inflection and force production.[6] Stroke affects 25-74% of the world's 50 million people. Approximately 35-76% of survivors require limited or absolute caregiver support to perform daily activities.[1,7]

The occurrence of stroke increases with increasing population, in middle- and low-income countries its incidence also gradually increasing. It was figured out that in middle or low-income countries the disability rates are 7 times more than in high-income countries.[8] Pakistan is the 6th most popular country in the world in terms of mortality rate, with stroke as the most common cause of disability.[9] People with a past medical history of TIA or stroke, ischemic coronary illness, atrial fibrillation, and

diabetes have a high risk of stroke.[10] Disability refers to a condition that limits activities and interactions, due to disease or injury defects. Post-stroke, patients experience a variety of impairments, including motor function, sensory, cognitive, and speech issues. Some impairments are indirectly associated with stroke, such as shoulder joint capsule tightness or decreased range of motion.[11] The stroke causes of long-term disability, such as paresis, loss of sensation, weakness, and spasticity in the neck, arm, and shoulder can have several implications on activities of daily life, including a diminished capacity to perform basic tasks of self-care, that can impact emotional and psychological well-being.[12] The most widespread effect after stroke is motor impairments, which involves usually face, arm, and leg, in one or different compositions. Sensory losses vary from the basic disappearance of feeling to additional progressive loss of awareness. Patients may define their vulnerability as numbness, tingling, or change. The more challenging loss of sensation comprises a stereognosis, graphic, and loss of double simultaneous stimuli.[13] Post-stroke sensory impairments are common with approximations of up to 89 percent of the patients who survived after stroke.[14] Stroke is also considered to be one of the biggest consequences of falls among the elderly[15], about 50 to 60 percent of stroke patients have gross motor impairment.[16,17] There are studies on the effects of Stroke on motor impairments related to Stroke but according to the researcher, the difference in the motor impairment between side of stroke, stage of stroke, type of stroke, and artery involvement have not been discussed in a single study previously. This study aimed to estimate disability levels in stroke patients with different stages, sides, types, and arteries involvements.

METHODS

The study was a cross-sectional study conducted in hospitals in Rawalpindi and Islamabad over six months. Data was collected from post-stroke patients with a sample size of 246. Male and female patients,6 months post-stroke patients, aged 50 to 80 years were included in the study, while patients with the following illnesses will be excluded from the study Global aphasia and unable to communicate, dementia, and mini-mental state examination score lower than 22, post-procedural stroke like CABG, angiography and post-operative stroke.

A questionnaire to collect data regarding demographics, stroke type, side of stroke, artery involvement (MCA, ACA), and stage of stroke (sub-acute or chronic) was developed. Functional ambulation scale, motricity motor index, and river mead motor assessment tool were used for assessment.

RESULTS

Data was analyzed through SPSS 21. The normality of data was assessed through the Kolmogrov Smirnov Test and data was found to be normally distributed. For between-group comparison independent t-test was used. Demographic characteristics of participants of study are given in Table. 1.

Table 1: *Demographic Characteristics of Participants*

Variables	**Mean ±SD**	
Age	56.90± 14.05	
Variables	Subcategories	Percentage (n)
Side of stroke	Right	53 % (131)
	Left	47% (116)
Type of stroke	Ischemic	75.7%(187)
	Hemorrhagic	24.3%(60)
Artery involvement	MCA	78.9%(195)
	ACA	20.2% (50)
Diabetes	Yes	41.7% (103)
	No	58.3%(144)
Hypertension	Yes	86.2% (213)
	No	13.8%(34)

The means and standard deviation of ischemic and hemorrhagic stroke were compared for the functional ambulation category mean and the SD for "ischemic" stroke was 1.99 ±1.56 and for" hemorrhagic" stroke was 2.033 ±1.58 with no statistically significant p-value. Independent t-test score of river mead motor assessment shows that mean ±SD of gross functioning was 6.06±3.79 and for hemorrhagic stroke, I 5.3 ± 3.94 for leg and trunk function values were 5.26±3.24, 5.3± 3.94 and for arm function 6.00±4.11, 5.95±4.56 respectively. These results showed that only pinch grip function is affected differently in ischemic and hemorrhagic stroke and all other functions are mostly equally affected in both types of strokes.

For comparison of the side of stroke, the functional ambulation category results showed that there was little or no effect of the side of stroke on a person's ambulation status. Mortictiy index values of upper limb functions showed only minor differences exist between the right and left sides of the stroke. Leg functions ankle dorsi flexion, knee extension, and hip flexion results showed that lower limb function is affected more in right-sided stroke patients than left-sided stroke. The total leg score for right-sided stroke was 41.27±23.81 and for left-side stroke 47.40±22.67 showing that the lower limb was affected more in right-side stroke patients. River mead gross motor function score was also less in right-side stroke patients. River mead leg trunk and arm function values showed greater disability on the right side of the stroke.

For comparison of the level of impairment with artery involvement (ACA and MCA) independent t-test was applied. Functional ambulation for MCA was 1.92 ±1.52 and for ACA was 2.32±1.17 with a p-value 0.05 showing a significant difference. Mortictiy index of pinch grip, elbow flexion shoulder abduction, and overall arm functions results showed that patients with MCA artery involvement showed greater level of disabilities as compared to ACA involvement. Mortictiy lower limb function of dorsiflexion, knee extension, and hip flexion scores were also less in patients with MCA artery involvement and total side score values are 49.32±25.02 for MCA and for ACA 50.25±21.56 respectively. River mead gross function, river mead leg and trunk function, and arm function value show more impairments in motor function in those suffering from MCA artery stroke.

For the severity of stroke patients with sub-acute stroke showed greater levels of disability and impairments as compared to chronic stroke.

Table 2. *Between Group Comparison for Type of Stroke, Side of Stroke, Artery Involvement and Stages of Stroke*

Outcome Measures	Outcomes	Type of Stroke			Side of Stroke			Artery Involvement			Stages of Stroke		
		Ischemic Stroke	Hemorrhagic stroke	p-value	Right Side	Left Side	p-value	MCA	ACA	p-value	Sub-acute	Chronic	p-value
		Mean ±SD	Mean ±SD		Mean ±SD	Mean ±SD		Mean ±SD	Mean ±SD		Mean ±SD	Mean ±SD	
FAC	Functional ambulation category	1.99 ±1.56	2.033 ±1.58	0.76	1.80 ±1.50	2.23 ±1.61	0.26	1.92 ±1.52	2.32 ±1.17	0.05*	1.80 ±1.32	3.20 ±1.20	<.001***
Mortictiy index	Pinch grip using a 2.5cm cube between thumb and forefinger	16.51 ± 7.93	15.78 ±9.27	0.04	15.92 ±8.43	16.81 ±8.08	0.28	16.08 ±8.48	17.32 ±7.47	0.09	15.71 ±8.39	21.13 ±5.60	<.001***
	Elbow flexion from 90° so that arm touches the shoulder	13.27±6.94	14.00 ±7.53	0.32	13.23 ±7.08	13.68 ±7.09	0.41	13.32 ±7.28	14.02 ±6.36	0.08	12.77 ±6.84	17.76 ±6.25	<.001***
	Shoulder abduction moving the flexed elbow from the chest	14.12 ±7.47	14.48 ±7.60	0.66	14.00 ±7.43	14.44 ±7.58	0.74	13.97 ±7.61	15.24 ±7.11	0.57	13.00 ±7.18	18.85 ±5.88	<.001***
	Ankle dorsi flexion with the foot in a planter flex position	14.05 ±7.38	14.03 ±7.45	0.39	13.22 ±7.32	14.98 ±7.38	0.84	13.77 ±7.52	15.00 ±6.76	0.62	13.80 ±7.07	18.73 ±6.40	<.001***
	Knee extension with a foot unsupported and knee at 90°	15.23 ±8.30	15.56 ± 9.04	0.29	14.25 ±8.67	16.50 ±8.11	0.55	15.00 ± 8.60	16.48 ±7.89	0.36	15.25 ±7.73	20.92 ±7.16	<.001***
	Hip flexion with the hip bent at 90° moving knee towards chin	14.83 ±8.12	15.01 ±8.62	0.47	13.97 ±8.41	15.89 ±7.92	0.51	14.58 ±8.35	15.94 ±7.70	0.37	14.55 ±7.44	20.51 ±7.00	<.001***
	Arm score	43.77 ±20.64	44.43 ±23.31	0.20	42.90 ±21.60	45.09 ±20.93	0.35	43.31 ±21.83	46.52 ±19.29	0.16	41.53 ±20.77	57.50 ±16.08	<.001***
	Leg score	44.09 ± 23.20	44.35 ±24.34	0.44	41.27 ±23.81	47.40 ±22.67	0.49	43.24 ±23.82	47.44 ±21.69	0.28	43.28± 21.37	60.09 ±19.65	<.001***
	Side score	50.23 ±23.79	47.12 ±25.75	0.29	47.06 ±24.55	52.19 ±23.76	0.61	49.32 ±25.02	50.25 ±21.56	0.14	48.09± 23.92	62.13 ±18.56	<.001***
River mead mobility assessment	River mead gross function	6.06 ± 3.79	5.3 ± 3.94	0.52	5.32 ±3.76	6.50 ±3.83	0.90	5.72 ±3.76	6.54 ±4.01	0.42	5.71 ±3.72	7.76 ±2.83	<.001***
	River mead leg and trunk	5.26 ± 3.24	4.88 ±3.39	0.68	4.76 ±3.37	5.62 ±3.11	0.10	4.98 ±3.22	5.92 ±3.37	0.76	4.91 ±2.94	6.85 ±2.44	<.001***
	River mead arm function	6.00 ±4.11	5.95 ± 4.56	0.33	5.67 ±4.15	6.53 ±4.28	0.37	5.76 ±4.21	6.86 ±4.065	0.29	6.22± 4.10	8.20 ±3.65	<.001***

DISCUSSION:

Stroke is the third leading cause of death in the worldwide and a major cause of disability in the elderly population. Estimating and understanding the level of impairment and disability following stroke and how it can affect the patient's quality of life should be a high priority in health care. A cross-sectional study conducted by Vastergaard et al. showed that stroke survivors were unable to perform their self-care activities and were completely unable to walk.[19] Staub et al. claimed that twenty-five to seventy-four percent are partially or fully dependent, due to their motor impairment, these results coincide with the result of this study.[20]

A study conducted by Mayo et al on 6 months post-stroke survivors claimed that among these people a significant level of disability and restriction is present in 4 extensive functional regions BADL (33 percent) domestic task (51 percent) travel (50 percent) and meaningful actions (53 percent).[21] A research study conducted by Hackett et al. found that about sixty percent of the patients need assistance in performing their basic daily life activities (BADL), (particularly dressing, taking showers, and walking outdoors), and the quality of life of the patients was primarily low for those who need assistance in their BADLs[22] the findings of this study aligns with the results of current study that level of impairment and disability in stroke survivor is very high which ultimately effects the activities of daily living.

D'Alisa, et al. found that stroke survivors had limitations in mobility, physical independence[23] Gjhankey et al.'s study revealed varying levels of recovery, with some patients experiencing quick improvements and others experiencing slower recovery [24]. Worldwide main source of disability and impairment is stroke. Post-stroke patients were observed with a notable change in their neurological function throughout their life, with the most frequent effect is hemiplegia, and functions of the upper and lower extremities are impaired[25], as mentioned in this study that functional ambulation, upper and lower limb impairment and mobility is greatly effected in post stroke patients.

Susan et al. stated that Approximately, 85% of stroke survivors may have upper limb weakness, and upper extremity impairment can lead to activity limitation and decreased quality of life[27] A study on stroke patients found that most functional restraints occur after three months to years and after six months, 5-10% of patients improved their upper and lower limb functions, while 15-20% experienced a significant reduction in impairments[11], these results accurately aligns with the findings of the current study, which depicted the more severe impairment at the sub-acute stage as compared to the chronic stage. Rochester, Minn conducted a study on 292 patients and their results showed that 75 percent of the patients need assistance in performing their ADLs after stroke. Wade and Langton concluded that the level of dependency is diminished from 58 percent at the first week after stroke to 9 percent after six months of stroke[29] these results are similar to the findings of this study. Jette et al. also concluded that 12 percent of disability present after one year in stroke survivors [30], all these findings are completely aligned with the present study findings.

CONCLUSION

This study concluded that post-stroke patients had greater impairments and disabilities in gross motor functions, arm, leg, and trunk functions, and greater dependency on ambulation. The impairment was more prevalent in right-sided strokes and ischemic strokes with MCA involvement. Patients with sub-acute stroke had greater disability and impairments compared to chronic strokes.

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AUTHORS' CONTRIBUTION:

KM: Data acquisition, analysis & interpretation, critical revision of the manuscript

SA: Data acquisition & drafting of manuscript

AS: Concept & design, analysis & interpretation, critical revision of the manuscript, final approval

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