J MEDICINE 2010; 11 : 137-142

Assessment of Stroke Outcome Based on Initial Stroke Severity Measured on Different Stroke Severity Scales

ABDUL QUDDUS [1], MATIUR RAHMAN [2], FAISAL AHMED [3], BADRUL ALAM MONDOL [4], MD. MAHMUDUR RAHMAN SIDDIQUI [5]

Abstract

Background: *Stroke is the second most common cause of death globally and the major cause of disability. Though a number of studies have been conducted on stroke outcome and recovery of walking function, the list and effects of predictive factors are still a major challenge to stroke rehabilitation.*

Materials and methods: *This was a randomized prospective study to evaluate whether initial stroke severity influences the stroke outcome. The patients were categorized after CT scan into two groups (group I- infarction type and group II haemorrhagic type). Initial stroke severity was evaluated in Scandinavian Stroke Scale (SSS). Functional status was evaluated after admission in Functional Independence Measure (FIM), Barthel Index (BI) and Short Form- 36 (SF- 36).To see the outcome in relation to time patients were evaluated with FIM, BI and SF- 36 four weeks after discharge.*

Results: *Analysis of Scandinavian Stroke Scale indicated that the overall score was higher among the patients with cerebral infarct (mean score 29.25) compared to patients with cerebral hemorrhage (mean score 20.08) and the mean difference was statistically significant ($p<0.001$). Analysis of Barthel Index indicated that the percentage of improvement was significantly high among the patients with cerebral hemorrhage compared to cerebral infarct in terms of transfers from bed to chair or vice versa ($p<0.001$). However, improvement was also high among the patients with cerebral hemorrhage as well as cerebral infarct, but the difference was not statistically significant ($p>0.05$)*

Conclusion: *This study indicates that initial motor, sensory and cognitive impairment can be good predictor in amount and time period of recovery of mobility function and other aspect in acute stroke patients, as data shows that milder the initial impairment faster and more is the recovery.*

Keyword: *Stroke, cerebrovascular accident, outcome assessment*

Introduction

Stroke is a major health problem that is growing in importance.[1] WHO estimates that worldwide 15 million people have a stroke every year and this number is rising.[2] Stroke is the second most common cause of death globally and the major cause of disability.[3,4] Though a number of studies have been conducted on stroke outcome and recovery of walking function, the list and effects of predictive factors are still a major challenge to stroke rehabilitation. Some conditions are associated with unfavorable outcome; for example, marked concomitant disease, bilateral brain damage, dementia, persistent neglect, bowel & bladder incontinence lasting more than two months, severe dysphagia, prolonged bed rest, clinical depression and long interval between onset and initiation of rehabilitation.[5] In another study it was found that age, gender, initial severity of the stroke, functional status at admission to hospital, urinary incontinence, impairment in cognitive function, unilateral neglect syndrome are determining the outcomes of the disorder.[6] The present study was designed to see whether initial stroke severity as evaluated in Scandinavian Stroke Scale (SSS) and functional status as evaluated in Functional Independence Measure (FIM), Barthel Index (BI) and Short Form- 36 (SF- 36) influences outcome of stroke evaluated by same methods.

Materials and method

The study was done on stroke patients admitted in Medicine and Neurology units, Sylhet MAG Osmani Medical College Hospital. Patients were selected randomly by lottery method. The study was done during a period of one year (from April

1. Consultant, Department of Medicine, Sylhet MAG Osmani Medical College Hospital, Sylhet
2. Associate Professor, Department of Neurology, Sylhet MAG Osmani Medical College, Sylhet
3. Associate Professor, Department of Medicine, Sylhet MAG Osmani Medical College, Sylhet
4. Associate Professor, Department of Neurology, Dhaka Medical College, Dhaka
5. Postgraduate resident, Department of Neurology, Dhaka Medical College Hospital, Dhaka

Correspondence: Abdul Quddus, Consultant, Department of Medicine, Sylhet MAG Osmani Medical College Hospital, Sylhet

2005 to March 2006). The patients were studied of both sexes from age 20 to 80 years. After admission all stroke patients were evaluated by detailed history and physical examination. It was specially noted whether patients were hypertensive, diabetic,smoker or presence of other relevant risk factors. It was also recorded whether there is any family history of hypertension, diabetes, ischaemic heart disease or stroke. CT scan of brain, ECG, CXR PA view, FBS and lipid profile, serum creatinine, complete blood count, urine for routine and microscopic examination were done in all patients. Stroke patients having bleeding disorders, previous stroke, unconsciousness for more than two weeks and associated with other life threatening illness were excluded from this study.

The patients were categorized after CT scan of head into two groups (group I- infarction type and group II haemorrhagic type). Initial stroke severity was evaluated in Scandinavian Stroke Scale (SSS). Functional status was evaluated after admission in Functional Independence Measure (FIM), Barthel Index (BI) and Short Form- 36 (SF-36).To see the outcome in relation to time patients were evaluated in FIM, BI and SF- 36 at four weeks after discharge. All data collected were recorded in predesigned data sheet. After collection and entry of data, analysis was done by unpaired t test, chi-square test and ANOVA test using SPSS version 10.

Results

A total of 55 patients were included by lottery methods out of 94 stroke patients and they were categorized into two groups on the basis of CT scan. The patients with infarct were considered as group I and with hemorrhage considered as group II patients. Out of 55 patients, 3 died and were excluded from analysis and rest 52 patients were followed-up. The mean age of the patients was 57.1±12.4 years ranging from 28 to 80 years. The mean age of the group I patients was 56.0±13.4 years and for group II patients was 58.4±11.2 years. Analysis revealed no statistically significant mean age difference between two groups of patients ($p>0.05$) as shown in Table-I.

Out of 52 patients, 28(53.8%) patients had cerebral infarct and 24 (46.2%) had cerebral hemorrhage. Analysis of risk factors revealed that the proportion of smoking, hypertension, diabetes mellitus and ischemic heart disease were higher among the patients with cerebral infarct than the patients with cerebral hemorrhage, however, there was no statistically significant difference between two groups of patients ($p>0.05$). The family history of risk factors indicated that the proportion of hypertension, diabetes mellitus were higher among the patients with cerebral hemorrhage compared to patients with cerebral infarct.

Analysis of Scandinavian Stroke Scale indicated that the overall score was higher among the patients with cerebral infarct (mean score 29.25) compared to patients with cerebral hemorrhage (mean score 20.08) and the mean difference was statistically significant ($p<0.001$) as shown in Table-II. Analysis of individual parameter indicated that score was better in patient with cerebral infarct than hemorrhage in terms of consciousness, eye movement, leg motor power,

Table-I

Age and sex distribution of the patients

Variables	Study patients				p value
	Group I		Group II		
	No. (n=28)	%	No. (n=24)	%	
Age in years					
<45	4	14.3	2	8.3	0.503*
45-54	8	28.6	5	20.8	
55-64	8	28.6	9	37.5	
³65	8	28.6	8	33.3	
Mean ± SD	56.0±13.4	58.4±11.2			
Sex					
Male	17	60.7	11	45.8	0.283§
Female	11	39.3	13	54.2	

Group I = Patients with cerebral infarct

Group II =Patients with cerebral hemorrhage

*p value reached from unpaired student's t test

§p value reached from chi square test

orientation ($p<0.05$) than patients with hemorrhage. However, no statistically significant mean difference of score was found between two groups in terms of speech, facial palsy and gait ($p>0.05$). But the score was higher in infarct patients than hemorrhagic patients.

Analysis of functional Independence Measure indicated that overall improvement was higher among the patients with infarct compared to patients with cerebral hemorrhage. However, percentage of improvement indicated that grooming, toileting, bladder control, locomotion in stairs, compression and expression significantly improved in patients with cerebral infarct. As a results, the overall motor subtotal, cognitive subtotal score was higher among the patients with cerebral infarct than cerebral hemorrhage (Table-III).

Analysis of Barthel Index indicated that the percentage of improvement was significantly high among the patients with

Table-II

Distribution of the patients by Scandinavian Stroke Scale

Parameters	Mean score		p value
	Group I(n=28)	Group II(n=24)	
Consciousness	5.64	4.42	.001
Eye movement	3.79	3.00	.001
Leg, motor power	3.14	1.96	.013
Orientation	5.29	2.75	.000
Speech	6.86	4.88	.111
Facial palsy	1.86	1.58	.155
Gait	2.68	1.50	.050
Scandinavian stroke scale	29.25	20.08	0.001

p value reached from unpaired student's t test

Table-III

Distribution of the patients by Functional Independence Measure

Parameters	Admission		4th wks		% of improvement		Pvalue
	Gr-I (n=28)	Gr-II (n=24)	Gr-I (n=28)	Gr-II (n=24)	Gr-I (n=28)	Gr-II (n=24)	
Self care							
Eating	1.96	1.75	4.46	3.21	50.9	43.7	.132
Grooming	1.96	1.83	4.89	3.21	55.4	40.9	.001
Bathing	1.14	1.00	4.36	3.08	70.2	66.7	.237
Dressing –upper body	1.07	1.00	4.39	3.08	72.0	66.7	.074
Dressing-lower body	1.25	1.08	4.71	3.21	70.8	65.3	.084
Toileting	1.75	1.71	4.50	3.21	57.7	45.1	.007
Sphincter control							
Bladder	1.93	1.87	4.61	3.46	53.0	41.0	.020
Bowel	1.96	1.71	4.82	3.38	54.8	46.5	.087
Transfer							
Bed, chair etc	1.32	1.17	4.29	3.25	63.1	63.2	.984
Toilet	1.21	1.13	3.11	3.00	60.7	62.5	.602
Tub, shower	1.29	1.17	4.29	3.12	64.3	61.8	.623
Locomotion							
Walk/Wheelchair	1.96	1.79	4.50	3.25	51.2	43.1	.078
Stairs	1.43	1.50	4.71	3.08	63.7	47.9	.013
Motor Subtotal Score	20.4	19.1	57.0	43.1	62.1	54.3	.005
Compression	1.96	1.87	4.82	3.33	54.8	40.3	.003
Expression	1.96	1.75	4.93	3.00	56.0	36.8	.008
Social cognition							
Social Interaction	2.00	1.87	4.57	3.42	50.6	41.0	.062
Problem Solving	1.96	1.83	3.18	3.04	36.3	38.2	.583
Memory	2.46	1.92	4.57	3.08	42.3	37.5	.215
Cognitive Subtotal Score	10.3	9.2	21.9	16.3	51.5	42.9	.002
Total FIM Score	30.7	28.4	78.9	57.9	59.5	50.4	.001

p value reached fro unpaired student's t test

Table-IV

Distribution of the patients by Barthel Index

Parameters	Admission		4th wks		% of improvement		p value
	Gr-I (n=28)	Gr-II (n=24)	Gr-I (n=28)	Gr-II (n=24)	Gr-I (n=28)	Gr-II (n=24)	
Tansfer (Bed to chair and back)	4.5	1.7	12.1	8.3	63.7	83.3	.001
Mobility (on level surfaces)	3.9	2.1	11.8	7.7	67.3	79.2	.075
Stairs	0.2	0.0	5.5	4.4	98.2	100.0	.360

p value reached from unpaired student's t test

Table-V

Distribution of the patients by SF 36 health status

Parameters	Admission		Discharge		Overall mean score		p value
	Gr-I (n=28)	Gr-II n=24)	Gr-I (n=28)	Gr-II (n=24)	Gr-I (n=28)	Gr-II (n=24)	
Vigorous activities,	.00	.00	.00	.00	.009	0.09	0.360
Moderate activities,	.00	.00	.00	.00	.036	.010	0.225
Lifting or carrying groceries	.00	.00	.00	.00	.107	.021	0.004
Climbing one several flights of stairs	.00	.00	.04	.00	.116	.010	0.006
Climbing one flight of stairs	.00	.00	.00	.00	.313	.302	0.827
Bending, kneeling, or stooping	.00	.00	.00	.04	.348	.458	0.016
Walking more than one mile	.00	.00	.00	.00	.179	.104	0.125
Walking several blocks	.00	.00	.00	.00	.277	.281	0.882
Bathing or dressing yourself	.00	.00	.00	.00	.321	.365	0.350

p value reached from repeated measure ANOVA between subjects

cerebral hemorrhage compared to cerebral infarct in terms of transfers from bed to chair or vice versa ($p<0.001$). However, improvement was also high among the patients with cerebral hemorrhage as well as cerebral infarct, but the difference was not statistically significant ($p>0.05$) (table- IV).

Repeated measure analysis of variance (ANOVA) as shown in Table-V indicated that quality of life significantly improved from admission to 4th week after discharge on observation in all the patients ($p<0.05$). However, lifting or carrying groceries and climbing one several flights of stairs was significantly high among the patients with cerebral infarct compared to cerebral hemorrhage ($p<0.005$), whereas bending, kneeling, or stooping was high among the patients with cerebral hemorrhage compared to cerebral infarct ($p<0.05$).

Discussion

The age range of patients in this study was 28-80 years. Maximum age group was 55-70 years (57.2%) mean age was 57±12.4 years. Anwarullah et al found 34 percent patients in the sixth decade and 27 percent in the seventh decade.[7] This observation was in conformity with that of Haque and Mannan and Liu and Chia.[8,9] In this study hypertension, diabetes mellitus, IHD were found in 71.2%, 46.2%, 15.4% of study population respectively. Family history of stroke, hypertension, diabetes mellitus, IHD were 36.5%, 63.5%, 53.8% and 28.8% respectively. Hypertension was the most principal risk factor for both ischaemic and haemorrhagic stroke.[10,11] These observations are in conformity with that of the present study. In this study smoking/ tobacco consumption was 71.2%, which was almost equal as Hypertension. Rozenthal et al found smoking (53.6%), hypertension (43.4%), hyperlipidaemia (22%) and diabetes mellitus (21%) as main risk factors for stroke.[12] Similar findings was also noted by Rahman M et al.[3] Increasing age i.e. age >55 years in this study was 57.1%. Increasing age (age greater than 67 years) is itself a risk factor for stroke.[10] In this study family history of stroke was found in 36.5%. In a study by Hannan A in BSMMU, Dhaka family history of stroke was found in 21.29%.[14] Diabetes mellitus was found in 46.2% in present study was simillar to Hannan et al and Rahman M et al.[13,14]

On admission patients were evaluated in SSS (Scandinavian Stroke Scale) and it was found that tone was more increased and power was less affected in group I patients. On the other hand sensory, congnitive and perceptual functions were more affected in group II patients. Analysis of SSS indicated overall scale was higher among patient with infracts (mean scale 29.25) compared to patient with hemorrhage (mean scale 20.08) and mean difference was statistically significant ($p<0.001$). On follow up at 4 weeks after discharge, patients mobility function were evaluated. The evaluation can be done FIM motor score, SF-36, Lowton IADL scores and SIS scores etc. In present study, evalution was done in Barthel Index, FIM and SF-36. Analysis of FIM revealed that improvement was higher in group I than group II.

BI analysis reveled that improvement was significantly higher among patients with haemorrhage compare to infarct in terms of transfer from bed to chair. In SF 36 analysis it was observed by repeated measure analysis of variance (ANOVA) indicated quality of life significantly improved from admission to 4th week after discharge on observation in all the patients ($p<0.05$). Jengs JS et al studied eight hundred and fifty acute stroke patients (ischemic stroke, 508; intracerebral hemorrhage, 342) in between November 2002 and December 2006.[15] Measures of interest were analyzed for three types of outcome: 3-month mortality or institutional care, and poor functional outcomes at discharge. Poor functional outcomes were defined as a Barthel index <80 or a Rankin scale >2. Multivariate regression models were used to determine the predictive value of the observed measures. After 3 months, 17% of patients had died; 21% were alive but being cared for in institutional settings; and 62% were alive and living at home. Functional status at discharge indicated 16% of patients had died, poor function in 50%, and good function in 34% of patients. Initial stroke severity, measured by National Institute of Health Stroke Scale and dependence on a ventilator predicts 3-month mortality and poor outcome in all stroke patients. [16] Vibo et al also commented the outcome of stroke was mainly determined by the initial severity of stroke and by elevated blood glucose value on admission.[17]

Conclusion

This study indicated that initial motor, sensory and cognitive impairment can be good predictor in amount and time period of recovery of mobility function and other aspect in acute stroke patients, as data shows that milder the initial impairment faster and more is the recovery. This study also shows that improvement was more in infarct group than haemorrhagic stroke.

Conflict of interest: None

References

1. Feigin VL,LawesCM, Bennet DA, Anderson CS. Stroke epidemiology: a review of population-based studies of incidence, prevalence, and case fatality in the late 20th century. Lancet Neurol 2003;2:42-53.

2. World health organization. The atlas of heart disease and stroke. Available at http://www.who.int/cardiovascular diseases/es/cvd-atlas-15jordan.stroke.pdf. Accessed January 20, 2010

3. Donnan GA. Press release. 6th world stroke congress, Vienna, Austria, September, 25-27.2008

4. Kitamura A, Sato S, Kiyama M, Imano H, Iso H, Okada T et al. Trends in the incidence of coronary heart disease and stroke and their risk factors in Japan, 1964 to 2003: the Akita-Osaka study. J Am Coll Cardiol 2008;52(1):71-9.

5. Milinaviciene E, Rastenyte D, Krisciûnas A. Factors influencing outcomes in patients with stroke. [Article in Lithuanian] Medicina (Kaunas). 2007;43(4):269-77.

6. Selman WR, Tarr R, Landis DM. Brain Attack: Emergency Treatment of Ischemic Stroke. Am Fam Physician 1997;55:2655–62.

7. Anwarullah AKM, 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.

8. Haque A, Mannan MA. Disease spectrum of neurology outpatient department, IPGMR, Dhaka, during 1995. Bangladesh J Neurosci 1996;2:5-8.

9. Liu LH, Chia LG. The effects of hypertension, diabetes mellitus, atrial fibrillation, transient ischaernic attack and smoking on stroke in Chinese people. Chung Hua I Hsuch Tsa Chin Taipei 1991;47:110-5.

10. Feigenson JS. Stroke rehabilitation: effectiveness, benefits and costs: some practical considerations. Stroke 1979;10:1-4.

11. Bogousslavasky J, Castillo V, Kumral E, Henriques I, Melle GV. Stroke subtypes and hypertension: primary haemorrhage vs infarction, large vs small artery disease. Arch Neurol 1996;53:265-9.

12, Rozenthul SN, Ronen R, Tamir A, Geva H, Elder R. Incidence, risk factors and causes of stroke in young adults. Harefuah 1996;130:165-70.

13. Rahman M, Musarrof AKM, Patwary I. Risk factor of strokes- a clinical study. Bangladesh J Med 2000.11(2): 90-4.

14. Hannan MA, Rahman MM,Haque A, Ahmed MU Stroke: Seasonal variation and association with hypertension. Bangladesh Med Res Counc Bull 2001;27(2):69-78.

15. Jeng JS, Huang SJ, Tang SC, Yip PKJ. Predictors of survival and functional outcome in acute stroke patients admitted to the stroke intensive care unit. Neurol Sci. 2008; 270(1-2): 60-6.

16. Yano K, Popper JS, Kagan A, Chyon PH, Grove JS. Epidemiology of stroke among Japanese men in Hawai during 4 years of follow-up: the Honolulu Heart Progress. Health Rep 1994;6:28-38.

17. Vibo R, Kõrv J, Roose M. One-year outcome after first-ever stroke according to stroke subtype, severity, risk factors and pre-stroke treatment. A population-based study from Tartu, Estonia. Eur J Neurol 2007; 14(4): 435-9.