

EVALUATING THE OUTCOME OF STROKE: A PROSPECTIVE HOSPITAL BASED STUDY

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ABSTRACT

Objectives: This study was aimed to determine the functional outcome after stroke and to assess the influence of various factors on acute in-hospital stroke mortality.

Material and Methods: This prospective study included 281 stroke patients of either sex, 20 to 70 years and above admitted in Dr. Ziauddin Medical University Hospital, North Nazimabad Campus, Karachi, during a period of one year. Main outcome measures used were Glasgow Coma Scale (GCS) and Modified Rankin Scale (mRS).

Results: Data analysis showed that in-hospital mortality was 11.74% (n=33/281). Age and gender had no adverse effect on acute mortality in this study while poor initial GCS; hemorrhagic stroke and all the studied risk factors were bad prognostic factors. At the end of one month, 32 patients were lost to follow-up and mortality was 13.5% (n=5/216) while excellent outcome was observed in 22.27% (n=47/216) and poor outcome in 77.72% (n=164/216) of patients.

Conclusion: This study confirms the significant morbidity and mortality associated with stroke and shows the need in preventing and controlling the risk factors for early death.

Key Words: Stroke Stroke, Outcome, Mortality, Glasgow Coma Scale, Modified Rankin Scale

INTRODUCTION

Stroke is the most common cause of adult disability and the third leading cause of death worldwide. Despite a decline in stroke mortality, the incidence of stroke is not declining. The burden of stroke is likely to increase substantially in the future because of the aging population. It places a major effect on society in terms of mortality, morbidity and economic cost.¹ The great variability of outcome seen in stroke patients had led to an interest in identifying the factors that determine the functional outcome.² Numerous clinical variables have been described as potential predictors of survival, recovery and ultimate outcome out of which important ones are demographic, underlying medical disorders, stroke types, lesion site and size and specific therapy related.³

Stroke is a difficult disease to study because of its differing etiologies, the heterogeneity of symptoms; variability in severity and in spontaneous recovery. Thus selecting outcome measures for stroke is extremely complex. Based on clinical and health-related quality of life,

outcome of stroke can be classified into impairments, disabilities and handicaps. *Impairments* are the signs and symptoms of the underlying pathology; *disabilities* include limitations in functional activities and *handicaps* refer to limitations in role functions. Ideally, recovery from stroke-related impairments leads to recovery from stroke disabilities; reduction of stroke handicaps and ultimately, to pre-morbid levels of quality of life but this is not always the case. More individuals with mild and moderate stroke are left with significant disabilities and lower quality of life¹.

Simple disability measures such as Rankin or Barthel scales have existed for years that provide a more objective assessment of functional recovery after stroke. Disability scores can be divided into “independent in activities of daily living” or “dependent”. Death can be added as a separate category or combined with another category as “dead or dependent.”⁴ Both scales are easy to use and have an acceptable degree of reliability. The modified Rankin scale (mRS) measures independence rather than performance of

MODIFIED RANKIN SCALE

Score	Description
0	No symptoms at all
1	No significant disability despite symptoms; able to carry out all usual duties and activities
2	Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance
3	Moderate disability; requiring some help, but able to walk without assistance
4	Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance
5	Severe disability; bedridden, incontinent and requiring constant nursing and attention
6	Dead

Table 1

specific tasks. In this way, mental as well as physical adaptations to the neurological deficits are incorporated. The scale consists of 6 grades from 0-5 (Table 1). With 0 corresponding to no symptoms and 5 corresponding to severe disability and 6 to death.⁵

The essential goal of rehabilitation is the restoration of as much function as possible, trying to ensure that the performance levels achieved are the most optimal ones for each particular individual. All relevant functional parameters as walking, activities of daily living (ADL) -- (feeding, toileting, dressing, transfers, mobility, bathing and grooming), several psychosocial dimensions, the living setting in the community including the financial status and when possible, return to work should be considered.⁶

The aim of the present study was to describe the functional outcome after stroke and to evaluate the influence of various factors (age, gender, stroke type, Glasgow come scale, and comorbidities) on the in-hospital mortality of patients with acute stroke.

MATERIAL AND METHODS

Inclusion/Exclusion Criteria:

We prospectively studied patients of either

sex 20 to 70 years and above who had *first ever stroke* admitted to Ziauddin Medical University Hospital North Nazimabad Campus, Karachi between April 1st 1997 and March 31st 1998.

The WHO definition of *stroke* was used: "rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting for 24 hours or longer or leading to death, with no apparent cause other than vascular origin".⁷

CT scan brain (plain) was done in every patient to confirm the diagnosis and the type of stroke and also to exclude any non-vascular cause of stroke. Patients with history of previous stroke or who had subarachnoid hemorrhage/transient ischemic attack/syncopal attack at presentation, any neurological deficit secondary to epilepsy or head injury or due to an infective, metastatic etiology and those suffering from pre-existing severe physical or cognitive disability were excluded from this study.

Upon admission, a standardized data sheet was used to record the demographic data (age and gender), clinical and neurological examinations including blood pressure readings and measurement of the GCS eye, verbal and motor scores, laboratory tests (random blood sugar,

MORTALITY ACCORDING TO GENDER AND AGE

Variables		No. of Subjects	Mortality		Alive		P-Value
			No.	%	No.	%	
Gender	Male	144	19	13.2	125	86.8	0.438
	Female	137	14	10.2	123	89.8	
Age (years)	Upto 40	11	1	9.1	10	90.9	0.162
	40 - 49	38	1	2.6	37	97.4	
	50 - 59	85	8	9.4	77	90.6	
	60 - 69	94	14	14.9	80	85.1	
	70 - 79	45	7	15.6	38	84.4	
	80 & above	8	2	25.0	6	75.0	

Table 2

MORTALITY ACCORDING TO GCS, STROKE TYPE AND RISK FACTORS

Variables		No. of Subjects		Mortality		Alive		P-Value
		No.	%	No.	%	No.	%	
GCS	3 - 9	76	27	29	38.2	47	61.8	0.001
	10 - 15	205	73	4	2.0	201	98.0	
Stroke type	Cerebral Infarction	197	70.1	13	6.6	184	93.4	0.001
	Cerebral Hemorrhage	84	29.9	20	23.8	64	76.2	
Risk Factors	Hypertension	185	65.8	16	8.6	169	91.4	0.049
	Cardiac disease	82	29.1	8	9.8	74	90.2	
	Diabetes	116	41.3	4	3.4	112	96.6	
	High Cholesterol	61	24.4	2	3.3	59	96.7	
	Smoking	121	43	2	1.7	119	98.3	
	Atrial fibrillation	12	4.2	1	8.3	11	91.7	

Significant association of GCS, Stroke type and risk factors vs mortality $p < 0.05$

Table 3

serum cholesterol) and 12 lead electrocardiography (ECG). Any history of pre-existing risk factors as hypertension, diabetes mellitus, smoking, hypercholesterolemia, cardiac diseases was inquired from the patient/relatives⁸.

Hypertension was defined if a patient either had the diagnosis of hypertension and/or was treated for it or had 2 measurements of BP $>160/95$ mm Hg or a single measurement of BP $>180/110$ mm Hg after admission.⁹⁻¹¹

Diabetes mellitus was considered present when subjects gave history of diabetes mellitus and/or were on oral hypoglycemic drugs or received insulin treatment or had random blood sugar >200 mg% during the hospital stay.¹¹

Smoking was defined as a person who smoked at least one cigarette/tobacco per day for the preceding three months or more.¹²

Hypercholesterolemia was defined when a patient had a diagnosis of it and/or was on diet or lipid lowering agents or had fasting blood cholesterol >200 mg% in the hospital stay.⁸

Cardiovascular causes Patients were considered to have a cardiac abnormality including atrial fibrillation when they had a self-reported history or had an abnormality on ECG.¹¹

Follow Up: The patients were followed up in the hospital till death/discharge and again reassessed 1 month later in the clinic or through telephone.

Main outcome measures: Glasgow Coma scale (GCS) as a measure of consciousness was evaluated on admission to the hospital¹³ and modified Rankin scale as a measure of disability was determined at 1 month after discharge and categorized as favorable/excellent outcome (score 0-1) or unfavorable/poor outcome (score 2-5) and

death (score 6).¹⁴

Data entry and analysis: Data was entered and analyzed by using the software package SPSS. Univariate analysis for each variable was assessed using student t test and the chi square test. P value < 0.05 was considered significant.

RESULTS

Demographic/Clinical data: Between April 1st 1997 to March 31st 1998, 281 patients with first ever stroke admitted in Dr. Ziauddin Medical University Hospital, North Nazimabad Campus, Karachi were studied. There were 144 males and 137 females (Table 2). The maximum frequency of stroke was found between the ages 51 to 70 years. The mean age was 62 years \pm 11.28 years. Out of 281 stroke patients, 197 (70.1%) had ischemic stroke while 84 (29.9%) hemorrhagic stroke. Mean systolic blood pressure recorded was 163 \pm 24.14 mm Hg and mean diastolic blood pressure 101 \pm 44.3 mm Hg. 205 (72.95%) had Glasgow Coma Scale (GCS) between 10/15 to 15/15 and 76 (27%) between 3/15 to 9/15 on admission.

Risk factors: Hypertension in 185 patients (65.8%) was the commonest risk factor for stroke in this study followed by smoking in 121 (43%), diabetes mellitus in 116 (41.3%), underlying cardiac diseases in 82 (29.1%), high cholesterol in 61 (24.4%) and atrial fibrillation 12 cases (4.2%) {Table 3}.

Laboratory data: Mean fasting blood sugar was 120 \pm 61.89 mg % and mean random blood sugar 192 \pm 86.86 mg%. Mean cholesterol value was 183.62 \pm 58.7 mg %. In 42 patients cholesterol was not checked.

Outcome: In-hospital mortality and factors affecting it and functional recovery after one

OUTCOME OF STROKE PATIENTS AT DISCHARGE AND ONE MONTH FOLLOW UP

Outcome Measure	On admission n = 281	On discharge n = 248	After 1 month n = 216
mRS 0-1	28(9.96%)	42(16.94%)	47(22.27%)
mRS 2-5	253(90.01%)	206(83.06%)	164(77.73%)
mRS 6	0(0%)	33(11.74%)	5(13.5%)

Table 4

month of discharge from the hospital was determined. (Table 4).

In-hospital mortality: Out of 281 patients with acute stroke 33 (11.74%) died in the hospital. Out of them 19(13.2%) were males and 14(10.2%) females. Maximum number of deaths took place between age's 60-80 years. In this study **no** significant association was found between the gender and the age with early mortality. (Table 1)

Patients with a GCS score <9 compared to those of >9 exhibited a significant high mortality rate. 20 (23.8%) patients with hemorrhagic stroke while only 13 (6.6%) with ischemic stroke died in the hospital depicting significantly higher expiry in the hemorrhagic stroke. Hypertension, smoking, diabetes mellitus, cardiac diseases, hypercholesterolemia, and atrial fibrillation, all the studied comorbidities/ risk factors influenced the in-hospital mortality significantly in this study. (Table 2)

Functional recovery: Thirty-two patients were lost to follow up and five (mRS score 6) expired thus one-month mortality was 13.5%. Of the 211 available patients, favorable outcome/independence (mRS score 0-1) was observed in 47 (22.27%) while unfavorable outcome/dependence (mRS score 2-5) was seen in 164 (77.72%)

DISCUSSION

The immediate period after stroke carries the greatest risk of death. Characteristics that can be determined at the onset of stroke and used by the clinician to predict early mortality include level of impaired consciousness, severity of the initial clinical syndrome, age and coexisting medical disorders. In this study we prospectively applied the GCS score as a measure of consciousness to 281 patients with acute stroke and recorded their survival status before discharge from the hospital. Thirty-three (11.74%) patients died. It has been found in the previous studies that the total GCS score is helpful not only in describing the clinical status of a patient but also contains valuable prognostic information following acute stroke and predicts early mortality much accurately.^{13,15}

Significant neurological recovery occurs in

the initial three to four weeks after stroke while by six months maximum functions are regained.¹⁶ Handicap and quality of life are much more important to the patient, but such measures are more difficult to define, more subjective, and difficult to validate. Assessment of disability has been suggested to be the most feasible compromise. We used modified Rankin scale as a measure of functional recovery/disability in our study, which has been found reliable in prior stroke trials.^{4,14}

The overall in- hospital stroke mortality in Pakistan and south East Asia varied between 7% to 34%^{3,17-20}. Primary intracerebral hemorrhage is one of the most frequent causes of hospital admission and mortality in the world. Mortality rates of 40% to 50% have been reported for hemorrhagic stroke²¹. Our study indicated 20 (23.8%) patients dying of hemorrhagic stroke. (p 0.001) Similar to prior studies poor GCS score <9 at presentation more observed in-patients with hematoma had worse prognosis (p 0.001)

Other investigators have described the advanced age of patients as a significant bad prognostic variable²¹. Neither the gender mortality (p=0.438) as previously reported nor the mean age (p=0.162) among the deceased and surviving patients can be reported as a significant outcome factors²¹⁻²³ of our investigation.

A majority of patients had a history of hypertension similar to reports of previous studies.²¹ Sixteen (8.6%) patients suffering from hypertension died depicting high blood pressure as a significant bad prognostic variable^{3,8,17,24}

More deaths were reported among diabetic patients suggesting diabetes mellitus as an important factor on mortality rate. Eight (9.8%) patients suffering from cardiac disease died showing it to be an adverse variable on mortality^{22,23,25} Smoking leading to death in 1.7% of smokers was also a bad prognostic variable on early mortality in our study.^{21,26} Literature on hypercholesterolemia and mortality was scanty.

The 30-day mortality was 13.5% in our study. In other studies it ranged between 8-30%²⁶⁻²⁸. Using modified Rankin scale 22.27% of stroke

survivors returned to their former functional level at one-month follow up while 77.72% were functionally dependent, either partially or fully, similar to the pattern suggested in other local as well western series.^{4,18,27,29}

Limitations of this study: This study was done in an urban tertiary care center so it cannot be generalized for the population at large. To determine full functional recovery in stroke patients' one month followed in this study is a too short period. An important prognostic indicator of outcome, the site and size of the lesion whether hematoma or infarct was not evaluated in this study.

CONCLUSION

Stroke causes death, disability or a frightening disruption of daily life. Mortality and morbidity associated with stroke have an immense social and financial impact. For cost effective management it is essential to identify the factors which determine the outcome inpatients with acute stroke. We identified hemorrhagic stroke, poor GCS score, high blood pressure, smoking history, diabetes mellitus, and cardiac disorders as bad prognostic factors for stroke outcome.

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