Original Article

Hospital Outcome of Acute Stroke Patients Associated with Various Risk Factors and Co-morbidities

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Abstract:

Background: *Stroke is a global health problem, leading cause of death all over the world. It accounts for chronic illness and disability in a large segment of population. It imposes a great loss on economy of the nation due to loss of service of the workforce during illness and extended hospitalization they require during recovery. Stroke continues to have a great impact on public health. It is associated with multiple risk factors and co-morbid conditions.*

Objective: *To find out the hospital outcome of acute stroke patients associated with various risk factors and co-morbidities.*

Materials and methods: *This is a cross sectional observational study, carried out in the department of Medicine and Neurology, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh for a period of 6 months. One hundred patients presented with acute stroke diagnosed on clinical & investigational background fulfilling the inclusion and exclusion criteria were enrolled in the study. Stroke severity was assessed using National Institute of Health Stroke Scale (NIHSS) score. Patients' symptoms, degree of disability or dependence in the daily activities and clinical outcome were evaluated and measured by the modified Rankin Scale (mRS).*

Result: *This study showed that a majority of patients (49%) were in the 51-60 years age group, mean age was 56.81 years. Male and female ratio was 1.38:1. Among all all-risk factors, hypertension is the most common, present in 72% cases; the next most common risk factors were DM (59%), smoking (47%), heart disease (35%), and migraine (14%). About 72% of patients had a mild stroke, 17% of patients had a moderate stroke and 11% of patients had a severe stroke according to NIHSS score at admission. Seventy-four (74%) of them had infarction and the rest had hemorrhage. The study showed that 62% of the patients recovered (mRS score 0 to 2) and among them the maximum were ischemic stroke. 29% had poor outcomes, disabled and they were discharged on request or risk bond (mRS score 3 to 5). 9% expired during hospital stay (mRS score 6). Logistic analysis revealed that age >50 years, hypertension, diabetes mellitus, heart disease, hyperlipidemia, family history of CVD, CAD, past history of stroke / TIA, migraine and peripheral vascular disease were associated with poor stroke outcome.*

Conclusion: *This study shows that the main risk factors & the comorbid conditions for a stroke were hypertension, diabetes mellitus, ischemic heart disease, hyperlipidemia and smoking. People suffering from a stroke with these risk factors have poorer outcomes than those with no risk factors & comorbidities. Identifying characteristics of people at high risk of recurrence has important implications for planning secondary prevention strategies to reduce the disease burden. Early detection and prevention of the risk factors can reduce health care burden and disability.*

Key words: *Modified Rankin Scale (mRS), National Institute of Health Stroke Scale (NIHSS),* Coronary heart disease (CHD).

Introduction

Stroke is a major hindrance to global health. It is the leading cause of disability and the second leading cause of mortality worldwide.[1] Strokes are responsible for three million deaths in developing countries.[2] Certain risk factors have consistently been identified as significant predictors of stroke outcome (mainly fatal stroke): age, hypertension, excessive alcohol intake, previous stroke, and atrial fibrillation.[3] Other risk factors much less consistently associated with stroke include smoking, diabetes mellitus, previous CHD, left ventricular hypertrophy and family history of stroke.[4,5] By treating and preventing these risk factors, stroke incidence and prevalence can be significantly reduced. Early detection and prevention of these risk factors are crucial in maximizing the benefit of stroke interventions while minimizing its complication and recurrence rates. There is a paucity of studies looking into the natural and modifiable risk factors & comorbid conditions of the strokes in Bangladesh.

Among all neurological diseases of adult life, stroke clearly ranks first in frequency and importance. At least 50% of neurological diseases in a general hospital are of this type. According to the World Health Organization (WHO), about 15 million people suffer from stroke per annum globally. Of them 5 million die and 5 million are permanently disabled.[6]

Hypertension is said to be the single most important risk factor accounting for about 70% of strokes.[7] All components of blood pressure (systolic, diastolic, mean) correlate with the incidence of a stroke.[8] The risk of a stroke is approximately 4 times greater in patients with definite hypertension (160/95 mm Hg) than in a normotensive individual and is twofold higher in so called borderline hypertensive individuals. Isolated raised systolic blood pressure even in the presence of normal diastolic blood pressure is a significant prediction of mortality.[9]

Diabetes mellitus is a risk factor independent of hypertension and is associated with a 3 fold increase in the risk of stroke.[10]

The Framingham study showed that in 10% male to 14% female of strokes are attributable to diabetes mellitus.[11] Diabetes mellitus is a major risk for a stroke among younger age groups.[12] Current cigarette smokers have more than two-fold risk of stroke compared with men who have never smoked.[13] Results from the Framingham study indicate that smokers had more than 3 times the risk of a cerebral infarction.[12]

Familial hyperlipidemia is associated with an increased risk of atherothrombotic disease and stroke. Hyperlipidemia often occurs in patients suffering from hypertension. It is difficult to assess whether strokes are specifically due to hyperlipidemia or a combination of conditions that include hyperlipidemia.[13] All these factors play a crucial role for aggravating the early complication. Coordinated care of stroke patient's result in improved outcomes, a decreased length of stay in the hospital and decreased cost. Control of hypertension and atrial fibrillation appear to offer the greatest chance of reducing risk for stroke recurrence after an ischemic stroke.[14]

In the context of limited facilities for management of stroke patients in our country, attempts for prevention of strokes are quite essential. With this limitation in our country this study is designed to help us to prevent risk factors for strokes, promotion of health care services and thereby rescuing some people from long term disability and or death and thereby preventing the burden on the family and the country.

Materials and methods:

This study was a cross sectional observational study carried out in the department of Medicine and Neurology, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh during the period of July 2017 to December 2017. A total of 100 admitted patients with acute stroke were included via the purposive sampling technique.

Inclusion criteria were patients admitted with an acute stroke with CT scan evidence, age >18 years. Exclusion criteria was patients whose CT scan of brain showed space occupying lesion, other conditions simulating with acute stroke e.g., extradural hematoma or subdural hematoma.

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Informed written consent was obtained from the patients or guardians after a full explanation of the details of the disease process and purpose of the study. Past medical and personal history for cigarette smoking, hypertension, diabetes mellitus, and ischemic heart disease and other associated disease condition was also sought. Other systemic examination and essential investigations like CBC, RBG, serum creatinine, serum lipid profile, ECG and CT scans of the brain were done in every patient. Initial stroke severity was assessed by calculating their NIHSS scores. All patients were kept under close supervision. When any untoward event developed it was managed and recorded properly. After collection of all information, these data were checked, verified for consistency and edited for a finalized result. Patients' symptoms, degree of disability or dependence in the daily activities and clinical outcome were evaluated and measured by modified Rankin Scale (mRS). Outcome were measured by patients recovered (mRS score 0 to 2), poor outcome, (mRS score 3 to 5) and expired during hospital stay (mRS score 6). After editing and coding, the coded data was directly entered into computer. The data were processed manually and analyzed with the help of SPSS (Statistical package for social sciences) Version 16. Chi-square test analyzed the categorial variables. Logistic regression analyses were performed to identify the independent predictors of high mRS. P value of <0.05 was considered as statistically significant.

Results:

The findings of the study obtained from data analysis are presented below.

Table I: Demographic characteristics of patients (n=100)

Characteristics	No. of patients	Percentage (%)
Age in years		
30-40	4	4.0
41-50	14	14.0
51-60	49	49.0
61-70	26	26.0
>70	7	7.0
Mean±SD	56.81±14.25	
Sex		
Male	58	58.0
Female	42	42.0

Table II: Risk factor for stroke patients (n=100)

Risk factor	No. of patients	Percentage (%)
Hypertension	72	72.0
Smoking	47	47.0
Diabetes mellitus	59	59.0
Heart disease	35	35.0
Hyperlipidemia	5	5.0

Family history of CVD, CAD	47	47.0
Past history of stroke/TIA	29	29.0
Migraine	14	14.0
Peripheral vascular disease	8	8.0

Table III: Patterns of a stroke in CT scans (n=100)

CT scan	No. of patients	Percentage (%)
Infarction	74	74.0
Hemorrhage	26	26.0

Table IV: Severity of strokes using the NIHSS score (n=100)

Severity of stoke	No. of patients	Percentage (%)
Mild (0-5)	72	77.0
Moderate (6-14)	17	17.0
Severe (15-31)	11	11.0

Table V: Hospital outcome of stroke patients (n=100)

Outcome	No. of patients	Percentage (%)
Good outcome (mRS 0-2)	62	62.0
Poor outcome (mRS 3-5)	29	29.0
Death (mRS >5)	9	9.0

Table VI: Association of the type of stroke and the outcome (n=100)

	Hemorrhagic stroke	Infraction	P value
Good outcome (mRS 0-2)	3(11.5%)	59(79.8%)	
Poor outcome (mRS 3-5)	15(57.7%)	14(18.9%)	0.001
Death (MRS >5)	8(30.8%)	1(1.3%)	

Table VII: Logistic regression analysis outcome of stroke associated with risk factors (mRS outcome >2)

Variable	P value	OR	95% CI	
			Lower	Upper
Age >50	0.0025	2.760	0.139	0.706
Hypertension	0.003	3.887	0.137	0.812
Smoking	0.233	0.476	0.140	1.613
Diabetes mellitus	0.001	3.997	0.038	1.715
Heart disease	0.001	1.931	0.576	1.874
Hyperlipidemia	0.039	1.614	0.112	1.231

Family history of CVD, CAD	0.021	2.576	0.014	1.237
Past history of stroke/TIA	0.041	1.897	0.038	1.775
Migraine	0.037	1.997	0.031	1.975
Peripheral vascular disease	0.011	1.800	0.015	1.304

Discussion:

A total of 100 patients with acute stroke already admitted in different units of medicine and neurology of Shaheed Suhrawardy Medical College Hospital, were selected. Presence of various risk factors and comorbidity among these patients were identified. In this study a majority of patients (49%) were between 51-60 years age group; 26% of cases were between the age group of 61-70 years. Mean age was 56.81±14.25 years. Study showed that the incidence of stroke gradually increased with age. Similar findings were observed in a study done by Hasan et al.[15]

In this study out of 100 cases 58 cases were male and 42 were female. Male-female ratio was 1.38:1. A similar study by Alamgir et al showed a significant difference (M: F=4:1) with higher male preponderance.[16]

In our study among all the risk factors hypertension was the most common, present in 72% cases; the next most common were DM (59%), smoking (47%), heart disease (35%) and migraine (14%). The result correlates with that of other studies where hypertension was found to be the most important risk factor.[17,18,19] Another study Anwar et al.[20] had similar findings: hypertension (69.7%), hyperlipidemia (28.9%), ischemic heart disease (22.4%), previous cerebral infract (23.7%) and renal impairment (19.7%). In a study done by Alamgir et al.[16] 58% of stroke patients were hypertensive. In another study at BIRDEM by Latif et al.[17] 50.30% of NIDDM patients with stroke were also hypertensive. In WHO collaborated study on the control of stroke in the community showed that in Japanese centers, association of hypertension with stroke was around 75%. In Ulan Bator, (Mongolia) the incidence of hypertension with stroke was higher still.[21]

In our study 72% of patients had a mild stroke, 17% of patients had a moderate stroke and 11% of patients had a severe stroke (NIHSS score) on admission and the findings were in line with the other studies.[22,23]

Patients' symptoms, degree of disability or dependence in daily activities and clinical outcome were evaluated, then measured by a modified Rankin Scale (mRS). Our study showed that 62% of the patients recovered (mRS score 0 to 2), among them maximum were ischemic stroke. 29% had poor outcome, disabled and they were discharged on request or risk bond (mRS score 3 to 5). 9% expired during the hospital stay (mRS score 6). Among expired cases the most common were hemorrhagic stroke patients. This result also supported by other studies.[10,12,13,22]

A logistic regression analysis revealed that age above   50

years, hypertension, diabetes mellitus, heart disease, hyperlipidemia, family history of CVD/CAD, past history of stoke/TIA, migraine and peripheral vascular disease were associated with poor stroke outcomes in this study (OR=2.76, p=0.0025; OR=3.887, p=0.003; OR=3.99, p=0.001; OR=1.93, p=0.001; OR=1.61, p=0.039, OR=2.57, p=0.021, OR=1.89, p=0.41, OR=1.99, p=0.037; OR=1.80, p=0.011 respectively). These findings are consistent with study done by Obaiko et al.[23] In that study the reported age was above 39 years and male gender, systemic hypertension, early onset of coma after stroke, and presence of co-morbidities were associated with poor stroke outcomes. In-hospital mortality among acute stroke patients are affected by several factors, including patient age, stroke type, stroke severity, and enrollment criteria.[24,25] Old age has been reported as a predictor of in-hospital mortality[26] and is associated with poor outcome in stroke patients.[27] Study done by Cheung-TerOng et al.[28] showed that stroke patients aged > 75 years have an increased risk of an in-hospital mortality.

Limitation of the study

This is a single center study with a limited sample size. So, this may not reflect the overall picture of the country. A large-scale study needs to be conducted to reach a definitive conclusion.

Conclusion

This study shows hypertension, diabetes mellitus, heart disease, hyperlipidemia, family history of CVD, CAD, past history of stoke/TIA, migraine and peripheral vascular disease were associated with poor stroke outcome. The risk factors identified in our study have implications for planning secondary prevention strategies. Preventive measured for risk factors and the routine follow-up may help to reduce health care burden and disability.

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