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Clinical Features, Risk Factors and Hospital Mortality of Acute Stroke Patients

Mahfuj-Ul-Anwar[1], Sajeda Afrin[1], ASM Rahenur Mondol[1], Mohammad Nurul Islam Khan[1], Narayan Chandra Sarkar[1], Mohammad Kumruzzaman Sarker[1], Shah Md Sarwer Jahan[1], Moni Rani[2] and Ratindra Nath Mondal[3*]

Affiliation

[1]Rangpur Medical College, Rangpur, Bangladesh

[2]Rajshahi Medical College Hospital, Rajshahi, Bangladesh

[3]Society of General Physicians and Daktarkhana (GP center) Rangpur, Bangladesh

[*]**Corresponding author:** Dr. Ratindra Nath Mondal, Society of General Physicians and Daktarkhana (GP center) Rangpur, Bangladesh, Email: dr.ratinmondal@gmail.com

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Abstract

Background: Stroke is a leading cause of mortality and disability worldwide. To prevent complications and permanent defects, early diagnosis, distinguishing the type and risk factor of stroke is crucial. **Methodology:** It was a hospital based cross sectional study, purposive sampling method was used, and a total of 469 stroke patients admitted into Department of Medicine, Rangpur medical college hospital, Bangladesh were included in this study. **Results:** In this study we have studied of 469 acute stroke patients. Among them 81% (380) were ischemic stroke patients and 19% (89) were hemorrhagic stroke. Overall male were more than female 308 (65.7%) vs 161(34.4%). The mean age for the ischemic stroke group was 64.1 ± 10.9 years, which was significantly higher than that of the hemorrhagic group (59.8 ± 9.60years) (P<0.05). Acute hemorrhagic stroke patients presented with acute onset of focal neurological deficit 61.8%, headache 64%, vomiting 59.6%, alteration of consciousness 48.3% and convulsion 27%. On the other hand, acute ischemic stroke patient presented with alteration of consciousness 65.5%, acute onset of focal neurological deficit 39.5%, paralysis 41%, deficit after awakening 32.4% and aphasia 34.7%. Among the risk factors of stroke in acute ischemic stroke patients hypertension was 59.2%, diabetes mellitus 20%, history of previous stroke 16.1%, ischemic heart disease 14.5% and atrial fibrillation 10.3% were present, on the other hand in acute hemorrhagic stroke patients hypertension 76.4%, smoking 70.8% and diabetes mellitus 6.7% were present. 26.97% of the acute hemorrhagic stroke and 13.9% of the acute ischemic stroke patients died in hospital. **Conclusion:** Common presentation of stroke was acute onset of focal neurological deficit; headache and vomiting were more in hemorrhagic stroke patient; alteration of consciousness, paralysis was predominant in ischemic stroke patient.

Keywords: Ischemic, Hemorrhagic, Stroke, Rangpur, Bangladesh.

Abbreviations: FSGS-Focal Segmental Glomerulosclerosis, MMF-Mycophenolate Mofetil, NS-Nephrotic Syndrome, GFR-Glomerular Filtration Rate, CR-Complete Remission, IR-Incomplete Remission, PR-Partial Remission, GMD-Global Burden of Diseases, IHD-Ischemic Heart Disease.

Introduction

Stroke was defined according to WHO criteria as rapidly developing clinical signs of focal (at times global) disturbance of cerebral function lasting more than 24 hours or leading to death with no apparent cause other than that of vascular origin. Two types of brain stroke are hemorrhagic and ischemic. Hemorrhagic stroke, which is due to blood vessel rupture, accounts for 20% of CVAs. Ischemic stroke due to brain vessels occlusion and blockage includes 80%. Stroke is a leading cause of mortality and disability worldwide and the economic costs of treatment and post-stroke care are substantial. Results from the 2015 iteration of the Global Burden of Diseases (GMD), Injuries, and Risk Factors Study (RFS) showed that although the age-standardized death rates and prevalence of stroke have decreased over time, the overall burden of stroke has remained high, with more than 80 million [1-4].

Stroke survivors in 2016. In 2016, stroke was the second largest cause of death globally (5.5 million deaths) after ischemic heart disease. Stroke was also the second most common cause of global Disability-Adjusted Life-Years DALYs (116.4 million). There were 80.1 million prevalent cases of stroke globally in 2016 and 13.7 million new stroke cases in 2016. In 2016 the number of stroke patient and death due to stroke in Bangladesh were 161,709 and 126,369 respectively. In order to prevent complications and permanent defects, early diagnosis is the key in stroke patients, however, distinguishing the type of stroke plays a crucial role in patient care. The management of a patient with acute stroke is based on the knowledge of stroke type: hemorrhagic or ischemic. In most developed countries, diagnosis is easily obtained by CT scanning, which allows the accurate Distinction of hemorrhagic and ischemic types [5,6].

However, quick access to CT scanning is not available in every country and hospital which may lead to loss of treatment golden time. Simple clinical findings are helpful in distinguishing the type of stroke, but need for diagnostic imaging is an undeniable fact. According to this issue, many studies described various clinical findings especially neurological signs and symptoms and risk factors differentiation, and some of them presented formulas to distinguish stroke types based on clinical evaluations. As populations age and low-income and middle-income countries go through the epidemiological transition from infectious to non-communicable diseases as the predominant cause of morbidity, together with concomitant increases in modifiable risk factors, it is expected that the burden of stroke will further increase until effective stroke prevention strategies are more widely implemented [7-14].

About 90% of the stroke burden is attributable to modifiable risk factors, with about 75% being due to behavioral factors such as smoking, poor diet and low physical activity. Achieving control of behavioral and metabolic risk factors could avert more than three quarters of the global stroke burden. Since treatment measures for stroke are still rather limited and expensive, in a high prevalent country like Bangladesh, it is important to be familiar with relative contribution of different stroke risk factor in an individual patient. The individuals with a relatively high risk profile can take steps to modify their risk factors through lifestyle changes and/or medical treatment. Healthy lifestyle modification and better adherence to recommended medications via an affordable multidrug polypill containing blood pressure and lipid-lowering medications, early initiation of antiplatelet drugs after ischemic stroke could potentially also enable cost-effective prevention of stroke globally, potentially halving stroke incidence and mortality [15-18].

In addition to prevention efforts, appropriate acute and long-term treatment is essential, given the high recurrence rate of stroke. Similarly, public awareness programs aimed at increasing the recognition of stroke warning signs and altering modifiable risk factors can be designed to address the high-risk groups. Because the pathogenesis of ischemic stroke is different from that of hemorrhagic stroke, their clinical factors including risk factors would not be the same. This study was undertaken to assess the difference in risk factors, clinical and laboratory profiles in hemorrhagic and ischemic stroke patients so as to provide some scientific evidence for stroke prevention in Bangladesh [19-21].

Materials and Methods

This was a hospital based cross sectional study was conducted in Department of Medicine, Rangpur medical college hospital, Rangpur, Bangladesh from January 2010 to December 2011. Purposive sampling method was used. The study included 469 patients with acute stroke diagnosed by history, clinical findings and confirmed by CT scan of brain within 1week of attack. Patients with no definitive CT scan results or those suspected to have transient ischemic attacks were excluded from the study. For each patient, demographic data, type of stroke, risk factors, clinical and initial laboratory variables and in-hospital death were recorded. Demographic variables included age and sex. Types of stroke included ischemic and hemorrhage.

Risk factors included a history of Hypertension (HTN), Diabetes Mellitus (DM), Ischemic Heart Disease (IHD), Valvular Heart Disease (VHD), Atrial Fibrillation (AF), Renal Impairment (RI), Smoking, Obesity (SO), advanced age (>80 years), previous stroke and family history of stroke, hypertension, Diabetes Mellitus (DM) and Coronary Artery Disease (CAD). Patient outcome included vital status at discharge (alive or dead). All patients were investigated with routine investigations such as TC, DC, ESR, Hb%, total platelet count, urine examination, RBS (on admission blood sugar level), FBS and 2HABF, fasting lipid profile, serum electrolytes, serum creatinine, ECG. CT scan of brain was done in every case to confirm the diagnosis. Treatment was given accordingly and inpatient outcome were observed. The clinical factors to be observed in this study included advanced age (>80 years), gender (male-exposure), cigarette smoking (average smoking ≥ 1 cigarettes per day, and continued more than one year). Hypertension was diagnosed when the blood pressure measured in the hospital was >140/90 mmHg or if the patient was taking antihypertensive agents. Diabetes was diagnosed if a patient was using oral hypoglycemic agents or insulin and or post-stroke repeated fasting plasma glucose levels ≥ 7.0 mmol/L (≥ 126 mg/dL) and 2 hours after glucose level ≥ 11.1mmol/L (≥ 200mg/dl) and or the glycosylated hemoglobin level exceeded 6.5%.

Obesity was defined based on the body mass index (BMI) value; males and females with BMI >30 were considered to be obese. On admission laboratory reports includes increased white blood cell (WBC>11.0×109/L), hypertriglyceridemia (triglyceride (TG)>1.7 mmol/L), hypercholesterolemia (total cholesterol (TC) ≥ 5.7 mmol/L), low level of high-density lipoproteins (HDL<1.0 mmol/L), ischemic changes or arrhythmia on ECG. All relevant information was recorded in a predesigned questionnaire. Collected data were compiled and appropriate analyses were carried out using computer-based software, Statistical Package for Social Science (SPSS)-17. The continuous clinical variants were compared by unpaired Student's t test. The Chi-square test was used to evaluate differences in proportion of clinical factors in patients between ischemic and hemorrhagic stroke. A P value <0.05 (two-tailed) was considered statistically significant.

Results

In this study we have studied of 469 acute stroke patients. Among them 81% (380) were ischemic stroke patients and 19% (89) were hemorrhagic stroke. Overall male were more than female 308 (65.7%) vs 161 (34.4%) and also in both types of stroke patients (ischemic stroke group 65.3% and 67.4% of the hemorrhagic group). The mean age for the ischemic stroke group was 64.08 ± 10.89 years, which was significantly higher than that of the hemorrhagic group (59.82 ± 9.60years) (P<0.05). (**Table 1**) shows the details.

	Ischemic stroke	Hemorrhagic stroke	P value
Mean Age (years)	64.08±10.889	59.82±9.601	0.001
Above 80 years	52 (13.7%)	2 (2.2%)	0.001
Sex			
male	248 (65.3%)	60 (67.4%)	0.804
female	132 (34.7%)	29 (32.6%)	

Table 1: Comparison of the age of patients (in percentage) with ischemic and hemorrhagic stroke.

Acute hemorrhagic stroke patients presented with acute onset of focal neurological deficit 61.8%, headache 64%, vomiting 59.6%, alteration of consciousness 48.3% and convulsion 27%. On the other hand, acute ischemic stroke patient presented with alteration of consciousness 65.5%, acute onset of focal neurological deficit 39.5%, paralysis 41%, deficit after awakening 32.4% and aphasia 34.7%. Clinical presentations of two subtypes of stroke were detailed in (**Table 2**).

Among the risk factors of stroke in acute ischemic stroke patients hypertension was 59.2%, diabetes mellitus 20%, history of previous stroke 16.1%, ischemic heart disease 14.5% and atrial fibrillation 10.3% were present, on the other hand in acute hemorrhagic stroke patients hypertension 76.4%, smoking 70.8% and diabetes mellitus 6.7% were present. (**Table 3)** showing risk factors of the ischemic and hemorrhagic stroke) the laboratory data of patients with ischemic and hemorrhagic stroke were compared at (**Table 4)**. Atrial fibrillation and ischemic changes on ECG was more in ischemic stroke than hemorrhagic stroke, 13.9% vs 3.4% and 16.6% vs 4.5% respectively. 26.97% of the acute hemorrhagic stroke and 13.9% of the acute ischemic stroke patients died in hospital.

Clinical presentation	Ischemic stroke	hemorrhagic stroke	P value
Acute onset of focal neurological deficit	150 (39.5%)	55 (61.8%)	0
Gradual onset of deficit	68 (17.9%)	5 (5.6%)	0.003
Headache	91 (23.9%)	57 (64.0%)	0
Vomiting	44 (11.6%)	53 (59.6%)	0
Convulsion	52 (13.7%)	24 (27.0%)	0.004
Coma	75 (19.7%)	32 (36.0%)	0.002
Alteration of consciousness	249 (65.5%)	43 (48.3%)	0.002
Paralysis	158 (41.6%)	37 (41.6%)	1
Deficit after awakening	123 (32.4%)	14 (15.7%)	0.002
Dysarthria	118 (31.1%)	17 (19.1%)	0.027
Aphasia	132 (34.7%)	23 (25.8%)	0.133
Dysphagia	89 (23.4%)	18 (20.2%)	0.576
Sensory impairment	41 (10.8%)	18 (20.2%)	0.021
SBP	139.0658 ± 32.83216	150.6180 ± 26.08792	0.002
DBP	83.8026 ± 14.55408	91.1236 ± 15.68063	0

Table 2: Comparison of clinical presentations on admission of ischemic and hemorrhagic stroke.

	Ischemic stroke	hemorrhagic stroke	P value
Above 80 years	52 (13.7%)	2 (2.2%)	.001*
Hypertension	225 (59.2%)	68 (76.4%)	.002*
DM	76 (20.0%)	6 (6.7%)	.002*
Smoking	233 (61.3%)	63(70.8%)	0.113
Obesity	15 (3.9%)	3 (3.4)	1
Ischemic heart disease	55 (14.5%)	3 (3.4%)	.002*
Valvular heart disease	47 (12.4%)	6 (6.7%)	0.191
Atrial Fibrillation	39 (10.3%)	1 (1.1%)	.002*
Previous stroke	61 (16.1%)	4 (4.5%)	.003*
Renal impairment	46 (12.1%)	11 (12.4%)	0.407
Family history of hypertension	62 (16.3%)	29 (32.6%)	.001*
Family history of DM	37 (9.7%)	5 (5.6%)	0.302
Family history of stroke	32 (8.4%)	6(6.7%)	0.829
Family history of CAD	15 (3.9%)	2 (2.2)	0.752

Table 3: Comparison of risk factors of the ischemic and hemorrhagic stroke.

	Ischemic stroke	hemorrhagic stroke	P value
WBC ($\times 10^9$L)	7.6550 ± 3.39053	9.8438 ± 4.12015	0
Random blood glucose (mg/dl)	7.3659 ± 2.72235	8.4753 ± 3.20200	0.003
Serum creatinine (mg/dl)	1.1707 ± 1.04457	1.1235 ± 1.25374	0.743
Serum triglyceride (TG) (mmol/L)	4.8325 ± 1.18581	4.7416 ± 1.06819	0.508
Serum total cholesterol (TC) (mmol/L)	1.7206 ± 0.82014	1.7994 ± 0.79863	0.413
Serum HDL (mmol/L)	1.1407 ± 0.29611	1.2564 ± 0.32808	0.001
Atrial fibrillation on ECG	53(13.9%)	3(3.4%)	0.003
Ischemic changes on ECG	63 (16.6%)	4 (4.5%)	0.002
AV block on ECG	3 (0.8%)	1 (1.1%)	0.57

Table 4: Comparison of laboratory data on admission of patients with ischemic and hemorrhagic stroke.

Discussion

In our study 81% patients were ischemic stroke, similar findings observed in other studies. Observed higher rates of ischemic stroke incidence suggests that ischemic stroke patients have a great exposure to modifiable risk factors which can be controlled through lifestyle modification and appropriate treatment thus can prevent a large proportion of such incidence of stroke. Stroke (both ischemic and hemorrhagic) is more common in men than women, our study also found similar result. Lifestyle differences, such as cigarette smoking and alcohol drinking, may help explain this sex disparity. In addition, there is no vascular protection of endogenous estrogen in males and it may contribute to the risk of stroke in men. In the current study, mean age of patients with ischemic stroke was higher than hemorrhagic stroke patients, similar findings observed in many of the other studies Knowledge on the relative contribution of risk factors in hemorrhagic versus ischemic strokes is still insufficient. Some risk factors are common for both hemorrhagic and ischemic stroke. In our study factors favoring ischemic stroke as opposed to hemorrhagic [22-29].

Strokes were diabetes, atrial fibrillation, history of previous stroke and increasing age. Hypertension and family history of hypertension favored hemorrhagic stroke as opposed to ischemic stroke. In our study smoking, obesity, Valvular Heart Disease (VHD), renal impairment, family history of DM, stroke or coronary artery disease favored neither of the stroke types. In a large study based on 394, 84 patients' well-established risk factors and markers of atherosclerotic and occlusive arterial disease such as diabetes, atrial fibrillation, previous myocardial infarction, previous stroke and intermittent arterial claudication were associated with ischemic stroke rather than hemorrhagic stroke smoking and high alcohol intake favored hemorrhagic stroke, whereas age, sex, and hypertension did not herald stroke type.

In the hospital-based Lausanne Stroke registry (n=3901) smoking, hypercholesterolemia, migraine, previous transient ischemic attack, atrial fibrillation, and heart disease favored ischemic stroke, whereas hypertension was the only significant factor related to hemorrhagic vs ischemic stroke. Hypertension is the most prevalent risk factor for stroke, based on data from 30 studies, and has been reported in about 64% of patients with stroke. High blood pressure can [30-33]. significantly increase the risk of a hemorrhagic stroke. This risk is even more pronounced in the elderly, in people who smoke, in men, in diabetics, and in people who drink alcohol. In our study 59.2% of the ischemic stroke and 76.4% of the hemorrhagic stroke patient had hypertension. Recent large-scale, international population studies suggest that diabetes is one of the most Important modifiable risk factors for cerebrovascular disease. Diabetes is also a well-established independent risk factor for ischemic stroke. Diabetes causes various microvascular and macrovascular changes often Cerebral Small Vessel Diseases (CSVD) and ultimately develops ischemic stroke. Cigarette smoking has long been recognized as major risk factors for stroke. The pathophysiological effects are multifactorial, involving both systemic vasculature and blood rheology. So far it is still controversial whether the effects of cigarette smoking on ischemic stroke are consistent with those on hemorrhagic stroke (Clinical factors in patients with ischemic versus hemorrhagic stroke in East China). The data from our study exhibited that the association of smoking with hemorrhagic stroke was approximately the same as that with ischemic stroke, similar result also found in previous studies [34-45].

Dyslipidemia have traditionally been regarded as a risk factor for coronary artery disease but not for cerebrovascular disease. However, recent studies have clarified the relationship between lipids and ischemic stroke, and showed that the risk of ischemic stroke. In a large cohort of elderly patients, low triglycerides levels were associated with an increased risk of hemorrhagic stroke. In our study, we observed a low level of HDL was much more closely related to ischemic stroke risk, similar findings obtained from a study of East China. There was no significant difference in the prevalence of hypertriglyceridemia and hypercholesterolemia between ischemic and hemorrhagic patients.

A study with larger-sample size investigation is necessary to confirm this finding. Atrial fibrillation increases the risk of stroke up to five fold, largely through an increased risk of thrombotic events leading to ischemic stroke. Antithrombotic therapy with vitamin K antagonists, antiplatelet drugs, or novel oral anticoagulants have been shown to reduce this risk by up to 60% in a meta-analysis of clinical trials. Improved diagnosis of and treatment for atrial fibrillation is thus likely to have a substantial impact on stroke burden. In our study atrial fibrillation was more in ischemic stroke than hemorrhagic stroke (13.9% vs 3.4%) [46-50].

Clinical features, such as acute onset, headache, vomiting, convulsion, increased systolic and diastolic blood pressure on admission, decreased consciousness and coma were significant in patients with hemorrhagic stroke than ischemic stroke patients reported by others our study also found similar result. Severity of the clinical features in hemorrhagic stroke presumably due to increased intracranial pressure and the direct compression or distortion of the thalamic and brain-stem reticular activating system, expansion of hematoma, worsening cerebral edema and meningismus resulting from blood in ventricles. On the other hand gradual onset, deficit after awakening, focal deficits, visual field defect and sensory impairment were significant in patients with ischemic stroke also observed previously, however, occurrence site of these signs depends on the brain area that is being nourished by suffering vessels.

On initial investigations like previous studies WBC, Blood Glucose (BG), HDL, were higher in the hemorrhagic group than in the ischemic group. On the other hand ischemic changes and atrial fibrillation8 on ECG is significantly observed in ischemic stroke patients. Our study findings are consistent with all those studies. Moreover, a previous study reported a significant elevation of the WBC count in ICH was associated with deteriorating level of consciousness, cerebral vasospasm and death. Increased WBC count is mainly attributed to enhanced catecholamine and corticosteroid release because of an extension of the blood into the subarachnoid space, but the inflammatory response of ventricular extension (ventriculitis) may be an additional contributing. Factor So, WBC count may. Be one of the important prognostic markers in hemorrhagic stroke patients. Hospital mortality is higher in hemorrhagic stroke than ischemic stroke. Ratindra et al found short term. (Within 28 days) mortality in hemorrhagic stroke 45.5%, where hospital mortality was 40% and in ischemic stroke 18.1% and hospital mortality was 7.97%. Our study found similar result [51-61].

Proper stroke management depends on the distinction between intracerebral hemorrhage and cerebral infarction. Whilst CT imaging remains the gold standard for differential diagnosis, availability of this important diagnostic tool is not always feasible. Despite the lack of absolute accuracy of classification models, adequate knowledge on risk factors, clinical features and initial investigations may contribute to such a differentiation of cerebral infarction from intracerebral hemorrhage in order to aid clinicians to decide about starting antiplatelet therapy in settings where rapid access to Computed Tomography (CT) is lacking [8].

Nevertheless, a combined analysis of 40000 randomized patients from the Chinese Acute Stroke Trial (CAST) has demonstrated that early aspirin use (within 48 hours of onset) amongst the 9000 patients (22%) randomized without a prior CT scan appeared to be of net benefit with no unusual excess of hemorrhagic stroke. Moreover, even amongst the 800 subjects (2%) whose presenting event was subsequently discovered to have been a hemorrhagic stroke, there was no evidence of detrimental effect of aspirin (OR 0.86 for further stroke or death, 63 aspirin versus 67 control). Because in CAST and IST trials the incidence of hemorrhagic stroke or transformation was low during the first day from the event, whereas that of recurrent ischemic stroke was relatively high, early aspirin use is justifiable when ischemic stroke is suspected and rapid CT scanning is lacking [62-64].

Conclusion

Common presentation of stroke was acute onset of focal neurological deficit; headache and vomiting was more in hemorrhagic stroke patient; alteration of consciousness, paralysis was predominant in ischemic stroke patient.

Limitation

Sample size was small, long term outcome of the stroke patients were not studied.

Future Direction

Community based study with large sample size will be needed to obtain a full picture of the stroke patients.

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