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Comparison of Clinical Presentation and Risk Factors in Hypertensive Patients with Ischemic and Hemorrhagic Stroke

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Abstract **Original Research Article**

Background: Stroke is a leading cause of morbidity and mortality worldwide, with hypertension being the most important modifiable risk factor. Clinical presentation and risk factor profiles often differ between ischemic and hemorrhagic stroke, influencing management and outcomes. ***Methods:*** This observational cross-sectional study was conducted at the Department of Medicine, Comilla Medical College Hospital, Bangladesh, from January to June 2013. One hundred hypertensive patients with first-ever stroke, aged 20–90 years, were enrolled. Clinical history, risk factors, neurological examination, and CT scan findings were recorded. Patients with previous stroke or other intracranial pathology were excluded. ***Results:*** Of the 100 patients, 80% had ischemic stroke and 20% hemorrhagic stroke. Females predominated (72%), with ischemic stroke more common among females (75%), whereas hemorrhagic stroke occurred more frequently in males (40%). Hyperlipidemia (37.5% vs. 40%) and smoking (31.2% vs. 25%) were the most common risk factors. Hemorrhagic stroke was associated with unconsciousness (90%), lower GCS (6 ± 3), headache (100%), and vomiting (90%), while ischemic stroke often occurred at rest (75%). ***Conclusion:*** Hemorrhagic stroke in hypertensive patients presents with more severe neurological deficits, whereas ischemic stroke is more prevalent in females and often occurs at rest. Recognition of these differences aids early diagnosis and targeted management.

Keywords: Hypertension, Ischemic stroke, Hemorrhagic stroke, Risk factors, Clinical presentation.

INTRODUCTION

Stroke is one of the leading causes of morbidity and mortality worldwide and represents a major public health challenge, particularly in low- and middle-income countries like Bangladesh. It is defined as the sudden onset of neurological deficit resulting from either ischemia or hemorrhage within the brain [1]. Globally, stroke is the second leading cause of death and a primary cause of long-term disability. According to the World Health Organization (WHO), approximately 15 million people suffer from stroke each year, of whom nearly 5 million die and another 5 million are left permanently disabled [2]. The burden is disproportionately higher in developing countries, where more than two-thirds of all stroke-related deaths occur.

Hypertension is recognized as the most important modifiable risk factor for stroke. Chronic high blood pressure contributes to vascular remodeling, atherosclerosis and weakening of cerebral vessels, thereby predisposing patients to both ischemic and hemorrhagic strokes [3]. While ischemic stroke results from obstruction of cerebral blood flow due to thrombus or embolus, hemorrhagic stroke is caused by rupture of a blood vessel, leading to intracranial bleeding [4]. The

clinical presentation of stroke varies depending on the type, location and extent of brain involvement, but common symptoms include sudden weakness, speech disturbances, headache, vomiting, altered consciousness and focal neurological deficits [5]. It has been observed that hemorrhagic strokes tend to present with more severe symptoms such as decreased consciousness, lower Glasgow Coma Scale (GCS) scores and higher frequency of headache and vomiting, whereas ischemic strokes often have a more insidious onset and are more common in older individuals and females [6].

Risk factor profiles for ischemic and hemorrhagic stroke also show important differences. Hyperlipidemia, diabetes mellitus, smoking, sedentary lifestyle and family history of stroke are more strongly associated with ischemic stroke, while uncontrolled hypertension and physical exertion are strongly linked to hemorrhagic stroke [7]. In Bangladesh, stroke remains a major cause of hospitalization and disability, yet limited data exist regarding the comparative clinical features and risk factor patterns between ischemic and hemorrhagic strokes in hypertensive patients [1]. Given that hypertension is highly prevalent in the Bangladeshi population, understanding these patterns is crucial for prevention, early diagnosis and appropriate management [8].

Neuroimaging, particularly computed tomography (CT) of the brain, plays a central role in differentiating between ischemic and hemorrhagic strokes. While clinical features can often provide important clues, definitive diagnosis and subsequent management decisions depend heavily on CT findings [9]. Accurate classification of stroke subtype is vital because treatment strategies differ: ischemic stroke may benefit from antiplatelet or thrombolytic therapy, whereas hemorrhagic stroke requires careful blood pressure control and sometimes neurosurgical intervention [10].

The present study was undertaken to compare the clinical presentation and risk factors of ischemic and hemorrhagic stroke among hypertensive patients admitted in a tertiary care hospital in Bangladesh. By analyzing differences in symptoms, level of consciousness and associated risk factors, along with CT-based localization of lesions, this study aimed to generate evidence that will help clinicians in early recognition of stroke subtypes and guide appropriate preventive and therapeutic strategies in hypertensive individuals.

METHODOLOGY & MATERIALS

This observational cross-sectional study was conducted in the Department of Medicine, Comilla Medical College Hospital, Comilla, over a period of six months from January 2013 to June 2013. A total of 100 hypertensive patients with first-ever stroke, aged between 20 and 90 years, were enrolled following informed written consent. Patients with a past history of stroke, CT evidence of brain tumor, tuberculoma, abscess, or metabolic derangements such as hypoglycemia and electrolyte imbalance were excluded. Relevant clinical data including age, sex, occupation, family history and associated risk factors like diabetes mellitus, dyslipidemia, smoking and obesity were recorded in a pre-designed questionnaire through face-to-face interviews, medical history taking and thorough physical examination. Stroke was defined as the sudden onset of a focal neurological deficit and diagnosis was confirmed by clinical evaluation and neuroimaging. All patients underwent CT scan of the brain to classify stroke subtypes and correlate neurological impairment with radiological findings, while additional investigations such as blood glucose and serum electrolytes were performed when necessary to rule out secondary causes. Ethical approval was obtained from the Bangladesh College of Physicians and Surgeons (BCPS) and confidentiality of patient data was strictly maintained. Quality assurance was ensured by carefully checking data for completeness and consistency, discarding irrelevant or inconsistent information. Data were analyzed using SPSS software, with quantitative variables expressed as mean ± standard deviation and qualitative variables as frequency and percentage and a p-value of <0.05 was considered statistically significant at a 95% confidence level.

RESULTS

Table 1: Sex distribution and stroke types in study population (n=100)

	Male	Female
Haemorrhagic stroke	08 (40%)	12 (60%)
Ischemic stroke	20 (25%)	60 (75%)

Table 1 shows among the study population 72 were female and 28 were male.

Table 2: Risk factors in study population (n=100)

Risk factors	Infarction (n=80)	Haemorrhage (n=20)
Diabetes mellitus	15 (18.75%)	05 (25%)
Coronary artery disease	10 (12.5%)	02 (10%)
Hyperlipidemia	30 (37.5%)	08 (40%)
Smoking	25 31.2%)	05 (25%)

Table 2 shows among the risk factors hyperlipidemia found most common 30 (37.5%) for ischemic and 08 (40%) for haemorrhagic stroke.

Table 3: Unconsciousness and stroke subtypes (n=100)

	Male	Female
Ischemic stroke	20 (25%)	60 (75%)
Haemorrhagic stroke	08 (90%)	02 (10%)

Table 3 shows unconsciousness is more common in haemorrhagic stroke (90%).

Table 4: GCS score in study population (n=100)

GCS score	5	7	9	11	13	15
Haemorrhagic stroke	7 (8.7%)	6 (7.5%)	30 (37.5%)	17 (21.2%)	12 (15%)	8 (10%)
Ischemic stroke	4 (20%)	2 (10%)	6 (30%)	4 (20%)	3 (15%)	1 (5%)

Table 4 shows GCS score is lower (6±3) in haemorrhagic stroke.

Table 5: Headache and stroke subtypes (n=100)

	Headache	No Headache
Ischemic stroke	20 (25%)	60 (75%)
Haemorrhagic stroke	20 (100%)	00

Table 5 shows headache is common (100%) in haemorrhagic stroke.

Table 6: Vomiting and stroke subtypes (n=100)

	Vomiting	No vomiting
Ischemic stroke	25 (31.7%)	55 (68.7%)
Haemorrhagic stroke	18 (90%)	02 (10%)

Table 6 shows vomiting is more (90%) in haemorrhagic stroke.

Table 7: Vertigo and stroke subtypes (n=100)

	Vertigo	No vertigo
Ischemic stroke	60 (75%)	20 (25%)
Haemorrhagic stroke	15 (75%)	05 (25%)

Table 7 shows vertigo is common both ischemic and haemorrhagic stroke (75%).

Table 8: Activities and stroke subtypes (n=100)

	During activity	During test
Ischemic stroke	20 (25%)	60 (75%)
Haemorrhagic stroke	19 (95%)	01 (5%)

Table 8 shows haemorrhagic stroke occurs more (95%) during activities whereas ischemic stroke more (75%) in resting condition.

DISCUSSION

This study compared the clinical presentation and risk factors of ischemic and hemorrhagic stroke among hypertensive patients admitted to a tertiary care hospital in Bangladesh. Among the 100 patients included, ischemic stroke was more common (80%) than hemorrhagic stroke (20%), with a predominance of female patients. The results also demonstrated important differences in risk factor distribution and clinical presentation between the two stroke subtypes.

The predominance of ischemic stroke in our series is consistent with the findings of Saha *et al.,* who reported ischemic stroke as the major subtype among hospitalized patients in Bangladesh [11]. Similarly, Siddique *et al.,* observed ischemic stroke in nearly two-thirds of their study population, underscoring its higher prevalence compared to hemorrhagic stroke [12]. In our study, ischemic stroke was more common in females, which aligns with the observations of Abdu *et al.,* who highlighted sex differences in stroke patterns and found a higher burden of ischemic stroke among women [13]. This could be related to longer life expectancy in females, higher prevalence of hypertension and possibly under-recognized vascular risk factors in women.

Risk factor analysis in our study revealed hyperlipidemia and smoking as the most frequent associations, followed by diabetes mellitus and coronary artery disease. This finding is in line with Rahman *et al.,* who demonstrated that dyslipidemia is highly prevalent in both ischemic and hemorrhagic stroke, with slightly higher frequencies in hemorrhagic patients [14]. Similarly, Anisuzzaman *et al.,* emphasized the role of hyperlipidemia and smoking in acute ischemic stroke patients in Bangladesh [15]. Smoking remains a well-established modifiable risk factor, as supported by Miah *et al.,* who showed its strong association with stroke in both young and older patients [16]. Our study also observed diabetes mellitus as a comorbidity, which has been consistently reported in Bangladeshi stroke populations, including in the registry analysis by Bhowmik et al [17].

Clinical presentation varied significantly between ischemic and hemorrhagic stroke in our cohort. Unconsciousness and lower GCS scores were predominantly observed in hemorrhagic stroke patients, reflecting more severe neurological impairment. Similar findings were documented by Khan *et al.,* who reported that reduced consciousness and poor GCS are strong predictors of mortality in hemorrhagic stroke patients [18]. Headache and vomiting were also strikingly more common in hemorrhagic stroke, which aligns with the results of Thrinetrapriya and Jagadeesan, who noted these symptoms as hallmark features of intracerebral hemorrhage [19]. In contrast, ischemic stroke tended to present with relatively less severe symptoms and was more frequently observed at rest, a pattern also highlighted in international studies such as that of Tan *et al.,* who examined ischemic stroke subtypes in a large Chinese cohort [20].

Vertigo was common in both ischemic and hemorrhagic stroke patients in our study, reported by 75% of cases. This finding is consistent with the work of Murphy and Werring, who described vertigo as a non-specific but common presenting feature in posterior circulation strokes, irrespective of subtype [21]. Activity at the time of stroke onset also showed significant differences between the two groups in our study. Hemorrhagic stroke was more often associated with physical activity (95%), whereas ischemic stroke occurred more often at rest. This supports the observations of Namale *et al.,* who reported that exertion and uncontrolled hypertension are major triggers for hemorrhagic stroke in Sub-Saharan Africa, a finding that resonates with our results in a Bangladeshi hypertensive population [22].

Our study findings are also relevant in terms of functional outcome implications. Salvadori *et al.,* compared ischemic and hemorrhagic stroke in a rehabilitation setting and found that hemorrhagic stroke patients generally presented with more severe deficits at admission, consistent with our observation of lower GCS and higher frequency of unconsciousness, headache and vomiting [23]. Such evidence highlights the need for early supportive management in hemorrhagic stroke, as opposed to the often more gradual presentation of ischemic stroke.

The differences in clinical and risk factor profiles between stroke subtypes have important clinical implications. While both ischemic and hemorrhagic strokes share hypertension as the dominant underlying cause, associated risk factors such as dyslipidemia, diabetes and smoking appear to be more relevant in ischemic events, whereas hemorrhagic events are linked to acute rises in blood pressure and physical activity. Recognizing these differences can guide preventive strategies. For instance, stricter lipid control and smoking cessation may reduce ischemic stroke incidence, while optimal blood pressure monitoring and avoidance of sudden exertion may reduce hemorrhagic risk in hypertensive patients.

LIMITATIONS OF THE STUDY

This study has several strengths, including its focus on hypertensive patients and its detailed analysis of clinical presentations. However, limitations such as a relatively small sample size and single-center design must be acknowledged, which may limit generalizability. Despite these limitations, the findings are consistent with both local and international studies and contribute valuable evidence to the understanding of stroke subtypes in hypertensive populations in Bangladesh.

CONCLUSION

In hypertensive patients, ischemic stroke was more common than hemorrhagic stroke and occurred predominantly in females, whereas hemorrhagic stroke was associated with more severe clinical presentations, including unconsciousness, lower GCS scores, headache and vomiting. Hyperlipidemia and smoking were the most prevalent risk factors across both subtypes. Hemorrhagic strokes were more likely to occur during physical activity, while ischemic strokes often developed at rest. These findings underscore the importance of early recognition of stroke subtypes, targeted management of modifiable risk factors and vigilant monitoring of hypertensive patients to prevent severe neurological outcomes.

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