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Original Research Article

Patterns of stroke subtypes among hypertensive patients: evidence from a hospital-based study in Bangladesh

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ABSTRACT

Background: Stroke is a leading global cause of disability and death, with a disproportionately high burden in developing nations. Hypertension is the primary modifiable risk factor for both ischemic and hemorrhagic stroke subtypes.
Methods: A cross-sectional study was conducted from January to December 2015 at Sylhet M.A.G. Osmani Medical College Hospital. We enrolled 96 hypertensive patients admitted with a stroke diagnosis to the Department of Medicine and Neuromedicine. Data on demographics, clinical profiles, and stroke subtypes were collected via a structured questionnaire and analyzed using descriptive and inferential statistics.
Results: The mean age of participants was 60.0 ± 11.46 years, with the highest proportion (34.4%) in the 51–60year age group. Most participants were female (68.8%) and housewives (59.4%), belonging to a lower-middle socioeconomic class (55.2%). Ischemic stroke was the predominant subtype (70.8%), consistent with global and regional patterns of stroke distribution, followed by intracerebral hemorrhage (25%) and subarachnoid hemorrhage (4.2%). A significant association was found between age and stroke subtype (p=0.01). Uncontrolled hypertension, a major driver of stroke risk, was prevalent in 74% of patients, and 61.5% reported irregular use of antihypertensive medications.
Conclusions: Ischemic stroke is the most common subtype among hypertensive patients in this setting, heavily linked to uncontrolled blood pressure. These findings underscore the critical need for effective hypertension management, including regular medication adherence and early intervention, to mitigate the stroke burden in Bangladesh.

Keywords: Stroke, Hypertension, Ischemic stroke, Haemorrhagic stroke, Bangladesh, Risk factors

INTRODUCTION

Stroke is a leading cause of death and disability globally, accounting for approximately 12 million deaths and 101 million prevalent cases worldwide.[1] It is defined as a sudden onset of neurological deficit due to focal cerebral injury resulting from vascular causes, including ischemic or hemorrhagic lesions.[2] In Bangladesh, stroke represents a major public health challenge, with hypertension being the single most significant modifiable risk factor.[3] Hypertension increases the risk of both ischemic and hemorrhagic strokes by 3-4 times.[4] Although thrombolytic therapy offers some benefit in acute ischemic stroke management, only a small proportion of patients qualify due to delayed presentation or limited resources.[5] Therefore, prevention through effective blood pressure control remains the cornerstone of stroke risk reduction.[6] Lifestyle modifications such as smoking cessation, dietary

control, and regular physical activity significantly reduce stroke incidence.[7,8] Globally, ischemic stroke constitutes nearly 80-85% of all cases, while hemorrhagic stroke accounts for about 15%.[9] Regional differences exist, with higher proportional rates of hemorrhagic stroke reported among Asian populations, potentially due to inadequate hypertension control and genetic predispositions.[10,11] Previous hospital-based data from Bangladesh indicate that the majority of stroke patients are hypertensive and belong to lower socioeconomic backgrounds.

Despite hypertension being a well-established risk factor, data on the distribution of stroke subtypes specifically among hypertensive individuals in Bangladesh remain limited.[12,13] Understanding these clinical patterns is critical for improving secondary prevention strategies and healthcare resource planning.[14-16] This study therefore aimed to determine the prevalence and distribution of stroke subtypes among hypertensive patients admitted to a tertiary care hospital in Bangladesh.

METHODS

A cross-sectional observational study was carried out at the Department of Medicine and Neuromedicine, Sylhet M.A.G. Osmani Medical College Hospital, Bangladesh, from January to December 2015. A total of 96 hypertensive patients diagnosed with stroke were purposively selected according to inclusion and exclusion criteria. Stroke was confirmed using computed tomography (CT) or magnetic resonance imaging (MRI) of the brain. Inclusion criteria included all hypertensive patients presenting with stroke, regardless of age and sex, confirmed radiologically. Exclusion criteria were stroke without hypertension, unconfirmed cases, stroke mimics such as intracranial mass or abscess, and unwilling participants. Data were collected using a pre-tested structured questionnaire comprising demographic variables (age, sex, occupation, socioeconomic status), clinical characteristics (smoking, family history, hypertension duration and control), and stroke subtypes. Ethical approval was obtained from the Institutional Review Board, and informed consent was secured.

Data analysis

Data were cleaned, coded, and analyzed using SPSS version 27.0. Categorical variables such as sex, occupation, and stroke subtype were expressed as frequencies and percentages, while continuous variables like age were presented as mean ± SD. Cross-tabulations were used to explore associations between stroke subtype and potential determinants such as age, sex, and hypertension status. The Chi-square test determined the level of significance.

RESULTS

Most patients (66.7%) were aged between 51-70 years, with a mean age of 60 years, indicating that stroke predominantly affects the older hypertensive population. (Figure 1).

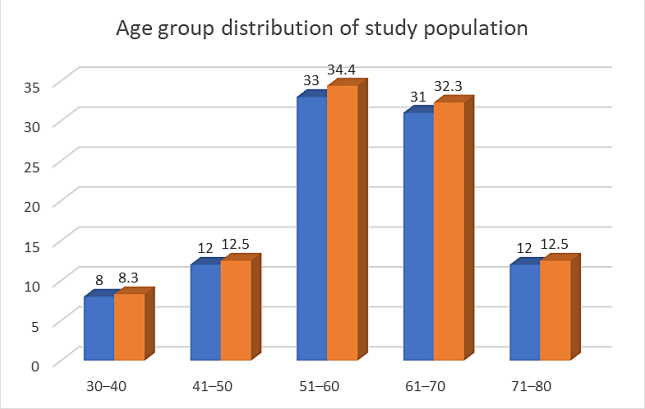

Figure 1: Age group distribution of patients (n=96).

Female predominance (68.8%) was observed, with a male-to-female ratio of approximately 1:2.2, suggesting gender-based vulnerability or healthcare-seeking differences. (Figure 2).

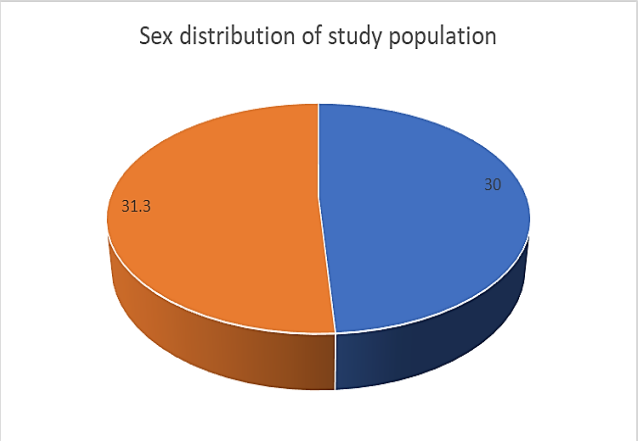

Figure 2: Distribution of patients by sex (n=96).

Ischemic stroke was the most prevalent subtype among hypertensive patients (70.8%), reflecting trends consistent with global and regional data (Table 1).

Table 1: Distribution of stroke subtypes (n=96).

Subtype of stroke	Frequency	Percentage (%)
Ischemic	68	70.8
Hemorrhagic	24	25.0
Subarachnoid hemorrhage	4	4.2

Maximum patients were from lower middle class 53(55.2%) and middle class 44(44.8%). (Table 2). Table 3 shows that 44.8% patients positive family history of hypertension, 9.4% patients had positive family history of DM, 15.6% patients IHD and 26.0% patients' stroke. Maximum patients had duration of hypertension less than

5 years 76.0%, Hypertension was controlled 26% and uncontrolled 74.0%, intake anti-hypertensive drugs irregularly 61.5% (Table 4).

Table 2: Distribution of the patients by socio-economic status of patients (n=96).

Socioeconomic status	Number of patients	Percentage %
Middle class	43	44.8
Lower middle class	53	55.2
Total	96	100.0

Table 3: Distribution of the patients by family history (n=96).

Family history	Number of patients	Percentage %
F/H of HTN	43	44.8
F/H of DM	9	9.4
F/H of IHD	15	15.6
F/H of stroke	25	26.0

Table 4: Distribution of the patients by hypertension (n=96).

	No. of patients	Percentage%
Duration of hypertension		
≤5 years	73	76.0
>5 years	23	24.0
Total	96	100.0
Type of hypertension		
Controlled	25	26.0
Uncontrolled	71	74.0
Intake of hypertensive drugs		
Regularly	37	38.5
Irregularly	59	61.5

Stroke subtype showed a statistically significant association with age (p=0.01), with ischemic stroke dominating middle-aged groups and hemorrhagic events more frequent among older individuals.

Table 5: Association between age group and stroke subtype (n=96).

Age group (years)	Ischemic (%)	Hemorrhagic (%)	SAH (%)	P value
30-40	100.0	0	0	
41-50	75.0	25.0	0	
51-60	63.6	36.4	0	
61-70	77.4	9.7	12.9	0.01
71-80	50.0	50.0	0	

Note: Stroke subtype showed a statistically significant association with age (p=0.01), with ischemic stroke dominating middle-aged groups and hemorrhagic events more frequent among older individuals.

Table 6: Association of subtype of hypertension with sex (n=96).

Sex	Frequency	Subtypes of stroke			P value
		Ischemic N (%)	Hemorrhagic N (%)	Subarachnoid haemorrhage N (%)	
Male	30	24(80.0)	6(20.0)	0(0.0)	0.250
Female	66	44(66.7)	18(27.3)	4(12.9)	
Total	96	68(70.8)	24(25.0)	4(4.2)	

Table 7: Association of subtype of hypertension with occupation (n=96).

Occupation	Frequency	Subtypes of stroke			P value
		Ischemic N (%)	Hemorrhagic N (%)	Subarachnoid haemorrhage N (%)	
Farmer	21	18(85.7)	3(14.3)	0(0.0)	
Labourer	12	9(75.0)	3(25.0)	0(0.0)	
Businessman	3	3(100.0)	0(0.0)	0(0.0)	0.068
Service holder	3	0(0.0)	3(100.0)	0(0.0)	
Housewife	57	38(66.7)	15(26.3)	4(7.0)	
Total	96	68(70.8)	24(25.0)	4(4.2)	

Table 5 shows the distribution of stroke subtypes by sex among 96 patients. Ischemic stroke was the most common subtype in both males (80.0%) and females (66.7%), followed by hemorrhagic stroke. Subarachnoid

hemorrhage was observed only among females (12.9%). The association between sex and stroke subtype was not statistically significant (p=0.250) (Table 6). Table 7 presents the distribution of stroke subtypes according to occupation among 96 patients. Ischemic stroke was the predominant subtype across most occupational groups, particularly among farmers and housewives. Hemorrhagic stroke was relatively more frequent among service holders, while subarachnoid hemorrhage was observed only among housewives. Overall, no statistically significant association was found between occupation and stroke subtypes (p=0.068). Table 8 illustrates the distribution of stroke subtypes according to blood pressure control status among 96 patients. Ischemic stroke was the most common subtype in both controlled (80.0%) and uncontrolled (66.7%) hypertension groups, followed by hemorrhagic stroke. Subarachnoid haemorrhage was observed only in patients with uncontrolled hypertension. The association between blood pressure control and stroke subtype was not statistically significant (p=0.342).

Table 8: Association of subtype of hypertension with blood pressure (n=96).

Type of hypertension	Frequency	Subtypes of stroke			P value
		Ischemic N (%)	Hemorrhagic N (%)	Subarachnoid haemorrhage N (%)	
Control	25	20(80.0)	5(20.0)	0(0.0)	0.342
Uncontrolled	71	48(66.7)	19(26.8)	4(5.6)	
Total	96	68(70.8)	24(25.0)	4(4.2)	

DISCUSSION

This study highlights that ischemic stroke is the most prevalent subtype among hypertensive patients in Bangladesh, accounting for 70.8% of cases, followed by hemorrhagic (25%) and subarachnoid hemorrhage (4.2%). These findings are consistent with prior studies conducted globally and regionally, which also report ischemic stroke as the predominant form.[15-17] The mean age of patients (60 years) aligns with previous reports from Asian countries, where stroke typically presents a decade earlier than in Western populations.[6] The female predominance contrasts with findings from Western studies suggesting cultural and social factors may influence hospital admission trends in Bangladesh.[3-10]

Uncontrolled hypertension (74%) and irregular medication use (61.5%) in the current study reaffirm hypertension as a key modifiable determinant of stroke risk.[12] Poor adherence to antihypertensive therapy significantly increases the likelihood of both ischemic and hemorrhagic strokes.[2] The significant association between age and stroke subtype (p=0.01) supports evidence that older individuals have higher susceptibility to hemorrhagic strokes due to age-related vascular fragility.[18]

Socioeconomic disparities were also evident, as over half of the patients belonged to the lower-middle class. Economic limitations and restricted healthcare access may delay diagnosis and treatment, exacerbating stroke outcomes.[8] Furthermore, the predominance of housewives (59.4%) in our sample highlights a demographic with potentially limited health literacy and access to preventive care.

Comparable findings from other studies reveal that irregularly treated hypertensive patients experience a higher proportion of hemorrhagic strokes.[1-9] The predominance of ischemic stroke in this study is consistent with global trends but underscores the regional burden of poorly controlled modifiable risk factors.[15,16] Preventive strategies focusing on community-level hypertension screening, lifestyle modification, and sustained medication adherence can substantially reduce stroke burden.[14-16] Future studies involving larger, randomized samples are necessary to confirm causal relationships and explore the role of comorbidities such as diabetes and dyslipidemia in the Bangladeshi hypertensive population.

CONCLUSION

Ischemic stroke is the predominant subtype among hypertensive patients in Bangladesh, particularly among those with uncontrolled blood pressure and irregular medication use. Regular monitoring, lifestyle modifications, and adherence to antihypertensive therapy are essential to reduce stroke-related morbidity and mortality. Public health programs targeting hypertension awareness and control can significantly mitigate the national stroke burden.

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