Original Article

Prevalence of Extracranial Carotid Artery Stenosis in Acute Stroke Patients in a Tertiary Care Hospital 🔓

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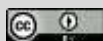
ABSTRACT

Background: *Extracranial carotid artery stenosis, a global condition, is a major risk factor for ischemic stroke. Stroke risk worsens this.* **Objective:** *This study aims to evaluate the prevalence of extra cranial carotid artery stenosis in acute stroke patients in a tertiary care hospital in Bangladesh.* **Method:** *A Dhaka tertiary care hospital's Neurology department studied 40 acute stroke patients from January to December 2022 in a cross-sectional research. Medical records were examined.* **Results**: *In our study, maximum patients (37.5%) were between 60-69 years of age group and 57.5% were male. 70% patients were urban people. Among the male patients, highest 17 (42.50%) had ischemic stroke. Similarly, among the female patients, highest 16 (40%) had ischemic stroke. 19 (47.5%) patients had stenosis. The prevalence of hypertension was highest (60%) followed by DM (40%) among the stenosis patients. The association between HTN, DM and both HTN & DM of stenosis patients were significant p<.05. Highest 15.78% had RT CCA 31%-46% and same result shows in LT ICA 37%-65% and RT ICA 25%-77%.* **Conclusion:**

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Hypertension and DM were the most common comorbidities in 19 stenosis patients. HTN and DM were strongly associated with stenosis patients. HTN sufferers should be careful to prevent stenosis.

***Keywords**: Extra Cranial Carotid Artery Stenosis, Acute Stroke Patients, Tertiary care hospital.*

INTRODUCTION

Ischemic cerebrovascular illness often results from extracranial carotid atherosclerosis [1,2,3]. These lesions may affect brain hemodynamics or embolism. High-risk patients, especially the elderly, have a 10% prevalence of carotid atherosclerotic plaque in males and 6% in women after 80 [4,5]. Plaque exceeds 50% of carotid lumen and causes hemodynamically severe carotid stenosis, for which therapy is changing.6. Effective imaging can detect carotid stenosis in 15% of strokes, preventing recurrent stroke in ischemic stroke patients.This research measures acute stroke patients' carotid stenosis to avoid recurrence.

Based on clinical and laboratory evidence, major vascular disease was expected to cause 34% of strokes, and the degree of extracranial carotid artery stenosis (ECAS) increases stroke risk [1-3]. Age is a risk factor for cerebral infarction [5] and ECAS [3]. Systolic blood pressure, diabetes, smoking, serum total cholesterol, low density lipoprotein cholesterol, and triglycerides are risk factors for ECAS in younger people, but serum HDL cholesterol protects [6–9]. Hypertension, high blood pressure, and serum total cholesterol are also risks. Duplex pulsed wave ultrasonography is safe, sensitive, and reliable for carotid artery imaging [10].

Several publications [11,12] have examined ethnic variations in stroke risk, stroke types, and brain artery atherosclerosis. In prior study, Chinese stroke patients were more likely than white stroke patients to have intracranial small-vessel disease, although extracranial sickness was rare. These studies were limited by small sample sizes or inadequate clinical and laboratory screening for extracranial disease [9,10]. Selection bias hinders general hospital autopsy and stroke presentation studies in developing nations. This covers alternative treatments, gender-specific economic status and hospital presentation criteria, and private vs. public hospital admission rates [11].

OBJECTIVE

- To determine acute stroke carotid stenosis prevalence.
- To examine the connection between Duplex ultrasound-detected carotid atherosclerosis and CT or MRI-detected ipsilateral brain lesions.
- Assess acute ischemic stroke patients' clinical characteristics and risk factors with carotid stenosis.

MATERIALS AND METHODS

Type of Study- Observational cross-sectional study

Place of Study- Department of Neurology, Bangladesh Medical College Hospital (BMCH), Dhaka, Bangladesh

Period of study- January 2022 - December 2022

Study Population: All patients with clinical and radiological features suggestive of acute ischemic stroke admitted in the neurology ward of BMCH were incorporated in the study population.

Sample size- 40 cases

Sampling method- Purposive sampling.

Data collection: Clinical data were recorded in a predesigned data collecting form.

Data analysis: Data were analyzed using SPSS-23 for Windows and represented as mean±SD. The one-way chi square test determined mean value differences' statistical significance. 0.05 was used to compare groups.

Methods: Between January 2022 and December 2023, 40 participants at the BMCH (Bangladesh Medical College hospital) participated in this cross-sectional study. The Neurology department conducted the study. 46 individuals in the adult age range who presented with stroke-like symptoms were chosen. Duplex analysis of carotid arteries was used to measure the degree of extracranial carotid artery stenosis, and the results were compared with ipsi lateral brain lesions identified by CT or MRI. Three individuals were removed from the research after imaging due to significant calcification of plaque and high carotid bifurcation, which prevented accurate assessment of the internal carotid artery. As their CT results could not be gathered, three further patients were disqualified. The research ultimately comprised 40 individuals with extracranial carotid artery stenosis. The extracranial carotid arteries of all the individuals were imaged using B-mode Color flow sonography. Additionally, 35 patients got brain CT scans, and 5 underwent MRIs. By looking through the medical record, demographic data was prospectively recorded and verified. Age, sex, medical history, clinical history of hypertension, history of limb weakness or history of falling, unconsciousness, and neurological examination were all included in the information. Radiologists from the BMCH's Department of Radiology and Imaging conducted the US assessment. Peak systolic and End diastolic velocities of the common carotid, internal carotid, and external carotid arteries on the left and right sides were recorded in order to assess the percentage of stenosis of the carotid arteries. To ensure patients receive the proper treatment to stop recurrence, their duplex color Doppler findings were compared with their brain CT or MRI findings. Brain CT or MRI results to ensure the patient is given the proper care to stop the disease from coming back.

RESULTS

The age distribution of the study participants is shown in **Table 1** below. Here, patients aged 60 to 69 made up the most (37.5%) of patients, while patients aged 80 to 89 made up the least (5%) of the patient population. See the table below:

Table 1: Age of the patients

Age	Frequency	Percentage
40-49	4	10.0
50-59	12	30.0
60-69	15	37.5
70-79	7	17.5
80-89	2	5.0
Total	40	100.00

Table 2 shows the sex distribution of the patients. Here, maximum patients (57.5%) were male and 42.5% were female patients. See the table below:

Table 2: Sex of the patients

Sex	Frequency	Percentage
Male	23	57.5%
Female	17	42.5%
Total	40	100.00%

Table 3 shows the occupation of the patients. Here, maximum patients (45%) were housewife and minimum patients (2.5%) were driver and unemployed. See the table below:

Table 3: Occupation of the patients

Occupation	Frequency	Percentage
Housewife	18	45.0%
Service Holder	10	25.0%
Unemployed	1	2.5%
Driver	1	2.5%
Retired	10	25.0%
Total	40	100.00%

Table 4 shows the residence of the patients. Here, maximum patients (70%) were urban people. See the table below:

Table 4: Residence of the patients

Home Address	Frequency	Percentage
Rural	12	30.0%
Urban	28	70.0%
Total	40	100.00%

Figure 1 demonstrates that the largest percentage of male patients (42.50%) and female patients (40%) with ischemic stroke respectively. Other types of stroke shows in following figure.
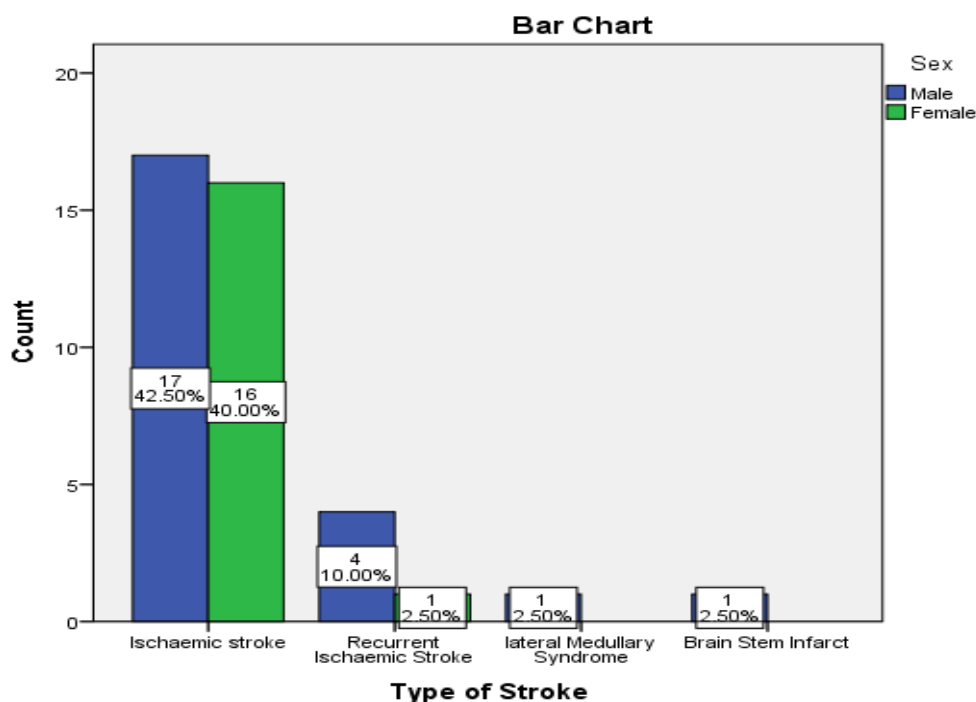
Figure 1: Type of stroke between patients

Ta

ble 5 shows that in our study, 52.5% patients had known case of diabetes. See the table below:

Table 5: Known Case of DM

DM	Frequency	Percentage
Yes	21	52.5%
No	19	47.5%
Total	40	100.0%

Figure 2 shows other co-morbidities of patients. Here, in our study maximum (57%) patients had hypertension. See the figure below:
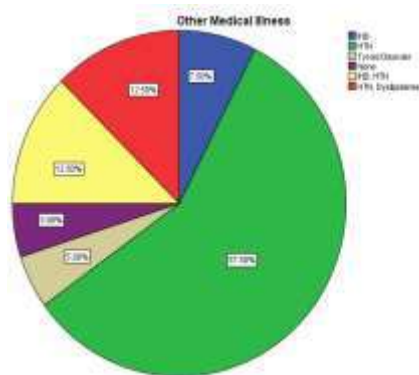

Figure 2: Pie chart showing other medical illness of patients

Table 6 shows the descriptive statistics of patients pulse, body weight and BMI. Here, mean pulse was 80.17 b/min, mean body weight was 59.463 kg and mean BMI was 22.08 kg/m^2. See the table below:

Table 6: Descriptive statistics showing patients pulse, body weight and BMI

Variables	N	Minimum	Maximum	Mean	Std. deviation
Pulse (b / min)	40	60	105	80.17	10.556
Body Weight (kg)	40	39.5	78.0	59.463	8.6613
BMI (Kg/m²)	40	16.79	28.33	22.0810	2.55822
Valid N (listwise)	40				

The descriptive data for patients that show the kind of medications they have are shown in **Table 7**. In this case, 7.5% of patients were insulin dependent and 27.5% were receiving oral medicines. See the table below-

Table 7: Descriptive Statistics showing patients type of medications

Variables	Frequency	Percentage
Diet	2	5.0%
Diet & Discipline	1	2.5%
galvus met 50/850 mg	1	2.5%
Herbal	1	2.5

Insulin	3	7.5
None	19	47.5
Oral	11	27.5
Oral, Insulin	2	5.0
Total	40	100.0

Figure 4 shows distribution of blood pressure of the patients. Here, maximum (17.50%) patients' blood pressure was 140/90. See the figure below-
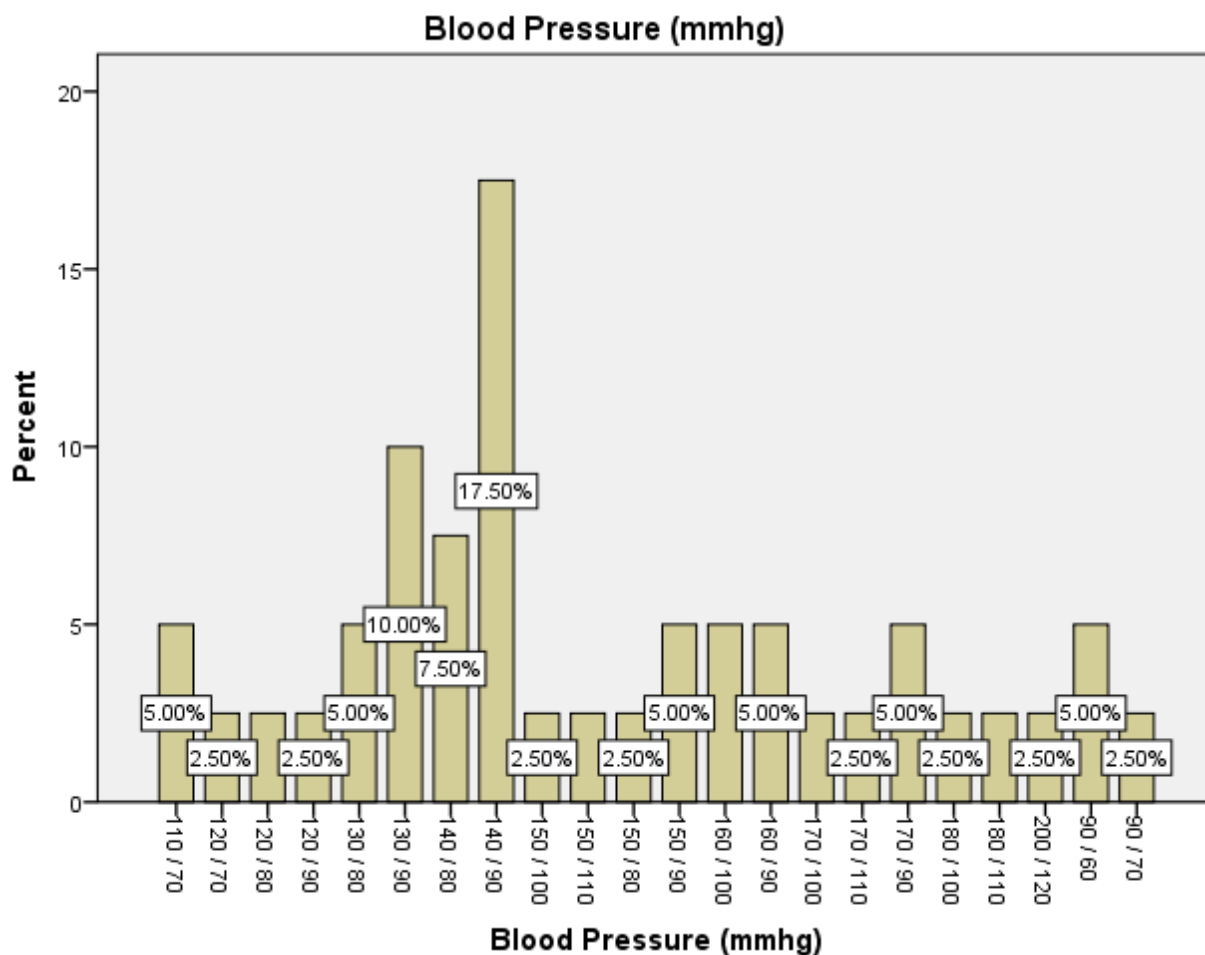

Figure 4: Bar chart showing distribution of patients' Blood pressure

The descriptive statistics for the patients' laboratory test results are shown in **Table 8**. In this instance, the mean values for G1 (mmol), HbA 1c (%), HDL (mg/dl), TG (mg/dl), TC, S. Creatinine (mg/dl), Na, K, Cl, and Hco3 were 8.961, 7.5800%, 35.945, 205.023, 185.854, 1.1450, 136.30, 12.8148, 102.57, and 24.62. See the table below-

Table 8: Descriptive statistics showing laboratory parameters of patients

Laboratory parameters	Minimum	Maximum	Mean	Std. Deviation
G1 (mmol)	4.0	17.8	8.961	3.7650

HbA 1c (%)	5.00%	13.70%	7.5800%	2.45401%
HDL (mg / dl)	21.0	59.0	35.945	9.1224
TG (mg / dl)	16.4	708.0	205.023	174.6730
TC	97.6	338.0	185.854	45.9987
S. Creatinine (mg / dl)	.52	5.10	1.1450	0.90259
Na	125	141	136.30	3.048
K	3.03	353.00	12.8148	55.16887
Cl	94	107	102.57	2.917
Hco3	22	26	24.62	1.102

Table 9 reveals that among the 15 patients who had stenosis along with additional comorbidities, hypertension was most common (60%) and diabetes was second (40%) in frequency. Patients with stenosis had a significant correlation between HTN and DM (p<.05.

Table 9: Prevalence of Stenosis as per comorbidities (N=15)

Types of comorbidities	Stenosis of duplex neck vessels (n)	Percent (%)	P value
Hypertension	9	60%	.001
DM	6	40%	.002
Total	15	100%	

Note: Chi square test <.05 considered as significant

The greatest 15.78% of the 19 patients with various forms of stenosis had RT CCA 31%-46%, and the same result was seen in LT ICA 37%-65% and RT ICA 25%-77%. The specific findings are displayed in table 9.

Table 9: Prevalence and Types of Stenosis of Duplex of neck vessels N=19

Duplex of neck vessels	Frequency	Percentage
RT CCA 31%-46%	3	15.78%
LT CCA 48%	1	5.26%
LT ICA 37%-65%	3	15.78%
RT ICA 25%-77%	3	15.78%
RT 90%	1	5.26%
RT carotid bulb 33%	2	10.52
LT bulb causing 28%	1	5.26%
Carotid vessels: RT side 22%	1	5.26%
Carotid vessels: LT side 19%	1	5.26%
RT DCA 42%-50%	1	5.26%
LT ICA 28%	1	5.26%

| LT bulb 58% | 1 | 5.26% |

[Multiple stenosis included]

DISCUSSION

The wide range of ECAS in human populations has been the subject of several published studies [13–15]. Chinese patients with ischemic stroke were more likely to have extracranial carotid disease (9-30%) than white patients with ischemic stroke (30-60%). Nineteen persons, or 47.5%, had stanosis. The top 15% also had the greatest RT CCA (31%-46%) and LT ICA (37%-65%) and RT ICA (25%-77%) reflect the similar pattern. This means that the rate of severe stenosis in our group is comparable to that seen in other studies [16]. This is consistent with the findings of two recent investigations on patients of Asian descent, which report a higher prevalence of ECAS in Japanese and Taiwanese stroke victims. Thus, it was demonstrated that in a more recent cohort of Japanese ischemic stroke patients (1989–1993), the prevalence of severe extracranial carotid artery stenosis was five times higher than in a cohort from 1963–1965. There may be a correlation between the rising prevalence of ECAS in our region and the increasing prosperity and westernization of its inhabitants. As a result of higher health expenditures and improved public health, hospitals in these nations are presenting and admitting patients with lower criteria. The availability of ECAS and the improvements in healthcare that have taken place in these nations over the previous two decades may also have played an influence. The increased incidence of extracranial cerebral artery stenosis may be attributable to a combination of these reasons.

Concurrent ECAS was predicted by the presence of diabetes, hypertension, and stroke in our sample population. This conclusion is supported by two other studies which show a significant correlation between these and severe carotid stenosis [17]. Patients with hemorrhagic strokes also tend to report more severe symptoms such as headache, vomiting, and loss of consciousness, which can lead to an overrepresentation of this kind of stroke in hospital-based series. Since patients with milder or temporary symptoms are more likely to be turned away by overloaded public hospitals or seek alternative medicine from acupuncturists and herbalists, this is especially significant in underdeveloped nations. Although there haven't been many research on cerebral vascular disease in Asian cultures, anecdotal evidence suggests that cerebral stenosis is at least twice as common as extracranial stenosis. This research should lead to a shift in how stroke patients are initially diagnosed. Examination of the extracranial carotid artery alone is unlikely to be sufficient to establish the etiology of the stroke since a stroke is a heterogeneous illness with numerous pathophysiologic origins. The severity of ECAS did not correlate with the patient's hypertension history [18]. Numerous research have made use of multivariate analysis, with varying degrees of success including both present and previous hypertension. Connecting systolic BP to disease risk in epidemiological research. Notably in the elderly, as a possible risk factor for cerebral infarction. ECAS was more common in younger persons because of male sex. Despite the fact that females have diminishing protection against cerebral infarction as they age, this study demonstrates that male sex is a distinct risk

factor for ECAS in the elderly. Studies employing multivariate analysis have not linked diabetes to ECAS, however prospective epidemiological research has linked diabetes to an elevated risk of cerebral infarction [17,11,16]. Moreover, there are a few problems with our study. The study's main shortcomings include its limited sample size and the potential for bias in participant selection.

CONCLUSION

Both hypertension and diabetes patients had a high stenosis prevalence. Among the co-occurring disorders, HTN had the strongest correlation. We found that the prevalence of severe ECAS is considerable in Bangladeshi patients with acute stroke. It is more common for patients to develop ECAS if they have a history of hypertension, diabetes, and stroke all at the same time. The findings from this study should inform future diagnostic approaches for those with an acute stroke. A more extensive study is recommended for this purpose.

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