

Metabolic profile of acute ischemic stroke patients in a tertiary care hospital

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ABSTRACT:

Background: When the blood supply to a portion of the brain is blocked or diminished, brain tissue cannot get oxygen and nutrients, resulting in an ischemic stroke. This study aimed to investigate the prevalence of hyperglycemia and dyslipidemia among patients with acute stroke in a tertiary healthcare setting in Bangladesh.

Methods: This cross-sectional study was conducted from January 2022 to December 2022 at a tertiary healthcare facility in Bangladesh, focusing on patients with acute ischemic stroke. Data was collected through a face-to-face interview, and medical records were reviewed. The study included 40 patients with acute stroke, evidenced by clinical findings and a CT scan of the Brain. Written informed consent was obtained after proper explanation, and participants were free to refuse or withdraw at any point. Confidentiality and privacy were maintained.

Results: The majority of participants (37.5%) were aged 60-69, with more males (57.5%) than females (42.5%). Most (70%) lived in urban areas. Among the participants, 82.5% had hypertension, and 52.5% had diabetes mellitus. The mean of HbA1c was 7.6% and of triglyceride was 205.0 mg/dl. Of the participants with acute stroke, 47.5% had extracranial carotid stenosis.

Conclusion: Nearly half of those who had an acute stroke also had diabetes, and four out of five had a history of hypertension. Among the patient hyperglycemia and dyslipidemia was common. Nearly half of those who suffered an acute stroke also experienced carotid stenosis. Consideration should be given to managing hypertension, DM, dyslipidemia, and carotid stenosis among patients with acute stroke.

Key Words:

DM, Hypertension, HbA1c, Dyslipidemia, Acute Stroke

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Introduction

Stroke is one of the leading causes of mortality and disability worldwide, accounting for approximately 5% of all disability-adjusted life-years and 10% of all deaths¹. Important risk factors in stroke patients include age, sex, smoking, hypertension, diabetes mellitus (DM), and hyperlipidemia².

Acute ischemic stroke risk is exacerbated by DM and related chronic hyperglycemia, which also results in a worsening clinical outcome and higher mortality³. Type 2 DM greatly raises the risk of first ischemic stroke and approximately doubles the risk of stroke; DM may be to blame for more than 8% of first ischemic strokes⁴.

Dyslipidemia is linked to increased risk of vascular events like stroke and monitoring triglyceride (TG) levels is crucial for patients at high risk of atherosclerotic cardiovascular disease⁵. TG is also a marker of increased residual cholesterol particles that trigger atherosclerosis and atherothrombosis⁶. One of the most frequent causes of stroke worldwide is atherosclerosis in major intracranial arteries, which results in alterations ranging from mild wall thickening to hemodynamically substantial luminal stenosis⁷.

Stroke was the leading cause of death in Bangladesh in the year 2019⁸. A nationwide survey revealed that the prevalence of stroke in Bangladesh was 11.39 per 1000 population⁹.

However, there is limited data on metabolic profile in acute stroke patients in the context of Bangladesh. This study is aimed to explore the metabolic profile in patients with acute stroke in a tertiary healthcare facility in Bangladesh.

Methodology

This is a descriptive cross-sectional study conducted in a tertiary healthcare facility in Bangladesh. This study purposively selected all the patients with confirmed clinical and radiological features of acute ischemic stroke attending the healthcare facility from January 2022 to December 2022. Data was collected through a face-to-face interview using a pre-tested, semi-structured, interviewer-administered questionnaire. Medical records were reviewed for confirmation of the stroke.

Initially, 46 patients of the adult age group presenting with clinical features of stroke were selected. After imaging, three patients were excluded from the study due to

high carotid bifurcation, which limited proper evaluation of the internal carotid artery, and due to extensive calcification of plaque, which interfered with imaging. Three more patients were excluded as their CT reports could not be collected. Ultimately a total of 40 patients with acute stroke were included in the study. Written informed consent was taken after a proper explanation of the purpose, procedure, and use of the study. The participants had the freedom to refuse to participate or withdraw at any point from the study. Confidentiality and privacy were maintained, giving maximum priority.

Statistical analysis

Variables were descriptively expressed by frequency, percentage, mean±standard deviation where applicable. For the variable of age in years, the closest integer value was used. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared and then categorized into four groups: for an adult of ≥20 years of age, underweight (<18.5 kg/m²), normal (18.5-24.9 kg/m²), overweight (25-29.9 kg/m²), obese (≥30 kg/m²)¹⁰. The 25th version of the Statistical Package for Social Science for Windows was used for analysis.

Results

The descriptive cross-sectional study was conducted from January 2022 to December 2022 in a tertiary healthcare facility in Bangladesh among 40 participants with clinically and radiologically confirmed acute stroke.

Table 1: Socio-demographic characteristics of the participants (N=40)

Variables	Frequency	Percentage
Age		
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
Sex		
Male	23	57.5
Female	17	42.5
Occupation		
Housewife	17	42.5
Employed	11	27.5
Retired	12	30.0
Residence		
Rural	12	30.0
Urban	28	70.0

Table 1 reveals that the highest proportion (37.5%) of participants belonged to the 60-69 years of age group. More were male (57.5%) than female (42.5%). The majority (70%) were living in the urban area.

Table 2: Distribution of co-morbidities among the participants (N=40)

Variables	Frequency	Percentage (%)
History of Diabetes mellitus (DM)	21	52.5
History of Ischemic heart disease	8	20.0
History of Hypertension (HTN)	33	82.5
History of thyroid disorder	2	5.0
History of dyslipidemia	5	12.5
History of both DM and HTN	22	55

Table 2 shows different co-morbidities related to stroke among the participants, which revealed that 82.5% of the participants had a history of hypertension, 52.5% had a history of DM, and 20.0% had a history of ischemic heart disease.

Table 3: Pulse, body mass index and other laboratory parameters of the participants (N=40)

Variables	Minimum	Maximum	Mean	p-value
Pulse (b/min)	60.0	105.0	80.2	0.29
Body mass index (Kg/m ²)	16.79	28.3	22.1	0.25
Random blood sugar (mmol)	4.0	17.8	8.7	0.33
HbA1c (%)	5.0	13.7	7.6	0.27
High density lipoprotein (mg/dl)	21.0	59.0	35.9	0.24
Low density lipoprotein (mg/dl)	55	230	115.3	0.25
Triglyceride (mg/dl)	16.4	708.0	205.0	0.24
Total cholesterol (mg/dl)	97.6	338.0	185.9	0.24
S. Creatinine (mg/dl)	0.52	5.1	1.1	0.25
Sodium (mmol/l)	125.0	141.0	136.3	0.33
Potassium (mmol/l)	3.0	353.0	12.8	0.25
Bicarbonate (mmol/l)	22.0	26.0	24.6	0.39

Table 3 describes that among the participants, the mean of random blood sugar was 8.9 mmol, and HbA1c was 7.6%, both of which indicate DM. The mean of triglyceride was 205.0 mg/dl, and potassium was 12.8 mmol/l.

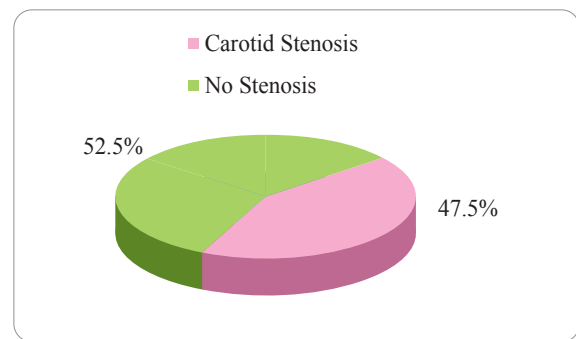


Figure 1: Proportion of carotid stenosis among participants with acute stroke (N=40)

Figure 1 depicts that 47.5% of the participants with acute stroke had developed carotid stenosis of any type.

Discussion

This cross-sectional study was performed in a tertiary healthcare facility among 40 participants with acute stroke attending the facility from January 2022 to December 2022. This study found that most (37.5%) of the participants were of the 60-69 years of age group. Most of the strokes occur in persons aged ≥ 65 years¹¹. It is evident that after age 55, the risk of having a stroke doubles approximately every decade¹². Prevention strategies and policies in Bangladesh should be formulated, giving attention to this age group as a similar finding was observed in this current study.

This study observed that 52.5% of patient with ischemic stroke had a history of DM and the mean of random blood sugar was 8.9 mmol, HbA1c was 7.6%. A study in Qatar reported a similar finding among patients with acute ischemic stroke, which found that 57.2% had DM where the recorded mean random blood sugar during admission was 9.7 mmol, and HbA1c was 7.4%¹³. Another study in Pakistan reported 48.1% of the participants as having DM¹⁴. The DM percentages are higher than that reported in European heart journal which stated that 30% of people with ischemic stroke have DM¹⁵. This discrepancy between Asian and European patient may be due to difference in their diet, physical activity and other lifestyle behaviors¹⁶.

This study explored the history of hypertension among the participants and observed that the majority (82.5%) had a history of hypertension. Such higher rates were also observed in other studies, such as in the USA (87.1%)¹⁷, in China (83.1%)¹⁸, and in Paraguay (78%)¹⁹.

The current study found that 20.0% of the acute ischemic stroke patient had a history of ischemic heart disease. A similar finding was reported in a study in India which found the overall 17.7% of the stroke patient had a history of ischemic heart disease²⁰. A lower rate was observed in Qatar which reported that 9.5% of patient with ischemic stroke was previously diagnosed with ischemic heart disease¹³. In this study more than fifty percent (55%) patients of ischemic stroke had both DM and HTN. One epidemiological study in Japan showed that approximately 50% of diabetic patients had hypertension, and approximately 20% of hypertensive patients had diabetes mellitus²¹. Adequate control of blood pressure in patients with diabetes improves the cardiovascular disease risk, particularly for stroke. In the UKPDS, for combined fatal and nonfatal stroke, tight BP control (mean BP achieved 144/82 mm Hg) resulted in 44% RR reduction compared with less aggressive control (mean BP achieved 154/87 mm Hg)²².

This study investigated the triglyceride level of the participants and found that the mean triglyceride level was a bit higher than that of the normal value. The normal value of the triglyceride in healthy individuals was <150 mg/dl²³. This finding is supported by the American heart association, which states that high triglycerides might expose individuals to an increased risk for stroke²⁴.

One of the most important findings of this study was that among the participants with acute stroke, 47.5% had carotid stenosis. Similar results were observed in India in 2019, where they found 46% of the participants with acute stroke had carotid stenosis²⁵, and in the Netherlands which was 52.3%²⁶. But a lower rate was observed in another study in the Netherlands, where the proportion was 18.7%²⁷, and the United Kingdom was 19.0%²⁸. The differences could be due to the fact that this current study was cross-sectional, where the studies with dissimilarity were cohort studies. Also, individual, lifestyle and other health risk factors might have contributed to it. It's important to note that one of the recruited patients had an underweight body mass index of 16.79 kg/m². whose ischemic stroke was preceded by a history of IHD.

This study had some limitations. As this was conducted in a tertiary healthcare facility, the results were not generalized. This study did not explore other risk factors like smoking, physical inactivity and dietary habits. As

sedentary lifestyle including lack of physical activities and unhealthy dietary habit has long been evidenced to be associated with DM, HTN, dyslipidemia which influence the incidence and outcome of ischemic stroke. This study also found a higher percentage of stroke among the patients with DM and HTN. It is recommended to counsel on lifestyle modification along with clinical management.

Conclusion

This study on acute ischemic stroke showed that more than 80% of patients exhibited medical record of hypertension, either with or without comorbid diabetes mellitus (DM), with close to 50% presenting with DM. Approximately 50% of those diagnosed with acute stroke had varying forms of carotid stenosis. Patients with acute stroke should receive particular emphasis on the treatment of conditions such as diabetes mellitus (DM), dyslipidemia, hypertension, and carotid stenosis. A well-maintained blood pressure and appropriate glyce-mic control might have the potential to provide enhanced preventive measures against stroke and other associated problems.

Conflict of Interest: None

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