ISSN (Print): 2617-0817 ISSN (Online): 2789-5912

Original Article

The Association of Ischemic Stroke after Myocardial Infarction in Bangladesh

DOI: dx.doi.org

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Received: 08 Aug 2022
Accepted: 13 Aug 2022
Published: 15 Aug 2022

Published by:
Sher-E-Bangla Medical College, Barishal

ABSTRACT

Background: *While most of the complications from a myocardial infarction can be adequately managed, thus leading to reduced mortality, stroke following a myocardial infarction remains a challenge even today, and can lead to potentially devastating complications.* ***Objective:*** *In this study our main goal is to evaluate the association of ischemic stroke after myocardial infarction.* ***Method:*** *This cross-sectional study was carried out at tertiary medical hospital. A total of 100 patients who approximately 31- to 74-year-old inhabitants, case subjects with a stroke within 1 month after an MI were included in the study. Where during evaluation, patients who had STEMI without Stroke were included in group A, n=50, and patients who had STEMI with Stroke were included in group B, n=50.* ***Results:*** *During the study, most of the patients belong to >61age group, 44% and 60% were male. patients who developed stroke during their hospitalization were more likely to have atrial fibrillation (18% vs 12%), chronic or acute heart failure (65% vs 60%), chronic renal failure (11% vs 5%), prior history of cerebrovascular accident (CVA) (9% vs 5%), diabetes mellitus (35% vs 23%), carotid artery (7% vs 4%) and aortic artery disease(7% vs 5%), CABG during hospitalization (10% vs 7%), and use of mechanical circulatory support (18% vs 9%), compared to those with no ischemic stroke. Besides this, Compared to patients without strokes, those with ischemic stroke were more likely to have higher in-hospital mortality (27% Vs 7%, $p < 0.001$) in univariate analysis and multivariate analyses and more likely to have higher in-hospital complications that eventually lead to increase mortality. Moreover, apart from age, having atrial Fibrillation, diabetes, history of CVA, heart failure, carotid disease and chronic renal failure were significantly associated with ischemic stroke in patients.* ***Conclusion:*** *The incidence of ischemic stroke following STEMI in the Bangladesh is getting higher over the study period, with increase of in-hospital mortality.*

Keywords: *ST-elevation myocardial infarction (STEMI), ischemic stroke, Mortality*

(The Planet 2022; 6(1): 38-43)

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INTRODUCTION

Stroke, whether hemorrhagic or non-hemorrhagic (ischemic), is one of the main causes of death and disability globally. Although modern pharmacological and mechanical therapies after a myocardial infarction (MI) have improved survival, stroke remains a devastating consequence of ST-elevation MI (STEMI) or non-ST-elevation acute coronary syndrome (NSTE-ACS), with a mortality rate of up to 60% at one year. [1-3]

Ischemic stroke can result in 10–20% mortality, while hemorrhagic stroke can result in significantly greater mortality.[4] Patients with stroke after a MI had higher in-hospital and long-term mortality, with in-hospital mortality of 30%, more immediate and severe impairments, and higher residual deficits at 6 months when compared to a matched sample of stroke patients without a prior MI. A recent community-based research [5] of stroke incidence following a MI found a 44-fold increase in risk of stroke during the first month, with the risk remaining even three years later. [5]

In this study our main goal is to evaluate the association of ischemic stroke after myocardialinfraction.

OBJECTIVE

- To assess the association of ischemic stroke after myocardial infraction.

METHODOLOGY

This cross-sectional study was carried out at tertiary medical hospital. A total of 100 patients who approximately 31- to 74-year-old inhabitants, case subjects with a stroke within 1 month after an MI were included in the study. Where during evaluation, patients who had STEMI without Stroke were included in group A, n=50, and patients who had STEMI with Stroke were included in group B, n=50. After getting consent from participants, demographic and other laboratory data were monitored in all patients.

Statistical analysis was performed using IBM SPSS Statistics 26, and figures were constructed using GraphPad Prism 8. Continuous variables are expressed as mean ± standard deviation, and categorical variables are expressed as count (percentages).

RESULTS

In table-1 shows age distribution of the patients where most of the patients belongs to >61age group, 44%. Followed by 21% belong to 41-50 years, 25% belong to 51-60 years and 10% belong to 31-40 years.

The following table is given below in detail:

Table-1: Age distribution of the patients

Age group	%
31-40	10%
41-50	21%
51-60	25%
>61	44%

In figure-1 shows gender distribution of the patients whereout of 100 patients 60% were male and 40% were female. The following figure is given below in detail:

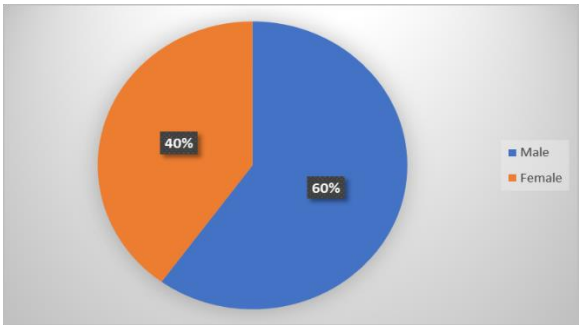

Figure-1: Gender distribution in the patients.

In table-2 shows comorbidity of the patients In univariate analyses, patients who developed stroke during their hospitalization were more likely to have atrial fibrillation (18% vs 12%), chronic or acute heart failure (65% vs 60%), chronic renal failure (11% vs 5%), prior history of

cerebrovascular accident (CVA) (9% vs 5%), diabetes mellitus (35% vs 23%), carotid artery (7% vs 4%) and aortic artery disease(7% vs 5%), CABG during hospitalization (10% vs 7%), and use of mechanical circulatory support (18% vs 9%). Compared to those with no ischemic stroke, patients with ischemic stroke were less likely to have prior CABG or PCIs, and less likely to have PCI during hospitalization. The following table is given below in detail:

Table-2: Co-morbidity of the patients in univariate analyses

Comorbidity	STEMI without Stroke	STEMI withStroke
Obesity	10%	15%
Dyslipidemia	35%	40%
Hypertension	50%	55%
Diabetes	23%	35%
History of Coronary artery disease	60%	65%
Chronic renal failure	5%	11%
Acute/chronic DVT/PE	2%	5%
Atrial Fibrillation	12%	18%
Coronary angiography	62%	67%
History of CVA	5%	9%
Aortic disease	5%	7%
Carotid Artery disease	4%	7%
Alcohol abuse and smoking status	11%	10%
Prior CABG	7%	10%
Prior PCIs	4%	5%
Mechanical circulatory support	9%	18%

In table-3 shows in-hospital Outcomes in Patients with ST Elevation Myocardial Infarction where compared to patients without strokes, those with ischemic stroke were more likely to have higher in-hospital mortality (27% Vs 7%, $p < 0.001$) in univariate analysis and multivariate analyses and and more likely to have higher in-hospital complications that eventually lead to increase mortality. The following table is given below in detail:

Table-3: In-hospital Outcomes in Patients with ST Elevation Myocardial Infarction

In-hospital Outcomes in Patients	STEMI without Stroke	STEMI with Stroke	P value
Cerebral Hemorrhage	0.4%	12.0%	<0.001
Acute renal failure	8%	27%	<0.001
Gastrointestinal bleed	3%	10%	<0.001
Cardiogenic shock	7%	19%	<0.001
In-Hospital cardiac arrest	2%	5%	<0.001
Mortality	7%	27%	<0.001
Mechanical ventilation	6%	21%	<0.001

Non-invasive ventilation (BIPAP/CPAP)	0.7%	2.2%	<0.001
Tracheostomy	0.5%	4.9%	<0.001
Palliative Care consult	1.0%	5.7%	<0.001
Length of hospital stay, mean (±SE)	0.03	0.23	<0.001

In table-4 shows association of Select Factors with Acute in hospital ischemic stroke in patients admitted with ST Elevation Myocardial Infarction. Where apart from age, having atrial Fibrillation, diabetes, history of CVA, heart failure, carotid disease and chronic renal failure were significantly associated with ischemic stroke in patients. The following table is given below in detail:

Table-4: Association of Select Factors with Acute in hospital ischemic stroke in patients

Factors	Unadjusted	P Value	Adjusted	P Value
Age	1.038 (1.037–1.041)	<0.001	1.019 (1.015–1.021)	<0.001
Atrial Fibrillation	2.91 (2.73–3.12)	<0.001	1.76 (1.65–1.91)	<0.001
Diabetes	1.27 (1.21–1.37)	<0.001	1.24 (1.17–1.34)	<0.001
Hypertension	0.97 (0.92–1.04)	0.53	1.00 (0.94–1.07)	0.94
History of CVA	2.27 (2.02–2.53)	<0.001	1.51 (1.33–1.69)	<0.001
Heart failure	2.54 (2.39–2.71)	<0.001	1.30 (1.21–1.41)	<0.001
DVT/PE	4.13 (3.52–4.81)	<0.001	2.49 (2.10–2.93)	<0.001
Aortic disease	2.31 (1.79–3.02)	<0.001	1.47 (1.11–1.98)	0.008
Carotid Artery disease	7.65 (6.73–8.68)	<0.001	6.17 (5.33–7.11)	<0.001
Chronic Renal Failure	1.95 (1.78–2.15)	<0.001	1.23 (1.10–1.35)	<0.001

DISCUSSION

Post PCI studies reported a slight increase in the incidence of ischemic stroke following myocardial infarction. This is because PCI can slightly increases immediate post-procedure risk due to procedure complexity and possible manipulation of arterial atherosclerosis plaques.[6-7]

The implications of our study's findings are the identification of in-hospital mortality risk factors for patients with STEMI who subsequently develop stroke. These risk factors included advanced age, male gender, in-hospital shock (cardiogenic and septic), respiratory failure, acute renal failure, pulmonary embolism, and in-hospital cardiac arrest. Lower mortality was noted in patients who had PCI for STEMI. Modifiable in-hospital mortality risk factors included shock, acute renal failure, pulmonary embolism, respiratory failure and cardiac arrest, which were all more similar to other studies. [8-10]

Besides that, another study reported that, along with AF, prior stroke, age >75, , peripheral vascular disease, diabetes, hypertension, any frailty, and no aspirin on discharge are independent predictors of an ischemic stroke. [11]

Moreover, other study also noted that, advanced Killip class (class II or above), AF/flutter (new or chronic) and cardiac

procedures (cardiac catheterizations and coronary artery bypass graft surgery – CABG) have also been found to be in-hospital predictors of ischemic stroke.[12]
Which again supported to our study where we found that, patients who developed stroke during their hospitalization were more likely to have atrial fibrillation (18% vs 12%), chronic or acute heart failure (65% vs 60%), chronic renal failure (11% vs 5%), prior history of cerebrovascular accident (CVA) (9% vs 5%), diabetes mellitus (35% vs 23%), carotid artery (7% vs 4%) and aortic artery disease(7% vs 5%), CABG during hospitalization (10% vs 7%), and use of mechanical circulatory support (18% vs 9%). Compared to those with no ischemic stroke, patients with ischemic stroke were less likely to have prior CABG or PCIs, and less likely to have PCI during hospitalization.
Our findings call for more aggressive patient care strategies in order to improve their survival. Interventions should include adequate hydration and precautions to lower rates of contrast induced or shock induced renal failure, aggressive aseptic precautions to minimize the incidence of sepsis and septic shock, appropriate deep venous thrombosis prevention for critically ill patients, and possibly creating multi-disciplinary approach for treating high risk population (elderly, male, respiratory failure and shock patients) by cooperation between interventional cardiology, critical care, heart failure, neurology and nephrology teams to optimize healthcare delivery and reach the best possible outcome.[13]

CONCLUSION

The incidence of ischemic stroke following STEMI in the Bangladesh is getting higher over the study period, with increase of in-hospital mortality. Further efforts are needed to provide superior level of care for those at high risk for developing stroke, and proactive modulation of risk factors that increase in hospital mortality are of paramount importance to achieve higher survival rates.

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