Section: Medicine

Original Research Article

PREDICTING MYOCARDIAL INFARCTION RISK IN CEREBROVASCULAR ACCIDENT PATIENTS USING CT CORONARY ANGIOGRAPHY

Anterpreet Kaur[1], Saurabh Singhal[2], Sachin Agrawal[3], Aakash Arora[4], Shirobhi Sharma[5]

[1]*Assistant Professor, Department of Medicine, Subharti Medical College, Meerut, Uttar Pradesh, India.*
[2]*Professor and Head of Department, Department of Medicine, Subharti Medical College, Meerut, Uttar Pradesh, India.*
[3]*Professor, Department of Radiology, Subharti Medical College, Meerut, Uttar Pradesh, India.*
[4]*Junior resident, Department of Medicine, Subharti Medical College, Meerut, Uttar Pradesh, India.*
[5]*Professor, Department of Medicine, Subharti Medical College, Meerut, Uttar Pradesh, India.*

Received *: 21/03/2026*
Received in revised form *: 26/04/2026*
Accepted *: 13/05/2026*

Corresponding Author:
Dr. Aakash Arora,
Junior Resident, Department of Medicine, Subharti Medical College, Meerut, Uttar Pradesh, India..
Email: aakasharora7121997@@gmail.com

DOI: 10.70034/ijmedph.2026.2.467

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (2); 2830-2835

ABSTRACT

Background: Cerebrovascular accident and coronary artery disease are interrelated manifestations of systemic atherosclerosis that frequently coexist because of shared cardiovascular risk factors. Stroke patients may harbor asymptomatic coronary artery disease, increasing the likelihood of future myocardial infarction. CT coronary angiography (CCTA) enables non-invasive evaluation of coronary artery stenosis and plaque characteristics, thereby assisting in cardiovascular risk stratification. The objective is to assess the prevalence of coronary artery stenosis using CT coronary angiography in stroke patients and to evaluate the association between coronary artery stenosis severity, stroke severity, and predicted myocardial infarction risk.

Materials and Methods: A hospital-based cross-sectional study was conducted among 60 patients with acute ischemic stroke. Demographic details, cardiovascular risk factors, laboratory parameters, and NIHSS-based stroke severity were recorded. All participants underwent CT coronary angiography for assessment of coronary artery involvement, stenosis severity, vessel disease pattern, plaque morphology, and high-risk plaque features. Statistical analysis was performed using descriptive and inferential methods.

Results: Dyslipidemia (73.3%) and hypertension (68.3%) were the most common risk factors. Moderate stroke severity was observed in 45.0% of patients, while moderate coronary stenosis was noted in 38.3%. Significant association was observed between NIHSS severity and coronary stenosis ($p<0.001$). Severe stenosis demonstrated strong association with high predicted myocardial infarction risk in 95.2% of cases. Combined severe NIHSS and severe stenosis were predominantly associated with high MI risk (90.9%). Triple vessel disease and mixed plaque morphology were frequently observed among patients with severe coronary involvement.

Conclusion: Increasing stroke severity was significantly associated with worsening coronary artery stenosis and higher predicted myocardial infarction risk. CT coronary angiography demonstrated important value in detecting subclinical coronary artery disease and identifying high-risk cardiovascular profiles in patients with cerebrovascular accident.

Keywords: Cerebrovascular accident; Coronary artery disease; CT coronary angiography; Myocardial infarction risk; NIHSS; Coronary stenosis.

INTRODUCTION

Cerebrovascular accident (CVA) and coronary artery disease (CAD) frequently coexist because both arise from progressive systemic atherosclerotic changes affecting multiple vascular territories. Structural vascular injury, lipid accumulation, endothelial dysfunction, and chronic inflammatory activity

contribute to plaque formation within cerebral and coronary circulation. Patients presenting with ischemic stroke often possess clinically silent coronary artery involvement, which may substantially increase the likelihood of future myocardial infarction and other major adverse cardiovascular events.[1] Contemporary coronary computed tomography angiography (CCTA) enables non-invasive visualization of coronary lumen narrowing, plaque distribution, and adverse plaque characteristics that may indicate heightened cardiovascular risk.[2,3]

Cardiovascular and cerebrovascular disorders remain major causes of morbidity and mortality worldwide. In India, rising prevalence of hypertension, diabetes mellitus, dyslipidemia, tobacco exposure, obesity, and sedentary behavior has significantly increased the burden of both stroke and coronary artery disease, particularly among middle-aged individuals from semi-urban and Tier II populations.[4,5] Previous investigations have demonstrated that incorporation of coronary artery calcium scoring, plaque quantification, and imaging-derived cardiovascular markers improves prediction of obstructive coronary artery disease compared with conventional clinical risk assessment alone.[6,7]

Recent developments in cardiac CT imaging have expanded the ability to identify morphologic and functional plaque features associated with future coronary events. Parameters such as low-attenuation plaque burden, plaque progression, vascular remodeling, and pericoronary adipose tissue alterations have shown important associations with myocardial infarction risk and acute coronary syndromes.[8,9] In addition, advanced CCTA-based assessment incorporating artificial intelligence and machine learning techniques has enhanced precision in evaluating plaque burden, stenosis severity, and long-term cardiovascular prognosis.[10,11]

Despite growing international evidence regarding the prognostic role of CCTA, limited Indian studies have examined coronary artery stenosis patterns among stroke patients, especially in Tier II healthcare settings where cardiovascular risk factors are commonly underdiagnosed or inadequately controlled. Furthermore, available literature provides insufficient data regarding the relationship between neurological severity and coronary artery disease severity in predicting myocardial infarction risk.[12] Therefore, the present study was undertaken to evaluate coronary artery stenosis using CT coronary angiography and determine its association with stroke severity in predicting myocardial infarction risk among patients with cerebrovascular accident.

MATERIALS AND METHODS

Study Design: The present study was conducted as a hospital-based cross-sectional observational study.

Study Population: Patients attending the Medicine Outpatient Department and Emergency Department with clinical features suggestive of acute ischemic stroke were screened for eligibility.

Inclusion Criteria:

Patients aged ≥18 years with acute ischemic stroke confirmed by neuroimaging, having a Modified Rankin Scale score <5, and presenting within 10 days of symptom onset were included after obtaining written informed consent.

Exclusion Criteria:

Pregnant women; patients with nonvascular illnesses associated with life expectancy <30 months; thyroid disorders; hyperaldosteronism; tuberculosis; bronchial asthma; chronic obstructive pulmonary disease; chronic kidney disease; chronic liver disease; malignancy; and patients with cerebral infarction secondary to arterial dissection or revascularization procedures were excluded.

Data Collection: Demographic details, clinical history, cardiovascular risk factors, laboratory parameters, and stroke severity were recorded using a structured proforma. Stroke severity was assessed using the National Institutes of Health Stroke Scale (NIHSS).

CT Coronary Angiography: All eligible participants underwent CT coronary angiography (CCTA) for assessment of coronary artery involvement, degree of stenosis, vessel disease pattern, plaque morphology, and high-risk plaque features.

Statistical Analysis: Data were analyzed using appropriate statistical software. Descriptive statistics were applied for demographic and clinical variables. Univariate and multivariate analyses were performed to evaluate associations between coronary artery stenosis severity, stroke severity, plaque characteristics, and predicted myocardial infarction risk. Statistical significance was considered at $p<0.05$.

Ethical Considerations: The study was conducted after obtaining informed written consent from all participants. Patient confidentiality, safety, and ethical principles were maintained throughout the study.

RESULTS

[Table 1] demonstrates the distribution of clinical risk factors among the study participants. Dyslipidemia was the most prevalent risk factor, observed in 73.3% of participants, followed by hypertension in 68.3% and smoking in 58.3%. Diabetes mellitus was present in 48.3% of cases, while alcohol consumption was reported by 45.0% of participants. Overall, a high burden of conventional cardiovascular risk factors was noted in the study population.

[Table 2] shows the distribution of stroke severity based on NIHSS among the study participants. Moderate stroke severity was the most common presentation, observed in 45.0% of patients, followed closely by severe stroke in 40.0%. Mild stroke was noted in 15.0% of cases. Overall, the majority of participants presented with moderate to severe neurological impairment at the time of evaluation.

Table 1: Distribution of Clinical Risk Factors (n = 60)

Risk Factor	Present n (%)	Absent n (%)
Hypertension	41 (68.3)	19 (31.7)
Diabetes	29 (48.3)	31 (51.7)
Dyslipidemia	44 (73.3)	16 (26.7)
Smoking	35 (58.3)	25 (41.7)
Alcohol	27 (45.0)	33 (55.0)

Table 2: Distribution of Stroke Severity Based on NIHSS (n = 60)

NIHSS Category	Frequency (n)	Percentage (%)
Mild	9	15.0
Moderate	27	45.0
Severe	24	40.0
Total	60	100.0
Statistical test: Descriptive statistics		

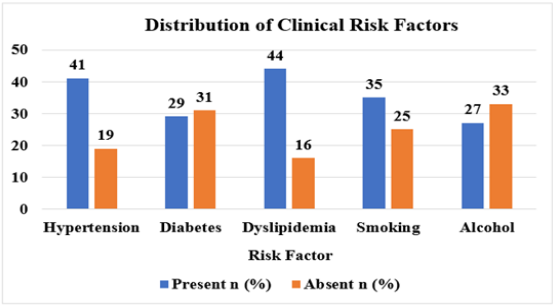

Figure 1: Distribution of Clinical Risk Factors

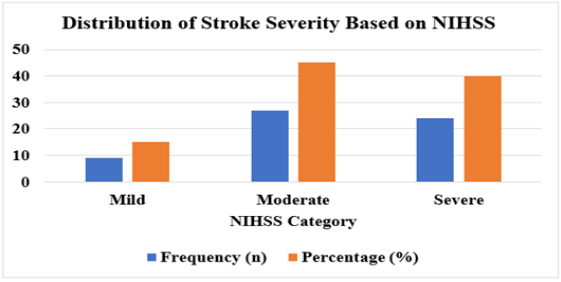

Figure 2: Distribution of Stroke Severity Based on NIHSS

Table 3: Distribution of Degree of Coronary Stenosis (n = 60)

Stenosis Category	Frequency (n)	Percentage (%)
Mild	16	26.7
Moderate	23	38.3
Severe	21	35.0
Total	60	100.0

[Table 3] depicts the distribution of coronary artery stenosis severity among the study participants assessed using CT coronary angiography. Moderate stenosis was the most frequently observed category, accounting for 38.3% of cases, followed by severe stenosis in 35.0% and mild stenosis in 26.7%. Overall, a substantial proportion of patients demonstrated moderate to severe coronary artery narrowing.

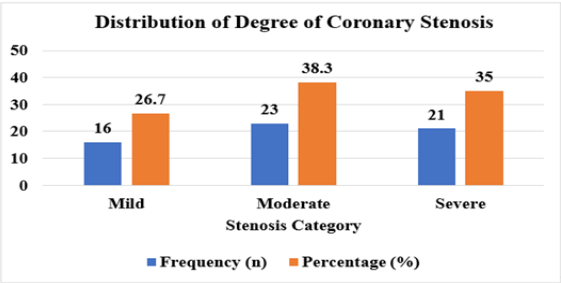

Figure 3: Distribution of Degree of Coronary Stenosis

[Table 4] demonstrates the association between NIHSS severity and degree of coronary stenosis among the study participants. Mild stroke cases were predominantly associated with mild stenosis, whereas moderate stroke severity showed higher frequency with moderate stenosis. Severe stroke was mainly observed in patients with severe coronary stenosis. The association was statistically highly significant ($p<0.001$), indicating a direct relationship between increasing neurological severity and worsening coronary artery narrowing.

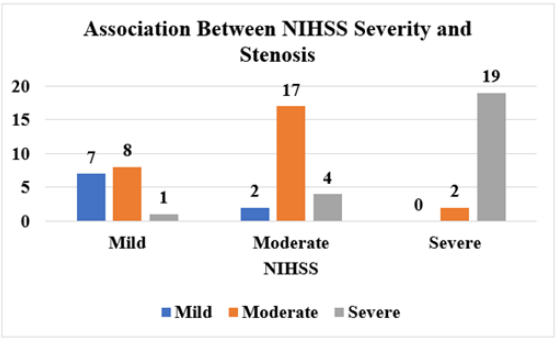

Figure 4: Association Between NIHSS Severity and Stenosis.

Table 4: Association Between NIHSS Severity and Stenosis (n = 60)

NIHSS	Mild	Moderate	Severe	Total	p-value
Mild	7	2	0	9	<0.001
Moderate	8	17	2	27	
Severe	1	4	19	24	
Total	16	23	21	60	

Table 5: Association Between Stenosis and MI Risk (n = 60)

Stenosis	Low	Moderate	High	Total	p-value
Mild	14	2	0	16	<0.001
Moderate	2	18	3	23	
Severe	0	1	20	21	
Total	16	21	23	60	

Table 6: Combined Effect of NIHSS and Stenosis on MI Risk (n = 60)

Combined Category	Low	Moderate	High	Total	p-value
Mild + Mild	8	1	0	9	<0.001
Moderate + Moderate	6	18	3	27	
Severe + Severe	0	2	20	22	
Total	16	21	23	60	

[Table 5] illustrates the association between coronary artery stenosis severity and predicted myocardial infarction (MI) risk among the study participants. Mild stenosis was predominantly associated with low MI risk, whereas moderate stenosis was mainly linked with moderate risk. Severe stenosis demonstrated a strong association with high MI risk. The relationship was statistically highly significant ($p<0.001$), indicating that increasing stenosis severity was associated with progressively higher predicted risk of myocardial infarction.

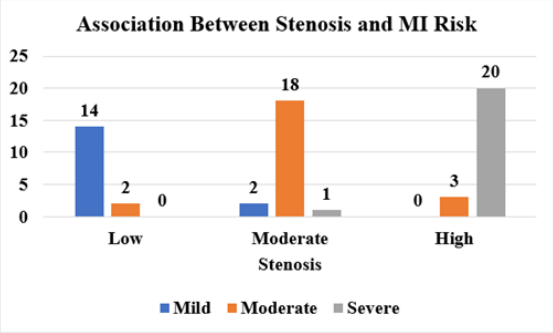

Figure 5: Association Between Stenosis and MI Risk

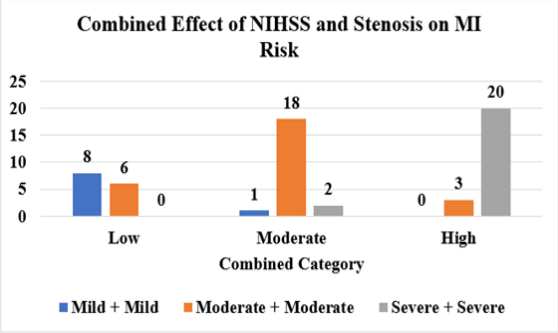

Figure 6: Combined Effect of NIHSS and Stenosis on MI Risk

[Table 6] demonstrates the combined effect of stroke severity and coronary artery stenosis on predicted myocardial infarction (MI) risk. Participants with mild NIHSS and mild stenosis were predominantly categorized under low MI risk, whereas moderate NIHSS with moderate stenosis was mainly associated with moderate risk. Severe NIHSS combined with severe stenosis showed a strong association with high MI risk. The association was statistically highly significant ($p<0.001$).

DISCUSSION

The distribution of clinical risk factors showed that dyslipidemia was the most common risk factor, present in 44 participants (73.3%), followed by hypertension in 41 patients (68.3%), smoking in 35 patients (58.3%), and diabetes mellitus in 29 patients (48.3%). Similar findings were reported by Yoon et al. (2020),[1] who observed that hypertension, diabetes, and lipid abnormalities were strongly associated with adverse cardiovascular outcomes in ischemic stroke patients. Commandeur et al,[4] (2020) also demonstrated that integration of lipid profile abnormalities and clinical risk variables significantly improved cardiovascular risk prediction. Al'Aref et al,[6] (2020) identified hypertension and diabetes as major predictors of obstructive coronary artery disease. In contrast, Chen et al,[3] (2023) focused predominantly on plaque radiomics and vulnerable plaque assessment rather than conventional cardiovascular risk factor prevalence.

The distribution of stroke severity based on NIHSS demonstrated that moderate stroke was the most common category, affecting 27 patients (45.0%), followed by severe stroke in 24 patients (40.0%), while mild stroke was observed in 9 patients (15.0%). Similar observations were described by Yoon et al. (2020),[1] who reported that patients with greater neurological impairment demonstrated higher cardiovascular risk and increased coronary artery disease burden. Lee et al,[8] (2019) also found that severe ischemic presentations were associated with high-risk plaque characteristics and significant coronary abnormalities. Wang et al,[9] (2022) reported that progressive plaque burden and stenosis severity were associated with clinically severe cardiovascular states. In contrast, Lin et al,[7] (2021) primarily emphasized artificial intelligence–based cardiovascular imaging without detailed neurological severity categorization.

The distribution of coronary artery stenosis revealed that moderate stenosis was the most common finding, observed in 23 participants (38.3%), followed by severe stenosis in 21 participants (35.0%), while mild stenosis was noted in 16 participants (26.7%). Similar findings were reported by Yoon et al,[1] (2020) who observed that increasing stenosis severity on coronary CT angiography was associated with higher cardiovascular event risk in ischemic stroke patients.

Williams et al,[2] (2020) demonstrated that obstructive coronary artery disease and greater plaque burden significantly increased future myocardial infarction risk. Lin et al,[5] (2022) also reported that higher plaque volume and stenosis severity independently predicted adverse cardiac outcomes. In contrast, Emfietzoglou et al,[10] (2022) focused more on overall imaging-based cardiovascular risk stratification rather than categorical stenosis distribution.

The association between NIHSS severity and coronary artery stenosis showed that mild stroke was predominantly associated with mild stenosis in 7 of 9 patients (77.8%), whereas severe stroke was mainly associated with severe stenosis in 19 of 24 patients (79.2%) with significant association ($p<0.001$). Similar findings were reported by Yoon et al,[1] (2020) who observed that increasing neurological severity and plaque burden were associated with higher cardiovascular event risk. Lin et al,[5] (2022) also demonstrated that greater plaque volume and stenosis severity predicted adverse cardiac outcomes. Lee et al,[8] (2019) reported that severe stenotic lesions with adverse plaque characteristics were strongly associated with ischemic cardiovascular events.

The association between coronary artery stenosis and myocardial infarction risk demonstrated that mild stenosis was mainly associated with low MI risk in 14 of 16 patients (87.5%), while severe stenosis showed strong association with high MI risk in 20 of 21 patients (95.2%) with significant association ($p<0.001$). Similar observations were reported by Williams et al,[2] (2020) who found that higher low-attenuation plaque burden and obstructive coronary disease significantly increased myocardial infarction risk. Tzolos et al,[12] (2022) also demonstrated that increased plaque burden independently predicted future MI events. Lin et al,[5] (2022) similarly reported higher adverse cardiac outcomes with increasing stenosis severity.

The combined effect of NIHSS severity and coronary stenosis on myocardial infarction risk showed that mild NIHSS with mild stenosis was predominantly associated with low MI risk in 8 of 9 patients (88.9%), whereas severe NIHSS with severe stenosis was strongly associated with high MI risk in 20 of 22 patients (90.9%) with significant association ($p<0.001$). Similar findings were observed by Yoon et al. (2020),[1] who demonstrated increased cardiovascular event risk with severe stroke and high-risk coronary plaque burden. Commandeur et al. (2020),[4] also reported improved MI prediction using combined imaging and clinical variables. Antonopoulos et al,[11] (2022) highlighted the importance of integrated cardiovascular risk stratification using multiple imaging parameters.

CONCLUSION

The findings demonstrated a significant relationship between neurological severity, coronary artery stenosis, and predicted myocardial infarction risk among patients with cerebrovascular accident. Increasing NIHSS severity was consistently associated with greater coronary artery narrowing and higher cardiovascular risk profiles, supporting the concept of shared systemic atherosclerotic involvement affecting both cerebral and coronary circulation. Patients with severe stenosis and advanced neurological impairment exhibited markedly higher predicted MI risk, indicating that coronary artery disease burden substantially influences cardiovascular prognosis in stroke populations. The observations also highlighted the clinical utility of CT coronary angiography in identifying occult coronary pathology, plaque severity, and high-risk cardiovascular status at an early stage. Collectively, these results support the study hypothesis that greater coronary artery blockage severity is associated with increased myocardial infarction risk in patients with cerebrovascular accident and emphasize the importance of integrated cerebrovascular and coronary risk assessment for improved prognostic stratification and preventive management.

REFERENCES

1. Yoon SH, Kim E, Jeon Y, Yi SY, Bae HJ, Jang IK, Lee JM, Yoo SM, White CS, Chun EJ. Prognostic value of coronary CT angiography for predicting poor cardiac outcome in stroke patients without known cardiac disease or chest pain: the assessment of coronary artery disease in stroke patients study. Korean journal of radiology. 2020 Jul 6;21(9):1055.
2. Williams MC, Kwiecinski J, Doris M, McElhinney P, D'Souza MS, Cadet S, Adamson PD, Moss AJ, Alam S, Hunter A, Shah AS. Low-attenuation noncalcified plaque on coronary computed tomography angiography predicts myocardial infarction: results from the multicenter SCOT-HEART trial (Scottish Computed Tomography of the HEART). Circulation. 2020 May 5;141(18):1452-62.
3. Chen Q, Pan T, Wang YN, Schoepf UJ, Bidwell SL, Qiao H, Feng Y, Xu C, Xu H, Xie G, Gao X. A coronary CT angiography radiomics model to identify vulnerable plaque and predict cardiovascular events. Radiology. 2023 Feb 14;307(2):e221693.
4. Commandeur F, Slomka PJ, Goeller M, Chen X, Cadet S, Razipour A, McElhinney P, Gransar H, Cantu S, Miller RJ, Rozanski A. Machine learning to predict the long-term risk of myocardial infarction and cardiac death based on clinical risk, coronary calcium, and epicardial adipose tissue: a prospective study. Cardiovascular research. 2020 Dec 1;116(14):2216-25.
5. Lin A, Manral N, McElhinney P, Killekar A, Matsumoto H, Kwiecinski J, Pieszko K, Razipour A, Grodecki K, Park C, Otaki Y. Deep learning-enabled coronary CT angiography for plaque and stenosis quantification and cardiac risk prediction: an international multicentre study. The Lancet Digital Health. 2022 Apr 1;4(4):e256-65.
6. Al'Aref SJ, Maliakal G, Singh G, van Rosendael AR, Ma X, Xu Z, Alawamlh OA, Lee B, Pandey M, Achenbach S, Al-Mallah MH. Machine learning of clinical variables and coronary artery calcium scoring for the prediction of obstructive coronary artery disease on coronary computed tomography angiography: analysis from the CONFIRM registry. European heart journal. 2020 Jan 14;41(3):359-67.
7. Lin A, Kolossváry M, Motwani M, Išgum I, Maurovich-Horvat P, Slomka PJ, Dey D. Artificial intelligence in cardiovascular imaging for risk stratification in coronary artery disease. Radiology: Cardiothoracic Imaging. 2021 Feb 25;3(1):e200512.

8. Lee JM, Choi G, Koo BK, Hwang D, Park J, Zhang J, Kim KJ, Tong Y, Kim HJ, Grady L, Doh JH. Identification of high-risk plaques destined to cause acute coronary syndrome using coronary computed tomographic angiography and computational fluid dynamics. Cardiovascular Imaging. 2019 Jun 1;12(6):1032-43.
9. Wang Y, Chen H, Sun T, Li A, Wang S, Zhang J, Li S, Zhang Z, Zhu D, Wang X, Cao F. Risk predicting for acute coronary syndrome based on machine learning model with kinetic plaque features from serial coronary computed tomography angiography. European Heart Journal-Cardiovascular Imaging. 2022 Jun 1;23(6):800-10.
10. Emfietzoglou M, Mavrogiannis MC, Samaras A, Rampidis GP, Giannakoulas G, Kampaktsis PN. The role of cardiac computed tomography in predicting adverse coronary events. Frontiers in Cardiovascular Medicine. 2022 Jul 15;9:920119.
11. Antonopoulos AS, Angelopoulos A, Tsioufis K, Antoniades C, Tousoulis D. Cardiovascular risk stratification by coronary computed tomography angiography imaging: current state-of-the-art. European journal of preventive cardiology. 2022 Mar 1;29(4):608-24.
12. Tzolos E, Williams MC, McElhinney P, Lin A, Grodecki K, Flores Tomasino G, Cadet S, Kwiecinski J, Doris M, Adamson PD, Moss AJ. Pericoronary adipose tissue attenuation, low-attenuation plaque burden, and 5-year risk of myocardial infarction. Cardiovascular Imaging. 2022 Jun 1;15(6):1078-88.