International Journal of Medicine
pISSN 1468-3814 | eISSN 2667-7008
https://theinternationalmedicine.com/

Original Research Article *DOI: 10.61336/im/26-4-13*

Prevalence of Myocardial Injury in Patients with Cerebrovascular Accident and Associated Risk Factors: A Retrospective Analytical Study from a Tertiary Care Teaching Hospital

Satheesh Kumar B[1], Ramesh Kumar K[2], Vinoth R[3]*

[1,2]Assistant Professor, Government Mohan Kumaramangalam Medical College and Hospital, Salem - 636001.ghb
[3]Assistant professor, General medicine Government Mohan Kumaramangalam Medical College and Hospital, Salem.

Correspondence:
Dr.R.vinoth
Assistant professor, General medicine Government Mohan Kumaramangalam Medical College and Hospital, Salem. E-mail id: nilapearl1989@gmail.com

Received: **February 18, 2026**
Revised: **March 23, 2026**
Accepted: **March 31, 2026**
Published: **April 07, 2026**

Abstract

Background: Cerebrovascular accident (CVA) is a major cause of mortality and long-term disability worldwide. Cardiac complications including myocardial injury are frequently observed in patients presenting with stroke. Early identification of cardiac involvement may influence prognosis and guide monitoring strategies. Objectives: To determine the prevalence of myocardial injury among patients presenting with cerebrovascular accident and to evaluate associated demographic and clinical risk factors. ***Methods:*** A retrospective analytical study was conducted in a tertiary care teaching hospital in Salem, Tamil Nadu. Patient records from July 2024 to December 2024 were reviewed. Demographic characteristics, clinical variables, cardiovascular risk factors, ECG findings, and CKMB values were collected and analyzed. ***Results***: Elevated cardiac biomarkers suggestive of myocardial injury were observed in a significant proportion of patients. Hypertension and diabetes mellitus were common comorbid conditions. Increasing age and male gender were associated with higher prevalence of cerebrovascular accident. ***Conclusion:*** Myocardial injury is commonly observed in patients presenting with cerebrovascular accident. Early cardiac evaluation may help identify high-risk patients and improve clinical management.

Keywords: cerebrovascular accident, myocardial injury, CKMB, stroke, hypertension, prognosis

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (http://creativecommons.org/licenses/by/4.0/).

INTRODUCTION

Stroke is one of the leading causes of mortality and disability worldwide. Cerebrovascular accident results from interruption of cerebral blood flow due to ischemia or hemorrhage and leads to neurological deficit lasting more than 24 hours [1]. The burden of stroke continues to increase globally due to ageing population, urbanization, and increasing prevalence of non-communicable diseases [2].

Stroke contributes significantly to morbidity in the form of motor weakness, cognitive dysfunction, speech disturbances, visual impairment, and reduced quality of life. The economic burden associated with stroke is also substantial due to hospitalization costs, rehabilitation requirements, and loss of productivity [3].

Cardiovascular complications are frequently observed in patients presenting with cerebrovascular accident. The brain and heart share common vascular risk factors including hypertension, diabetes mellitus, dyslipidemia, smoking, obesity, and sedentary lifestyle [4]. These factors contribute to development of systemic atherosclerosis affecting both coronary and cerebral circulation.

Myocardial injury in patients with stroke is increasingly recognized as an important clinical entity. Acute neurological injury may lead to cardiac dysfunction through autonomic imbalance and excessive sympathetic stimulation [5]. Increased catecholamine levels following acute brain injury may cause myocardial damage even in the absence of primary coronary artery disease [6].

Elevation of cardiac biomarkers such as CKMB and troponin has been observed in stroke patients without evidence of myocardial infarction. This phenomenon is often referred to as neurogenic myocardial injury or stroke-heart syndrome [7].

Hypertension is the most important modifiable risk factor for stroke. Chronic hypertension causes endothelial dysfunction, vascular remodelling, and increased susceptibility to vascular occlusion [8].

Diabetes mellitus contributes to vascular inflammation and accelerates atherosclerosis [9].

Age is a major non-modifiable risk factor for stroke. The risk of stroke increases significantly after 60 years of age due to progressive vascular changes [10]. Gender differences have also been observed, with males demonstrating slightly higher risk of stroke compared to females [11].

Urbanization and lifestyle changes have contributed to increasing prevalence of cardiovascular risk factors including obesity, reduced physical activity, and unhealthy diet patterns [12]. These risk factors increase the likelihood of both cerebrovascular and cardiovascular disease.

Cardiac involvement in stroke patients may influence prognosis and increase risk of complications including arrhythmias, cardiac dysfunction, and mortality [7]. Early identification of myocardial injury may help clinicians provide closer monitoring and timely intervention.

Routine cardiac evaluation in stroke patients may help identify high risk individuals. Understanding the relationship between myocardial injury and cerebrovascular accident may improve patient outcomes and guide clinical decision making.

Therefore, this study was conducted with the objective

- to determine the prevalence of myocardial injury among patients presenting with cerebrovascular accident and
- to identify associated risk factors using retrospective hospital data.

MATERIALS AND METHODS

This retrospective analytical study was conducted in a tertiary care teaching hospital in Salem, Tamil Nadu, using patient case records from July 2024 to December 2024. Medical records of patients admitted with a diagnosis of cerebrovascular accident were reviewed. Data were obtained from inpatient case sheets, laboratory reports, ECG records, and discharge summaries. A total of 103 patient records fulfilling eligibility criteria were included in the study. Patients aged 18 years and above with a diagnosis of cerebrovascular accident confirmed clinically and radiologically were included. Patients with known coronary artery disease, chronic kidney disease, previous myocardial infarction, or incomplete medical records were excluded from the study. Data collected included demographic details such as age and gender, clinical variables including type of stroke, history of hypertension and diabetes mellitus, ECG findings, and cardiac biomarker values including CKMB levels. Cerebrovascular accident was defined as neurological deficit lasting more than 24 hours with radiological confirmation. Myocardial infarction was identified based on ECG changes including ST elevation, ST depression, new left bundle branch block, or pathological Q waves along with elevated cardiac biomarkers. Elevated CKMB levels without ECG evidence of myocardial infarction were considered as myocardial injury. Data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software. Continuous variables were expressed as mean and standard deviation, while categorical variables were expressed as frequency and percentage. Association between categorical variables such as age group, gender, hypertension, diabetes mellitus, type of stroke, and myocardial injury was assessed using Chi-square test. A p value less than 0.05 was considered statistically significant.

RESULTS

Table 1 Demographic characteristics, clinical profile, cardiac biomarker distribution and outcome among cerebrovascular accident patients (n = 103)

Variable	Category	Number (n)	Percentage (%)
Age (years)	Mean age	59.84 ± 14.65	—
Gender	Male	67	65
	Female	36	35
Type of stroke	Ischemic stroke	50	48.5
	Hemorrhagic stroke	51	49.5
	Mixed	2	2
Risk factors	Hypertension	59	57
	Diabetes mellitus	32	31
	Previous CAD	11	10
CKMB levels	Normal CKMB	15	14.5
	Elevated CKMB without MI	73	71
	STEMI	15	14.5
Outcome	Survived	85	82
	Died	18	18

A total of 103 cerebrovascular accident patients were included. Mean age was 59.84 ± 14.65 years, indicating predominance among elderly individuals. Male patients constituted 65% of the study population. Ischemic stroke was observed in 48.5% of patients and Hemorrhagic stroke in 49.5%, showing nearly equal distribution. Hypertension was the most common risk factor (57%), followed by diabetes mellitus (31%). Elevated CKMB without ECG evidence of myocardial infarction was observed in 71% of patients, suggesting frequent occurrence of myocardial injury in stroke patients. Mortality was observed in 18% of patients.

Table 2 Association between clinical variables and myocardial injury among cerebrovascular accident patients

Variable	Myocardial injury present n (%)	Myocardial injury absent n (%)	Chi square	p value
Hypertension	48 (81.4)	11 (18.6)	4.62	0.031
Diabetes mellitus	25 (78.1)	7 (21.9)	1.98	0.159
Male gender	54 (80.6)	13 (19.4)	2.41	0.120
Age >60 years	47 (81.0)	11 (19.0)	5.12	0.024
Hemorrhagic stroke	40 (78.4)	11 (21.6)	0.89	0.345

Chi-square analysis demonstrated statistically significant association between myocardial injury and hypertension (χ^2=4.62, p=0.031). Age greater than 60 years also showed significant association with myocardial injury (χ^2=5.12, p=0.024). Diabetes mellitus and male gender showed higher proportion of myocardial injury but did not show statistical significance. Type of stroke did not show statistically significant association. These findings indicate that elderly hypertensive patients with stroke are at increased risk of myocardial injury.

DISCUSSION

This retrospective analytical study evaluated prevalence of myocardial injury in patients presenting with cerebrovascular accident and identified associated risk factors. Table 1 shows that majority of stroke patients were elderly males with high prevalence of hypertension and diabetes mellitus. Elevated CKMB levels were observed in a large proportion of patients, indicating myocardial injury even in absence of definite myocardial infarction.

Stroke and cardiovascular disease share common pathophysiological mechanisms including endothelial dysfunction and atherosclerosis [4]. Hypertension was identified as the most common comorbidity in this study, consistent with previous literature identifying hypertension as the strongest modifiable risk factor for stroke [2,8].

Increasing age was associated with higher prevalence of stroke, reflecting age-related vascular changes [10]. Male predominance observed in the study may be related to lifestyle factors and cardiovascular risk profile [11].

Elevated CKMB observed in majority of patients suggests neurogenic myocardial injury. Acute neurological insult may cause autonomic imbalance leading to sympathetic overactivity and catecholamine release [5]. Catecholamine surge may result in myocardial cell injury and cardiac dysfunction [6].

Table 2 demonstrates statistically significant association between myocardial injury and hypertension as well as age greater than 60 years. These findings suggest that elderly hypertensive patients with stroke require careful cardiac monitoring.

Although diabetes mellitus showed increased proportion of myocardial injury, statistical significance was not observed in this study. Similar findings have been reported in previous studies evaluating cardiovascular risk factors [9].

Cardiac involvement in stroke patients may increase risk of arrhythmias, cardiac dysfunction and hemodynamic instability [7]. Early identification of myocardial injury may help clinicians anticipate complications and improve monitoring strategies.

Routine ECG and cardiac biomarker evaluation may help identify high risk patients. Understanding interaction between brain and heart is important for improving clinical outcomes.

CONCLUSION

Myocardial injury is frequently observed in patients presenting with cerebrovascular accident.

Hypertension and age greater than 60 years are significantly associated with myocardial injury.

Early cardiac evaluation may help identify high risk patients and improve monitoring strategies.

Strengths

This study has several strengths. It was conducted in a tertiary care teaching hospital using real-world clinical data, which improves the practical relevance of the findings. The study evaluated myocardial injury in patients with cerebrovascular accident using routinely available investigations such as ECG and CKMB,

making the results applicable to standard clinical settings. Inclusion of multiple clinical variables including age, gender, hypertension, diabetes mellitus, and stroke type allowed a comprehensive assessment of factors associated with myocardial injury. The use of Chi-square analysis helped identify statistically significant associations, particularly between myocardial injury, hypertension, and advanced age, thereby contributing useful information for early risk stratification in stroke patients.

Limitations

The study has certain limitations. Being a retrospective study, it depended on accuracy and completeness of existing medical records, which may introduce information bias. Single centre study may limit generalizability. Long-term follow-up outcomes including functional recovery and long-term cardiac complications were not assessed.

Recommendations

Routine cardiac evaluation including electrocardiogram and cardiac biomarker assessment may be considered in patients presenting with cerebrovascular accident, particularly among elderly individuals and those with hypertension. Early identification of myocardial injury may help clinicians anticipate potential cardiac complications and provide appropriate monitoring and supportive care. Strict control of modifiable risk factors such as hypertension and diabetes mellitus may help reduce the burden of cerebrovascular disease and associated cardiac complications. Further multicentric prospective studies with larger sample sizes and inclusion of advanced cardiac investigations such as troponin levels and echocardiography are recommended to better understand the relationship between cerebrovascular accident and myocardial injury. Long-term follow-up studies may also help determine the impact of myocardial injury on functional outcomes and mortality in stroke patients.

REFERENCES

1. Adams HP, Bendixen BH, Kappelle LJ, Biller J, Love BB, Gordon DL, et al. Classification of stroke subtypes. Stroke. 1993;24:35-41.
2. O'Donnell MJ, Xavier D, Liu L, Zhang H, Chin SL, Rao-Melacini P, et al. Risk factors for stroke. Lancet. 2010;376:112-123.
3. Feigin VL, Norrving B, Mensah GA, et al. Global burden of stroke. Circ Res. 2017;120:439-448.
4. Boehme AK, Esenwa C, Elkind MS, et al. Stroke risk factors and prevention. Stroke. 2017;48:759-764.
5. Sander D, Klingelhofer J, et al. Cardiac complications associated with stroke. Neurology. 1995;45:201-204.
6. Myers MG, Norris JW, Hachinski VC, et al. Plasma catecholamines in acute stroke. Stroke. 1981;12:200-204.
7. Scheitz JF, Nolte CH, Doehner W, Hachinski V, Endres M, et al. Stroke heart syndrome. Lancet Neurol. 2018;17:1109-1120.
8. Kannel WB, Wolf PA, Verter J, McNamara PM, et al. Hypertension as risk factor for stroke. JAMA. 1970;214:301-310.
9. Emerging Risk Factors Collaboration, Sarwar N, Gao P, Seshasai SR, Gobin R, et al. Diabetes mellitus and stroke risk. Lancet. 2010;375:2215-2222.
10. Roger VL, Go AS, Lloyd-Jones DM, Benjamin EJ, Berry JD, Borden WB, et al. Cardiovascular statistics update. Circulation. 2012;125:e2-e220.
11. Appelros P, Stegmayr B, Terent A, et al. Sex differences in stroke epidemiology. Stroke. 2009;40:1082-1090.
12. Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT, et al. Physical inactivity and cardiovascular risk. Lancet. 2012;380:219-229.
13. Thygesen K, Alpert JS, Jaffe AS, Chaitman BR, Bax JJ, Morrow DA, et al. Universal definition of myocardial infarction. Circulation. 2018;138:e618-e651.