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Original Research Article

Mean platelet volume in acute ischemic stroke: a hospital-based cross-sectional study

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ABSTRACT

Background: Platelet activation is a key mechanism underlying acute ischaemic stroke. Mean platelet volume (MPV), routinely reported in complete blood counts, reflects platelet size and functional activity and has been proposed as a marker of thrombotic tendency.
Methods: This hospital-based cross-sectional study enrolled adults with neuroimaging-confirmed acute ischaemic stroke admitted to a district hospital in Karnataka, India. Clinical characteristics, vascular risk factors, laboratory indices including MPV, and stroke severity measured by the National Institutes of Health Stroke Scale (NIHSS) were documented and analysed.
Results: Among 134 patients studied, males accounted for 89 (66.4%), and the largest age group was 56-65 years, 51 (38.1%). Hypertension was present in 101 (75.4%), diabetes mellitus in 80 (59.7%), smoking in 60 (44.8%), alcohol use in 54 (40.3%), and coronary artery disease in 48 (35.8%). MPV values were significantly elevated in patients with these risk factors and showed a positive correlation with NIHSS score.
Conclusions: Increased MPV is associated with acute ischaemic stroke and with greater neurological severity. MPV may be a simple and economical adjunct marker for early risk stratification.

Keywords: Deranged lipid profile, Ischemic stroke, Mean platelet volume, Stroke severity, Thrombosis

INTRODUCTION

Stroke continues to be a major contributor to mortality and long-term neurological disability worldwide, with ischaemic events constituting the majority of cases.[1] The impact is particularly pronounced in developing nations, including India. Early identification of laboratory markers linked to stroke severity could improve prognostic assessment and guide clinical management.[2] Platelet activation plays a fundamental role in the formation of arterial thrombi after endothelial injury and is central to the development of ischaemic stroke.[3] Mean platelet volume represents an indirect measure of platelet reactivity because larger platelets contain more dense granules, exhibit greater metabolic activity, and generate higher levels of thromboxane A_2.[4] Elevated MPV has been associated with several atherothrombotic conditions, including acute coronary syndromes and cerebrovascular disease.[5,6] However, data from Indian cohorts examining the relationship between MPV, stroke severity, and vascular risk factors remain limited. The present study was undertaken to explore these associations in patients with acute ischaemic stroke

METHODS

Study design and setting

This observational cross-sectional study was carried out in the Department of General Medicine at District Hospital Bagalkot, Karnataka, India, over an 11-month period from August 2023 to June 2024. Ethical approval was obtained from the Institutional Ethics Committee (IRB No.: DHD/DNB/01/2024/25). Written informed consent was secured from all participants or their authorized representatives prior to enrolment.

Study population

Adults aged 18 years or older presenting with first-ever acute ischaemic stroke confirmed by CT or MRI brain and admitted within 72 hours of symptom onset were consecutively recruited. Patients were excluded if they had intracranial haemorrhage, known haematological or platelet disorders, active infection or inflammatory conditions, recent major surgery or trauma (within three months), malignancy, chronic liver disease, or prior use of antiplatelet medication.

Data collection

Demographic details and clinical variables-including age, sex, hypertension, diabetes mellitus, smoking status, alcohol intake, dyslipidaemia, and history of coronary artery disease-were recorded using a standardized data sheet. Venous blood was sampled at admission under aseptic precautions and analysed on an automated haematology analyser to obtain complete blood count parameters, including MPV. Neurological deficit at presentation was quantified using the National Institutes of Health Stroke Scale (NIHSS), a validated 15-item clinical scoring system ranging from 0 to 42, where higher scores denote more severe impairment, as originally described by Brott et al The patient selection pathway is depicted in Figure 1.[7]

Statistical analysis

Data were entered into Microsoft Excel and processed using SPSS version 29. Continuous variables were summarized as mean ± standard deviation, whereas categorical variables were expressed as number and percentage. Group differences were assessed using Student's t-test or chi-square test as appropriate. The association between MPV and NIHSS score was evaluated using Pearson's correlation coefficient. Statistical significance was defined as $p<0.05$.

Flowchart depicting patient selection, inclusion and exclusion criteria, data collection, and analysis process in the study evaluating mean platelet volume in acute ischaemic stroke.

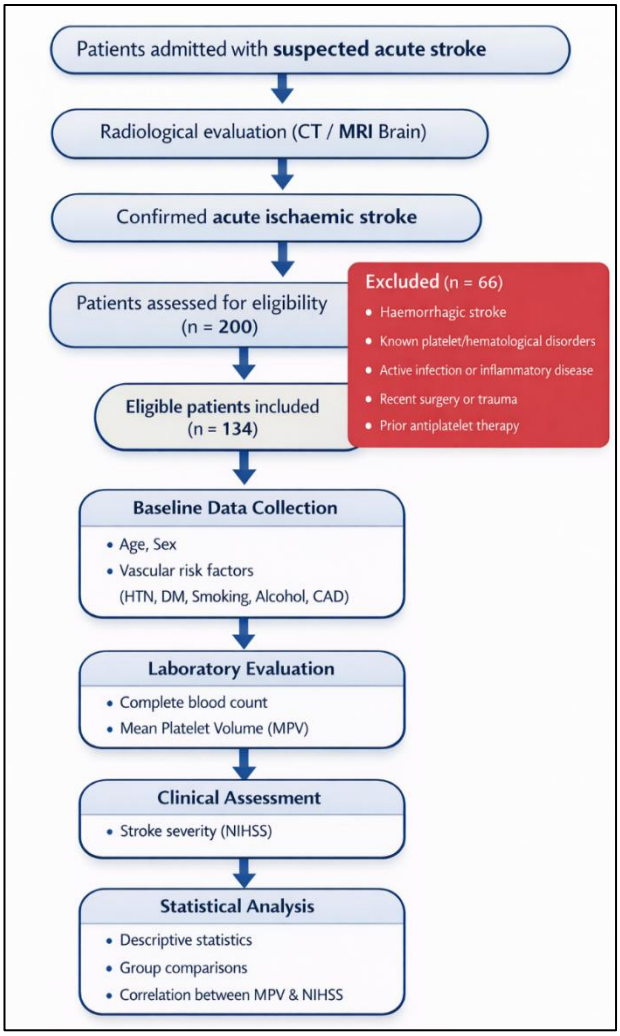

Figure 1: Study flow diagram.

RESULTS

A total of 134 patients with acute ischaemic stroke were included in the analysis. The predominant age category was 56-65 years, comprising 51 (38.1%) patients, while males represented 89 (66.4%) of the cohort. Hypertension was the most frequent risk factor, identified in 101 (75.4%) patients, followed by diabetes mellitus in 80 (59.7%), smoking in 60 (44.8%), alcohol consumption in 54 (40.3%), and coronary artery disease in 48 (35.8%) (Figure 2) (Table 1). MPV values were significantly higher in male patients compared with females ($p<0.05$).

Similarly, individuals with hypertension, diabetes mellitus, smoking history, alcohol use, and coronary artery disease demonstrated significantly elevated MPV levels on Student's t-test analysis ($p<0.05$ for all comparisons). The association between MPV and stroke severity is illustrated in Figures 3 and 4. Pearson correlation analysis revealed a moderate positive correlation between MPV and NIHSS score ($r=0.42$, $p<0.001$), indicating that increasing platelet volume was associated with more severe neurological deficit.

Table 1: Demographic characteristics of patients with acute ischaemic stroke (n=134).

Characteristic	N	%
Age group (years)		
18–45	12	9.0
46–55	28	20.9
56–65	51	38.1
66–75	31	23.1
>75	12	9.0
Sex		
Male	89	66.4
Female	45	33.6
Total	134	100.0

Distribution of patients by age group and sex. The 56–65-year age group was most prevalent, and males comprised the majority of the cohort.

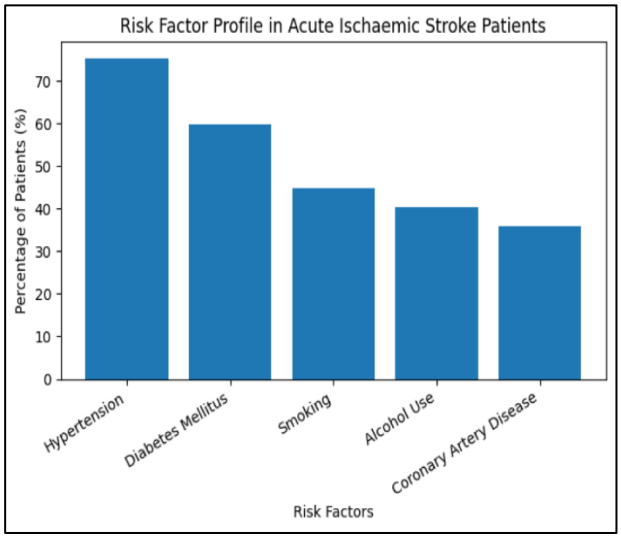

Figure 2: Risk profile in acute ischemic stroke patients.

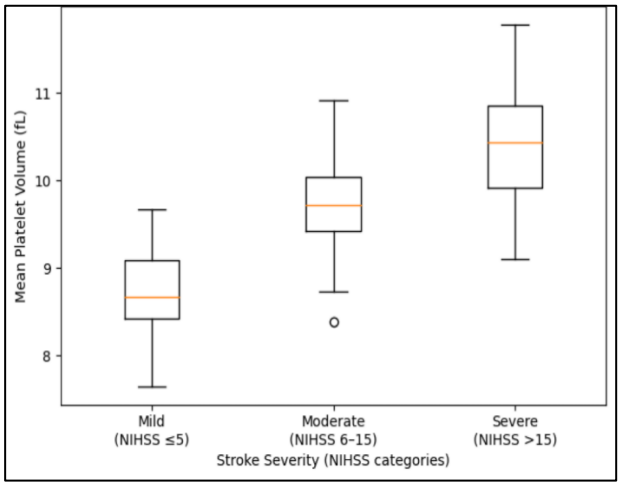

Figure 3: Mean platelet volume across stroke severity categories.

Distribution of major vascular risk factors among patients with acute ischaemic stroke. Hypertension was the most prevalent risk factor, followed by diabetes mellitus, smoking, alcohol use, and coronary artery disease (Figure 2). Box-and-whisker plot demonstrating mean platelet volume (MPV) across National Institutes of Health Stroke Scale (NIHSS) severity categories. Median MPV values increase with rising stroke severity, indicating an association between platelet size and neurological deficit.

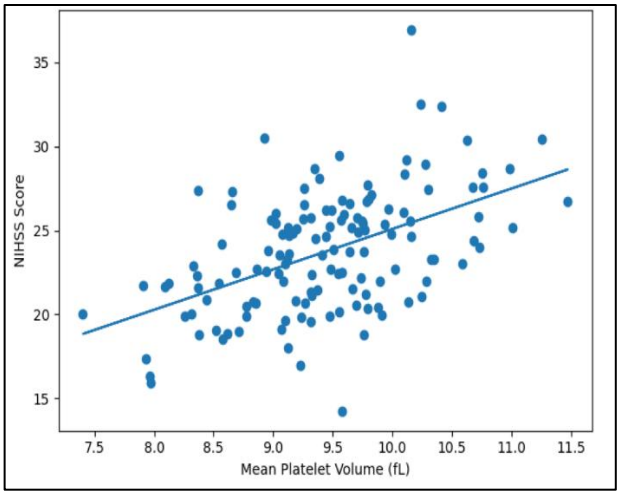

Figure 4: Correlation between mean platelet volume and stroke severity (NIHSS).

Scatter plot showing the correlation between MPV and stroke severity as assessed by the NIHSS. A positive linear relationship is observed, indicating higher MPV values with increasing stroke severity.

DISCUSSION

The findings of the present study demonstrate a clear relationship between increased MPV and acute ischaemic stroke, with higher MPV values observed among patients with more severe neurological impairment and a greater burden of vascular risk factors. These results reinforce the concept that platelet size and activity are closely linked to the pathobiology of ischaemic cerebrovascular events. Platelets are central mediators of arterial thrombosis following endothelial disruption or plaque rupture.[3] Larger platelets exhibit enhanced enzymatic activity and increased production of prothrombotic substances such as thromboxane A_2, which may amplify thrombus formation.[4] Prior studies, including those by O'Malley et al and Greisenegger et al, have reported similar elevations in MPV among patients with acute ischaemic stroke, supporting the biological plausibility of our observations.[5,8]

In the current cohort, elevated MPV was also associated with established vascular risk factors including hypertension, diabetes, smoking, alcohol use, and coronary artery disease. These conditions are known to

promote endothelial dysfunction and heightened platelet reactivity. Previous cardiovascular investigations have likewise demonstrated associations between increased MPV and adverse atherosclerotic profiles.[9-12] An important observation in this study is the positive correlation between MPV and NIHSS score at presentation. Patients with more severe strokes tended to have higher MPV values, suggesting that increased platelet reactivity may contribute to larger thrombus burden and more extensive cerebral injury. Comparable findings have been described in earlier stroke populations.[5,13,14] From a clinical perspective, MPV is appealing because it is inexpensive, rapidly available, and routinely included in standard haematology reports. Its use alongside established clinical tools may enhance early risk stratification, particularly in settings with limited resources. Nevertheless, variability in laboratory measurement and the absence of universally accepted threshold values remain important limitations.[6]

Limitations

This study has several limitations. The cross-sectional design does not allow causal inference, and MPV was measured only once at admission without serial monitoring. As a single-centre study, the generalizability of the findings may be restricted. Potential confounding factors, including inflammatory markers and preanalytical influences on MPV, were not comprehensively evaluated. Furthermore, stroke subtypes and long-term functional outcomes were not assessed. Multicentric prospective studies are required to validate these findings.

CONCLUSION

The present study shows that MPV is elevated in patients with acute ischaemic stroke and correlates positively with stroke severity and major vascular risk factors. These observations further highlight the contribution of platelet activation to the pathophysiology of acute cerebrovascular disease. Given its widespread availability, rapid turnaround, and low cost, MPV may serve as a useful adjunct in the early risk assessment of patients with acute ischaemic stroke, particularly in resource-limited settings. However, large prospective multicentric studies with serial measurements are needed before MPV can be established as an independent prognostic biomarker.

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REFERENCES

1. WHO. Global Health Estimates: Leading Causes of Death. Geneva: WHO. 2020. Available at: https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/ghe-leading-causes-ofdeath. Accessed on 23 January 2026.
2. Powers WJ, Rabinstein AA, Ackerson T, Adeoye M, Bambakidis NC, Becker K, et al. 2018 guidelines for the early management of patients with acute ischemic stroke. Stroke. 2018;49(3):46-110.
3. Bath PMW, Michelson AD. Platelets in cerebrovascular disease. Arterioscler Thromb Vasc Biol. 1995;15(3):286-92.
4. Bath PM, Butterworth RJ. Platelet size: measurement, physiology and vascular disease. Blood Coagul Fibrinolysis. 1996;7(2):157-61.
5. Greisenegger S, Endler G, Hsieh K, Tentschert S, Mannhalter C, Lalouschek W. Is elevated mean platelet volume associated with worse outcome in acute ischemic cerebrovascular events?. Stroke. 2004;35(7):1688-91.
6. Chu SG, Becker RC, Berger PB, Bhatt DL, Eikelboom JW, Konkle B, et al. Mean platelet volume as a predictor of cardiovascular risk: systematic review and meta-analysis. J Thromb Haemost. 2010;8(1):148-56.
7. Brott T, Adams HP , Olinger CP, Marler JR, Barsan WG, Biller J, et al. Measurements of acute cerebral infarction: a clinical examination scale. Stroke. 1989;20(7):864-70.
8. O'Malley T, Langhorne P, Elton RA, Stewart C. Platelet size in stroke patients. Stroke. 1995;26(6):995-9.
9. Martin JF, Bath PM, Burr ML. Influence of platelet size on outcome after myocardial infarction. Lancet. 1991;338(8780):1409-11.
10. Huczek Z, Kochman J, Filipiak KJ, Horszczaruk GJ, Grabowski M, Piatkowski R, et al. Mean platelet volume on admission predicts impaired reperfusion and long-term mortality in acute myocardial infarction treated with primary PCI. J Am Coll Cardiol. 2005;46(2):284-90.
11. Shah B, Sha D, Xie D, Mohler ER, Berger JS. The relationship between diabetes, metabolic syndrome, and platelet activity as measured by mean platelet volume. Diabetes Care. 2012;35(5):1074-8.
12. Khandekar MM, Khurana AS, Deshmukh SD, Kakrani AL, Katdare AD, Inamdar AK. Platelet volume indices in coronary artery disease: an Indian scenario. J Clin Pathol. 2006;59(2):146-9.

13. Mayda-Domaç F, Misirli H, Yilmaz M. Prognostic role of mean platelet volume in stroke. J Stroke Cerebrovasc Dis. 2010;19(1):66-72.
14. Korkmaz L, Bektas H, Karadag B, Ozkan A, Tasdem ir K, Yigit F, et al. Increased mean platelet volume is associated with ischemic stroke. Clin Appl Thromb Hemost. 2012;18(6):620-5.

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