Original Research Article

A Study on Correlation between Mean Platelet Volume and Stroke Outcome

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Abstract

Introduction: Stroke, a cerebrovascular accident, results from vascular causes, including ischemic or hemorrhagic events. Its diagnosis relies on clinical assessment and imaging studies. With a significant global health burden, stroke ranks among leading causes of morbidity and mortality. Prevention and management strategies, including Mean platelet volume (MPV) association studies, are vital for mitigating its impact.

Methods: This cross-sectional study involved thorough clinical assessments using a pre-designed questionnaire and diagnostic tests. Stroke severity was evaluated using the Modified Rankin Scale (MRS), providing insights into disability-adjusted life years (DALY). Statistical analysis utilized a significance level of P< 0.05 to determine meaningful associations.

Results: The study involved 92 participants, mean age 60.39 ± 7.75 years, with 53.3% male and 46.7% female. Prevalence rates included hemiplegia (34.8%), altered sensorium (22.8%), headache (19.6%), vomiting (18.5%), convulsions (4.3%), hypertension (47.8%), coronary artery disease (32.6%), dyslipidemia (31.5%), and smoking history (28.3%). Glasgow Coma Scale categorized severity. MPV remained stable across time points.

Conclusion: The study underscores the significant impact of stroke, with consistent findings across age, gender distribution, symptomatology, comorbidities like CAD and severity based on GCS scores. Furthermore, it highlights a notable association between MPV and stroke severity.

Keywords: Stroke, Participants, Demographics, Symptoms, MPV.

Introduction

Stroke, also known as a cerebrovascular accident (CVA), is characterized by the sudden onset of neurological impairment resulting from a focal vascular cause. This encompasses both ischemic strokes, caused by a blockage in a blood vessel supplying the brain, and hemorrhagic strokes, resulting from bleeding into the brain. [1] Diagnosis of stroke relies on clinical evaluation along with imaging studies such as CT or MRI scans of the brain. [2]

Cerebrovascular diseases, including stroke, pose significant health burdens globally. In India alone, it's estimated that there are 203 strokes per 100,000 people over the age of 20 annually, totalling approximately 1 million cases. [3] This staggering figure underscores the immense public health challenge posed by stroke. Moreover, stroke ranks among the leading causes of morbidity and mortality worldwide. It was the sixth leading cause

of disability-adjusted life years (DALY) in 1990 and is projected to rise to the fourth leading cause by 2020. [4] The impact of stroke extends beyond mortality, as survivors often face long-term disabilities and decreased quality of life.

Prevention and management strategies for stroke are crucial in mitigating its devastating effects. [1] These may include lifestyle modifications, such as controlling blood pressure and cholesterol levels, as well as timely medical interventions like thrombolytic therapy for ischemic strokes or surgical interventions for hemorrhagic strokes. This study was undertaken to investigate the association between mean platelet volume (MPV) and both the occurrence of stroke and its subsequent outcome.

Methods

It was a cross-sectional study, conducted in the department of General Medicine, GSL Medical College, Rajahmundry. Study was conducted

between January 2021 to June 2022. Study protocol was approved by the Institutional Ethics Committee. Informed written consent was taken from the study members.

The inclusion criteria for the study comprised individuals aged above 30 years who presented with clinical symptoms indicative of stroke, which were subsequently confirmed through CT or MRI scans. The exclusion criteria for the study included individuals with a history of transient ischemic attacks or recurrent stroke, known cases of hereditary platelet disorders, thrombocytopenia, and those currently using medications such as anticoagulants, statins, and antiplatelet agents. Additionally, patients with inflammatory conditions were excluded from participation.

Each study participant underwent a thorough clinical assessment, encompassing detailed medical history and examination facilitated by a pre-designed questionnaire. Essential diagnostic tests were administered to ensure comprehensive evaluation. The severity of stroke during follow-up was gauged through the application of the Modified Rankin Scale (MRS), a validated measure in India [5]. Furthermore, a range of investigations was conducted on all subjects, augmenting the depth of analysis. The MRS not only assessed stroke severity but also provided insights into DALY, contributing significantly to understanding the impact of stroke on quality of life. [6]

Statistical analysis: All statistical analyses were conducted using SPSS software trial version 20.0 and MS Excel-2010. The t test was employed to evaluate associations among categorical variables. A P value of <0.05 was deemed statistically significant, indicating meaningful associations between variables.

Results:

The study comprised 92 participants, with a mean age of 60.39 ± 7.75 years. The majority (44.6%) fell within the 61-70 age bracket, followed by 35.9% in the 51-60 age range. Gender distribution showed 53.3% male and 46.7% female participants. Hemiplegia was present in 34.8% of subjects, altered sensorium in 22.8%, headache in 19.6%, vomiting in 18.5%, convulsions in 4.3%, and 47.8% were hypertensive. Additionally, 32.6% had coronary artery disease, 31.5% had dyslipidemia, and 28.3% had a history of smoking. Glasgow Coma Scale categorized 30.4% as Mild, 39.1% as Moderate, and 30.4% as Severe. Mean platelet volume (MPV) at admission was 10.19 ± 2.10 fL, on Day 7 it remained 10.18 ± 2.10 fL, and on Day 28 it decreased to 9.67 ± 2.13 fL. MRS scores distributed as grade 0 (15.2%), grade 1 (10.9%), grade 2 (17.4%), grade 3 (17.4%), grade 4 (13%), grade 5 (13%), and grade 6 (13%). Statistical analysis revealed no significant difference in MPV

concerning gender, age, hypertension, dyslipidemia, and MRS scores.

Discussion

Stroke ranks as the second leading cause of mortality and a significant contributor to disability. [3, 7] It is characterized by an acute episode of neurological dysfunction, lasting for 24 hours or leading to death, attributed to either ischemia or hemorrhage. [8] This definition underlines the severity and urgency in diagnosing and treating stroke promptly to mitigate its adverse effects on individuals and society.

Out of the total 92 participants in the study, the mean age was 60.39 ± 7.75 years, ranging from 43 to 75 years. The majority (44.6%) fell into the 61-70 age group, followed by 35.9% in the 51-60 age range. Males slightly outnumbered females, comprising 53% of the participants. Comparing with Elsayed AM et al. [9] whose study reported a mean age of 61.4 ± 13.5 years and a similar gender distribution, the present study findings aligned closely. Similarly, the study by Sreejit OT et al. [10] reported a mean age of 61.22 years and a strong male preponderance, consistent with our observations. Additionally, Elsayed AM et al. [9] noted a higher prevalence of severe cases among men, mirroring our findings.

In our study, hemiplegia was observed in 34.8% of subjects, altered sensorium in 22.8%, headache in 19.6%, vomiting in 18.5%, and convulsions in 4.3%. Kumara tini et al. [11] found similar trends, reporting hemiplegia in 42.7% of subjects, altered consciousness in 26.8%, and other complaints resembling our findings. Vijayakumar Vaidya et al.[12] focused solely on ischemic stroke patients, noting hemiparesis as the most common complaint (49.1%), followed by speech disorders (29.1%), which contrasts with our study's broader inclusion criteria potentially explaining the variation in predominant complaints. In our study, 32.6% of participants were diagnosed with CAD. This finding is consistent with the observations of Lok et al. [13] where 40% of subjects had CAD, and Bhasme S et al. [14] where 35.82% had CAD, reflecting a similar prevalence to our study.

In our study, 30.4% of cases were categorized as mild, 39.1% as moderate, and 30.4% as severe based on GCS scores. Mahmood N et al. [15] reported a mean GCS of 9.9 ± 3.79 for all patients, with 28% classified as mild brain injury, 35% as moderate, and 31% as severe at admission, aligning closely with our findings. In the present study it was observed that there was a strong association between MRS and MPV. MRS scores distributed as grade 0 (15.2%), grade 1 (10.9%), grade 2 (17.4%), grade 3 (17.4%), grade 4 (13%), grade 5 (13%), and grade 6 (13%). In a study done by Kamat V et al. [16] mean MPV value increases as

the severity of stroke based on MRS scale increases ($p=0.02$) which is significant, also seen in present study. In a study done by Mahmood N et al. [15] mean MPV among 59.75 % haemorrhagic cases was 8.83 ± 0.84 fL and rest ischemic cases was 8.97 ± 0.85 fL which shows higher MPV in case of ischemic stroke which was found in present study also.

The study underscores the significant impact of stroke, with consistent findings across age, gender distribution, symptomatology, comorbidities like CAD and severity based on GCS scores. Furthermore, it highlights a notable association between MPV and stroke severity.

References:

1. Murphy SJ, Werring DJ. Stroke: causes and clinical features. Medicine (Abingdon). 2020; 48(9): 561 – 6.
2. Ma J, Tian Z, Chai P, Wan Q, Zhai T, Guo F, Li Y. Estimating the economic burden of stroke in China: a cost-of-illness study. BMJ Open. 2024; 14(3): e080634.
3. Kalita J, Bharadwaz MP, Aditi A. Prevalence, contributing factors, and economic implications of strokes among older adults: a study of North-East India. Sci Rep. 2023; 13: 16880.
4. GBD 2016 DALYs and HALE Collaborators. Global, regional, and national disability-adjusted life-years (DALYs) for 333 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet. 2017; 390(10100): 1260 – 1344.
5. ElHabr AK, Katz JM, Wang J, et al. Predicting 90-day modified Rankin Scale score with discharge information in acute ischaemic stroke patients following treatment. BMJ Neurology Open. 2021; 3: e000177.
6. Li Jx, Zhong Qq, Yuan Sx, et al. Trends in deaths and disability-adjusted life-years of stroke attributable to low physical activity worldwide, 1990–2019. BMC Public Health. 2023; 23: 2242.
7. Thayabaranathan T, Kim J, Cadilhac DA, Thrift AG, Donnan GA, Howard G, Howard VJ, Rothwell PM, Feigin V, Norrving B, Owolabi M, Pandian J, Liu L, Olaiya MT. Global stroke statistics 2022. Int J Stroke. 2022; 17(9): 946 – 56.
8. Owolabi MO, Sarfo F, Akinyemi R, et al. SIREN Team; as part of H3Africa Consortium. Dominant modifiable risk factors for stroke in Ghana and Nigeria (SIREN): a case-control study. Lancet Glob Health. 2018; 6(4): e436 – e446.
9. Elsayed AM, Mohamed GA. Mean platelet volume and mean platelet volume/platelet count ratio as a risk stratification tool in the assessment of severity of acute ischemic stroke. Alexandria J Med. 2017; 53(1): 67 – 70.
10. Sreejith OT, Zafar L, Beg M, Siddiqui OA. Association of Mean Platelet Volume with Risk Factors and Functional Outcome in Acute Ischemic Stroke. Journal of Neurosciences in Rural Practice. 2021; 12(04): 764 – 9.
11. Tini K, Samatra I DPGP, Wiryadana KA, et al. Clinical profile of patients with cerebrovascular disease at Stroke Unit, Sanglah General Hospital, Denpasar, Bali. Bali Medical Journal. 2020; 9(1): 129 – 36.
12. Vaidya CV, Majmudar DK. A clinical study of ischemic stroke from capital of Gujarat, India. Sahel Med J 2015; 18: 177 – 81.
13. Lok U, Gulacti U, Ekmekci B, Bulut T, Celik M. Predictive and prognostic role of mean platelet volume in patients with first-ever acute ischemic stroke. Neurosciences. 2017; 22 (2):119.
14. Bhasme S, Kapil Rathi, Neel Chhajed, & Miren Patel. Role of mean platelet volume in a patient with ischemic stroke: A cross sectional study. International Journal of Health and Clinical Research. 2022; 5(3), 778 – 80.
15. Mahmood, Najia and Anjum, Nida and Khurram, Muhammad. Platelet Volume and Acute Stroke Patient Characteristics. Internal Medicine. 2021; 06: 24 – 8.
16. Kamat V, Kinagi S, Patil A. A study of mean platelet volume in acute ischemic stroke. Int J Adv Med 2021; 8:214 – 9.