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STUDY ON THE ASSOCIATION OF MEAN PLATELET VOLUME WITH ISCHAEMIC STROKE

General Medicine

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ABSTRACT

Background: Stroke is a common neurological condition. One of the most significant issues with public health is ischemic cerebrovascular disease (ischaemic stroke). A thrombus that blocks an atherosclerotic blood artery that has stenosis causes an ischemic stroke. Platelets play an important part in atherothrombosis pathogenesis. Large platelets have higher prothrombotic factor production, are more reactive, and aggregate more readily. The finding that big platelets are present in ischemic stroke patients by measuring mean platelet volume lends credence to the theory that platelet volume affects thrombotic major artery occlusion. **Aim:** The aim of the present study was to find out whether a significant association exist between the occurrence of ischaemic stroke and mean platelet volume as well as to find out whether a significant association exist between stroke subtype and mean platelet volume. **Materials and Method:** The study was a prospective case control study conducted at Sree Mookambika Institute of Medical sciences for a period of 6 months. The study included 50 patients diagnosed with acute ischemic stroke and who presented to the hospital within 48 hours of onset of symptoms and 50 controls were also selected. The severity of stroke assessed using the National Institute of Health Stroke Scale (NIHSS). Blood sample was collected for measuring mean platelet volume (MPV). Results were analysed using SPSS 20.0 version and the association was tested using Student t test. **Results:** MPV has got a statistically significant correlation with ischaemic stroke with a p value less than 0.001. The average MPV in cases was 8.73±0.71. The average MPV in controls was 7.61±0.67. The study found an elevated MPV in the acute phase of ischaemic stroke. MPV has got a statistically significant correlation with ischaemic stroke and severity of stroke with a p value less than 0.001. **Conclusion:** MPV is a promising indicator of ischemic stroke which can be used to anticipate the earliest signs of acute ischemic stroke. These markers may have the benefit of being simple to measure in a small sample size of blood.

KEYWORDS

Atherosclerosis, Hypertension, Lacunar syndrome, Platelet indices, Stroke.

INTRODUCTION:

Cerebrovascular illness predates heart disease throughout history. Apopexy was the name given to stroke in ancient times. The first to propose that apoplexy was brought on by cerebral blood vessels was the Swiss physician Johan Jakob Weefer (1620–1695).[1]

Stroke is not a single disease but a clinical syndrome with vascular roots. A stroke is defined by the World Health Organisation (WHO) as a focal or widespread brain malfunction showing quickly in clinical symptoms that continue for more than 24 hours.[2] The WHO estimates that around 33% of stroke patients—or 15 million people—die from the disease, and a comparable percentage—about 33%—develop a lasting impairment. Every half second a stroke happens somewhere in the world, and one stroke-related death occurs every ten seconds. According to estimates, 84 - 262 persons per 100,000 population in rural regions and 334–424 people per 100,000 population in urban areas in India experience a stroke.[3]

The Oxfordshire Community Stroke Project categorization of stroke syndromes was used to categorise strokes into lacunar and non-lacunar syndromes, which include Partial Anterior Circulation Syndrome, Posterior Circulation syndrome and Total Anterior Circulation Syndrome.[4]

After atherosclerotic plaques erode or break, platelets form intravascular thrombus, which causes a stroke. The size of platelets affects their ability to clot. Due to their elevated thromboxane A2 level, higher granule content, propensity for expressing greater glycoprotein Ib as well as IIb/IIIa receptors, and increased ability to combine with collagen, larger platelets exhibit higher thrombotic potential.[5]

The megakaryocyte indices have shifted in a prothrombotic direction due to increased platelet function in risk factors for stroke like hypertension, diabetes mellitus, smoking, and hypercholesterolemia, as well as in some vascular conditions linked to stroke like atherosclerosis and myocardial infarction. A helpful biomarker for the early identification of thromboembolic disorders is the mean platelet volume (MPV).[6]

In addition to platelet thrombopoietic reactivity, MPV is an independent risk factor for the occurrence of ischemic stroke.[7] The use of platelet indices in patients with stroke has been extensively studied internationally. There is, however, a dearth of information on the Indian population. This study was carried out to ascertain the importance of MPV in patients with acute ischemic stroke in the South Indian region.

AIMS AND OBJECTIVES:

To find out whether a significant association exist between stroke subtype and mean platelet volume and to determine the association between severity of stroke and mean platelet volume.

MATERIALS AND METHODS:

Present study was a prospective case control study conducted in Department of general medicine, Sree Mookambika Institute of Medical Sciences, Kulasekharam for a period of 6 months from July 2022 to December 2022. All stroke patients admitted in medical wards were included in the study. Patients with thrombocytopenia, on antiplatelet drugs, hereditary disorders with large platelets and on drugs that can cause thrombocytopenia.

A total of 50 cases were included in the study who were patients admitted in the medical wards, diagnosed to have stroke and who met the inclusion criteria. Fifty controls were selected from amongst those patients admitted in the medical wards for other diseases. Each control was matched for age, risk factors for stroke like diabetes mellitus, hypertension, smoking, alcoholism, and dyslipidemia.

Medical history and examination were conducted for all patients. Each case was assessed and severity of stroke assessed using the National Institute Of Health Stroke Scale (NIHSS) (Table 1). Blood sample was collected from the antecubital vein using a 5cc syringe. Sample was then transferred to EDTA container. Samples were analysed using Mindray automated analyser which uses the technology based on electrical impedance to measure the MPV.

Table 1: National Institute of Health Stroke Scale

Score	Severity
0	No symptoms
1 – 4	Mild
5 – 15	Moderate
16 - 20	Moderate to severe
21 - 42	Severe

Statistical Analysis was carried out using SPSS 20.0 version. Significance is assessed at 5% level of significance. Analysis of variance (ANOVA) has been used to find the significance of study parameters between three or more groups of patients. Student t test was used to find the significance of study parameters on continuous scale between two groups.

OBSERVATION AND RESULTS:

The mean age for cases was 53.12±10.07, whereas for controls it was55.87±10.64. The maximum number of cases in this study were in the age group between 51 to 60 years followed by 61 to 70 years. Among the study population 68(68%) of cases and controls were males and 32(32%) were females. No statistically significant difference was found among the two groups. Out of the many risk factors for stroke, hypertension was the most prevalent in this study group followed by dyslipidemia and diabetes.

The frequency of subtypes of stroke and NIHSS was given in table 2 and 3 respectively. The most common subtype of stroke was Lacunar Syndrome seen in 30(60%) of the cases.

Table 2: Distribution of subtypes of stroke

Stroke subtypes (n=50)	Number	Percentage
Lacunar Syndrome	30	60
Posterior Circulation Syndrome	12	24
Partial Anterior Circulation Syndrome	6	12
Total Anterior Circulation Syndrome	2	4

Table 3: Distribution of NIHSS Score

NIHSS Score (n = 50)	Number	Percentage
Mild	1	2
Moderate	15	30
Moderate to severe	10	20
Severe	24	48

Table 4 showed that the mean MPV value was higher in cases then the controls. On comparison MPV had statistically significant correlation with a p value < 0.001.MPV also had statistically significant correlation with ischaemic stroke and severity of stroke with a p value less than 0.001.

Table 4: Comparison of MPV in cases and controls

	Cases	controls	t value	p value
Mean MPV	8.73±0.71	7.61±0.67	5.132	<0.001

DISCUSSION:

Ischemic stroke is hypothesised to develop from the thrombotic blockage of an atherosclerotic blood artery that has stenosis.[8] Initial platelet adhesion to the injured vessel causes recruitment of additional platelets, which then occurs after platelet aggregation, plug development, and thrombotic occlusion. Therefore, finding large platelets among patients would corroborate the theory that platelet volume promotes thrombotic major artery occlusion that results in ischemic stroke.[9]

The present study found a significant increase in MPV in patients with acute ischemic stroke. Additionally, when MPV was contrasted with stroke subtypes and severity, the findings of this study showed a substantial difference. The rise in MPV may have played a role in the formation of stroke rather than being merely a result of the acute event itself because large platelets may enhance the thrombotic event in a vulnerable individual.

Larger platelets may be a risk factor for the development of stroke, which would have a considerable predictive value. Platelets are known to play a critical role in the transformation of a stable atherosclerotic plaque to an unstable one.[10] Studies have shown that acute cerebral ischemia as well as transient ischemic stroke increase platelet volume.

Sundari M et al.[11] reported in their study revealed that there was a statistically significant difference (P < 0.001) in the MPV and PDW values between the two groups. In the receiver operating characteristic curve, the difference in the areas under the curve for MPV and PDW was also shown to be statistically significant (P 0.001). The changes in MPV and PDW values across age categories, genders, and concomitant conditions, however, did not appear to be statistically significant.

In their study, Ludhiadch A et al.[12] found a statistically significant connection between elevated MPV and ischemic stroke (p < 0.02). Patients with high mRS were shown to have high MPV levels, confirming that a larger MPV is associated with ischemic stroke impairment. Additionally, MPV was discovered to be substantially linked with atherosclerosis of the major arteries (p< 0.001).

Similarly, Xu M et al.[13] observed that in individuals who had acute cerebral infarction, MPV had a favourable connection with carotid atherosclerosis. In patients with acute cerebral infarction, higher MPV was an independent predictor of a poor functional outcome, according to multivariate logistic regression analysis. Das D et al.[14] observed no statistically significant difference in MPV between stroke patients and controls. This was contrast to the present study.

CONCLUSION:

The current study has demonstrated an increase in MPV in acute stroke. These findings are likely to be alterations happening during thrombopoiesis and point to a function for larger platelets in the development of cerebral thrombosis. Further research is needed to understand how platelet volume affects stroke pathogenesis, outcomes, and most critically, those at risk for stroke.

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Conflicts Of Interest: There are no conflicts of interest

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