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Original Research Article.

A Hospital Based Prospective Study to Evaluate the Association of Mean Platelet Volume with Ischaemic Stroke

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ABSTRACT

Background: Strokes are the most important cause of prolonged disability. Ischaemic stroke occurs due to thrombus occluding a stenosed atherosclerotic blood vessel. Platelets have a crucial role in the pathophysiology of atherothrombosis. The aim of this study, attempt the find out the association between mean platelet volume and ischaemic stroke.

Materials & Methods: This is a case control study done on 30 Patients of acute ischemic stroke admitted to department of medicine, govt. Medical college, Bhilwara. Thirty age and sex matched controls were also recruited for study. Patients with acute cerebro vascular accident admitted in medicine department within 48 hours of onset of symptoms, after application of inclusion and exclusion criteria were enquired about presenting complaints, mode of onset of neurological deficit, past history of TIA, hypertension, diabetes mellitus in detail. Modified Ranking Scale (MRS) at the time of admission and at day 28 were calculated. Standard treatment was given to all patients with Cerebro vascular accident.

Results: Our study showed that the mean age for stroke cases was 66.24±7.214 years when compared to 65.16±8.715 years in controls; the difference was not statistically significant with P value of 1.000 i.e. cases and controls were matched for age. The association between MPV and severity of stroke was studied by comparing NIHSS with corresponding mean values of MPV in each group. No statistically significant correlation was seen.

Conclusion: We concluded that larger platelets in the genesis of cerebral thrombosis and are likely to represent changes occurring at thrombopoiesis.

Keywords: Stroke, Thrombopoiesis, Ischaemic Stroke, CVA.

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INTRODUCTION

Strokes are the most important cause of prolonged disability. About 15% to 25% of stroke survivors become disabled permanently, while 20% remain in institutional care for three months after their stroke.[1] Stroke is one of the most common neurological disorders. Ischaemic stroke occurs due to thrombus occluding a stenosed atherosclerotic blood vessel. Platelets have a crucial role in the pathophysiology of atherothrombosis. Ischaemic Cerebrovascular disease (ischaemic stroke) is one of the leading public health problems.

Stroke incidence is much more common in other countries. Rates are especially high in Asia and Eastern Europe. Occurrence rates of stroke differ considerably among different regions. Increase in life expectancy of individuals in developing countries has made stroke an important worldwide problem.[2,3] In India, community surveys show a prevalence rate for hemiplegia in the range of 200 per 1,00,000 persons.

Due to the high incidence of stroke and the high costs expended for each individual patient, it accounts for a sizeable amount of the health care costs. Thus, stroke and its sequelae are important issues for health care planners. Because the costs of treatment and the economic consequences of lost productivity are so great, prevention of stroke will be a very cost-effective strategy. [2]

Although the term cerebrovascular accident (CVA) is used widely by physicians and other health care professionals, it is an appalling pseudoscientific characterization of stroke that substitutes labeling for understanding. The term should be abandoned because many strokes are not accidents, but preventable catastrophes.

Thus, the definition of stroke is clinical and laboratory studies including brain imaging are used to support the diagnosis. The clinical manifestations of stroke are highly variable because of the complex anatomy of the brain and its vasculature.[4] Large platelets

are more reactive, produce more prothrombotic factors and aggregate more easily. So the detection of large platelets in patients with ischaemic stroke support the idea that platelet volume influences thrombotic large vessel occlusion. There are very few documented studies in India comparing the association of mean platelet volume with ischaemic stroke. The aim of this study, attempt the find out the association between mean platelet volume and ischaemic stroke.

MATERIALS & METHODS

This is a case control study done on 30 Patients of acute ischemic stroke admitted to department of medicine, govt. Medical college, Bhilwara. Thirty age and sex matched controls were also recruited for study.

Inclusion Criteria: Acute cerebro vascular accident (both ischemic and haemorrhagic) with definitive signs of neurological deficit, confirmed by imaging CT/MRI brain.

Exclusion Criteria

1. Patients presenting 24hrs after the onset of neurological symptoms.
2. Haemorrhagic stroke.
3. History of stroke in the past, history of stable or unstable angina and myocardial infarction.
4. Known or suspected neoplastic disorders.
5. Acute infectious disease or known case of diseases that cause inflammation such as arteritis, arthritis, ankylosing spondylitis, osteomyelitis, inflammatory bowel disease.
6. Known case of Immunological disorders and disorders of platelet.
7. Medications that can reduce the platelet count: hydroxyurea, antineoplastic agents, and inhibitors of the platelet integrin $\alpha_{IIb}\beta_3$.
8. Patients on steroids or other immunomodulatory drugs.

Methods

Patients with acute cerebro vascular accident admitted in medicine department within 48 hours of onset of symptoms, after application of inclusion and exclusion criteria were enquired about presenting complaints, mode of onset of neurological deficit, past history of TIA, hypertension, diabetes mellitus in detail.

Special enquiry about alcoholism, smoking, pregnancy, or recent delivery and use of anticoagulants or oral contraceptives was made. Any similar illness in the family was asked.

Complete general and neurological examination was done. CBC, RFT and LFT were estimated. ECG, CT/MRI of brain were done.

Serum samples for platelet indices [platelet distribution width (PDW), platelet count, immature platelet fraction (IPF), Mean Platelet volume (MPV) estimation were taken after confirming cerebro vascular accident and sent to the laboratory.

Modified Ranking Scale (MRS) at the time of admission and at day 28 were calculated. Standard treatment was given to all patients with Cerebro vascular accident. MPV level was correlated with MRS score at the time of admission and again at 28 day.

Statistical Analysis

Difference in proportion would be analyzed using chi square test. Odds ratio would be find out for raised level of platelet indices. The level of confidence would be kept 95% for all statistical analysis. Data analysis was done by SPSS (Statistical package for social sciences.)

RESULTS

The above table depicts that the mean age for stroke cases was 66.24±7.214 years when compared to 65.16±8.715 years in controls; the difference was not statistically significant with P value of 1.000 i.e. cases and controls were matched for age. Most of the patients were in the age group of 61-70 yrs (table 1).

Table 1: Distribution of ischemic stroke cases & control group according to age

Age groups	Cases (N=30)		Controls (N=30)	
(in years)	No	%	No	%
≤50	2	6.66%	2	6.66%
51 to 60	3	10%	9	30%
61 to 70	19	63.33%	15	50%
>70	6	20%	4	13.34%
Mean ± SD	66.24±7.214		65.16±8.715	

Table 2: Risk factors (HTN, DM, Smoking, Alcohol) for ischemic stroke among study subjects & control

Risk factors	Cases (N=30)		Controls (N=30)		P Value
	No	%	No	%	
HT	18	60%	10	33.33%	<0.05*
DM	14	46.66%	8	26.66%	<0.05*
Smoking	14	46.66%	9	30%	>0.05
Alcohol	8	26.66%	5	16.66%	>0.05

Table 3: Correlation Between Stroke severity and MPV

NIHSS Score	No.	MPV (EDTA)	MPV (Citrate)
1-4	1	7.5±0.0	7.06±0.0
5-15	9	8.12±0.76	7.83±0.82
16-20	6	8.41±0.79	7.87±0.83
21-42	14	8.45±1.07	8.02±1.03
Significant	P-value	0.933	0.978

Out of many risk factors for stroke, hypertension was significantly associated with stroke (p value=0.0115*). Diabetes came second with percentage of 46.66% (14/30) among cases and 26.66% (8/30) among controls, and was also significantly associated with stroke (p value 0.0488*). Alcohol and smoking were seen more in cases but the difference was not statistically significant (p>0.05) (table 2). The association between MPV and severity of stroke was studied by comparing NIHSS with corresponding mean values of MPV in each group. No statistically significant correlation was seen (table 3).

DISCUSSION

Our study showed that the mean age for stroke cases was 66.24±7.214 years when compared to 65.16±8.715 years in controls; the difference was not statistically significant with P value of 1.000 i.e. cases and controls were matched for age. Most of the patients were in the age group of 61-70 yrs. Which was comparable with Bath et al[5] (65±9).The mean age in our study was lower as compared to some western studies like O'Malley et al[6] (79.5 ± 6.5 years), Butterworth et al[7] (71.9±10.8), A. Muscari et al[8] (78 years) and Pikija et al[9] (76 years) but it is higher as compared to an Indian study by in Parvaiz et al[10] (58 years). This disparity in age may be due to higher life expectancy in the west as compared to developing world.

Out of many risk factors for stroke, hypertension was significantly associated with stroke (p value=0.0115*). Diabetes came second with percentage of 46.66% (14/30) among cases and 26.66% (8/30) among controls, and was also significantly associated with stroke (p value 0.0488*). Alcohol and smoking were seen more in cases but the difference was not statistically significant (p>0.05). Similar trend was seen in the other studies as mentioned below with hypertension being the most prevalent risk factor (84.7% in A.Muscari et al[8] and 82.7% in Pikija et al[9]).

Diabetes mellitus had a representation of 35% which was higher as compared to the other studies (8.6% in O'Malley et al[6], 21.2% in Muscari et al[8] and 18.5% in Pikija et al[9] studies). Smoking was at second or third place in other studies (14% in O' Malley et al[6], 14.6% in Muscari et al[8] and 4.9% in Pikija et al[9] studies).

The clinical severity of stroke at presentation was assessed using the National Institutes of Health Stroke scale and severe type of stroke was seen in 46.66% of cases with a score ranging from 21 to 42. 3.33% had only minor stroke with a score of 1-4, 30% had moderate stroke with a score ranging from 5 to 15, 20% had moderate to severe stroke with a score ranging between 16 and 20. The association of MPV with severity of stroke was determined by comparing the NIHSS score with the corresponding mean values of MPV in each group. MPV- EDTA showed a p value of 0.933 and MPV citrate showed a p value of 0.978, both of which were statistically insignificant. O'Malley[6] conducted similar studies and assessed stroke severity using the modified Rankin's scale. In that study outcomes were divided as independent (Rankin's grade 0-2), dependent (Rankin's grade 3 to 5), and dead (Rankin's grade 6). However, no statistically significant correlation with MPV was obtained. Butterworth et al[7] studied patients who were dead or dependent at 3 months, using the Lindley score, and they had a higher platelet volume, and a tendency to a lower platelet count as compared to those who fared well. But statistical significance was not obtained. There is indirect evidence that the changes in MPV and platelet count are likely to have preceded the vascular event and are unlikely to be due to platelet consumption at the infarct site. Because the average life span of platelets is about 8 days, the elevated MPV seen within the first 48 hours after stroke probably represent the platelets released before the infarction. Large platelets may promote the thrombotic event in a susceptible individual, and the increase in MPV may have contributed to the development of stroke rather than simply being a consequence of the acute event itself.

CONCLUSION

We concluded that larger platelets in the genesis of cerebral thrombosis and are likely to represent changes occurring at thrombopoiesis. Further research is required into the role of platelet volume in stroke pathology, outcome, and most importantly, in individuals at risk for stroke.

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