QUANTIFICATION OF MEAN PLATELET VOLUME IN DIABETIC PATIENTS PRESENTING WITH CEREBROVASCULAR DISEASES

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ABSTRACT

Objective: To estimate the mean platelet volume (MPV) in the patients with diabetes who present to hospital with various cerebrovascular diseases.

Methodology: It was a cross sectional descriptive study conducted in the Department of Medicine, Hayatabad Medical Complex (HMC), Peshawar from 1st June, 2014 till 30th Mar, 2015. A total of 137 adult patients between 25 to 75 years of age of either gender with Type 2 DM and stroke attending hospital were included. All patients with prior chronic kidney disease, chronic liver disease or with previous cerebrovascular events were excluded from the study. Under strict aseptic conditions, 10cc blood was obtained and sent immediately to hospital laboratory for measurement of MPV.

Results: Among the 137 patients, 85 (62.04%) were females and 52(37.96%) were males. The average age of the patients was 53.01±11.97 years with range of 30-73 years. Average duration of DM in the patients was 5.15±2.87 years with range of 1-12 years. There were 65(47.45%) patients of the less than or equal to 4 years DM duration. Forty two (30.66%) patients were in the range of 5-7 years, 24 (17.52%) were in the 8-10 years range while 6(4.38%) presented with cerebrovascular accidents at more than 10 years of type 2 DM. There were 84 (61.3%) and 53(38.7%) patients having MPV greater than and less than 9.01 fl respectively (average MPV was 9.42±0.92).

Conclusion: Increased MPV was found in a significant number of patients and was more in the males and patients with age greater than 50 years.

Key Words: Mean platelet count, Diabetes, Cerebrovascular accidents

INTRODUCTION

In understanding the pathogenesis of ischemic events, platelets have a pivotal role. It is well known fact that larger the platelets, the more they are reactive because they produce more prothrombotic factors resulting in better aggregators to adenosine diphosphate (ADP), collagen or adrenaline and more thromboxane A2 (TxA2) secretion. Individuals suffering from diabetes mellitus (DM), hypercholesterolemia, myocardial infarction, ischemic stroke and smoking are known to have large size platelets[1].

Platelets are integral part of the coagulation, inflammation, thrombosis, and atherosclerosis by secreting a wide range of substances. The major role of the platelets in the athero-thrombotic process is evident from the fact that the anti-platelets drugs are known to reduce cerebrovascular events[2]. In the pathophysiology of coronary heart disease, the mean platelet volume (MPV) is postulated to have a major role. The platelets are more activated in patients with insulin resistance[3].

The MPV and platelet counts are established indicators of the thrombotic potentials for micro vascular complications in individuals with DM[4,5].

The larger the platelets, the more are the denser granules which are metabolically and enzymatically active and more is the thrombotic potential[6]. It has been repeatedly reported in literature a positive correlation between increased MPV and DM with resultant increased vascular complications[7].

In one study, a positive association was found between MPV and platelet distribution width in individuals with DM (9.21±0.14) as compared to healthy controls (8.535±0.166)[5]. The results were reproduced in another study showing higher MPV in type 2 DM (9.25±1.49) as compared with healthy controls (8.47±0.49)[7].

DM in association with cerebrovascular diseases is quite common in our adult population. The MPV in general acts a risk factor for a variety of micro/macro vascular diseases especially in diabetics and its magnitude in our local population is still unknown as no local studies

have been conducted. This study project was designed to quantify the MPV in DM patients presenting with cerebrovascular diseases.

The results of this study should provide us with valuable local data about MPV in our patients with DM presenting with cerebrovascular accidents. We hope the results of this study should also kick start the quest for larger scale population screening for the MPV levels and their possible associations with other illnesses.

METHODOLOGY

It was a cross sectional descriptive study using consecutive (non probability) sampling technique. It was carried out in the Department of Medicine, Hayatabad Medical Complex (HMC), Peshawar from 1st June, 2014 till 30th Mar, 2015. The hospital ethical review committee granted approval of the study project. All included patients gave a written informed consent.

A total of 137 patients meeting the eligibility criteria were enrolled in the study. We enrolled all adult patients between 25 to 75 years, of either gender with Type 2 DM and stroke attending hospital through outpatients or the casualty department were admitted and treated as per ward standard protocol. A detailed history and clinical examination was done. All patients with prior chronic kidney disease, chronic liver disease or with previous cerebrovascular events were excluded from the study.

Under strict aseptic conditions, 10cc blood was obtained and sent immediately to hospital laboratory for measurement of MPV. All the laboratory investigations were done from single hospital laboratory under the supervision of an expert hematologist. The machine used was the haemotology analyzer Sysmex, the XP-300™ and EDTA was used as the anticoagulant.

The information was recorded in a specially designed performa. Data was analyzed using SPSS version 17. Mean±SD was calculated for numerical variables like age, MPV and duration of disease. Frequencies and percentages were calculated for categorical variables like gender. MPV was stratified among age to see the effect modifiers. The results were presented in tables.

RESULTS

Among the 137 patients that were included, 85 (62.04%) were females and 52(37.96%) were males. The average age of the patients was 53.01±11.97 years with range of 30-73 years. Patient's age was divided in four categories as shown in Table 1.

Average duration of DM in the patients was 5.15 ±2.87 years with range of 1-12 years. Surprisingly there were 65(47.45%) patients of less than or equal to 4 years DM duration. Forty two (30.66%) patients were in the

range of 5-7 years, 24 (17.52%) were in the 8-10 years range while 6(4.38%) presented with cerebrovascular accidents at more than 10 years of type 2 DM.

There were 84 (61.3%) and 53(38.7%) patients having MPV greater and less than 9.01 respectively with average MPV as 9.42±0.92.

Age wise distribution of MPV showed that MPV in old age was high as compared to younger patients. The distribution of MPV across various age groups is shown in Table 1.

DISCUSSION

DM is a continuously increasing global health concern[8,9]. The WHO in 2011 estimated 346 million individuals from all over the world known to be suffering from DM[10]. It is the increase in the platelets activity that is responsible for increasing the vascular complications with DM[11].

India with 19 million individuals with DM tops the list followed by China with 16 million and the US with 14 million[8,9]. The poorer the glycaemic control, the longer the duration of DM and associated conditions like obesity, hypercholestrolaemia and hypertension, the more likely are the complications[12].

The MPV is an estimate of the average size and activity of platelets. The larger the platelets, the higher the MPV and hence more reactive and likely to aggregate. These larger platelets secrete more serotonin, β-thromboglobulin and thromboxane A2 as compared to comparatively smaller platelets[13-16]. The resultant thrombotic vascular complications are secondary to the amalgam of the various procoagulant effects. This cascade of effects does suggest a positive association of platelets size and hence MPV with the state of thrombogensis especially in diabetics[14-17]. In response to the rupture of the small atherosclerotic plagues, there might be increased platelet recruitment, hyper reactivity and resultant bone marrow stimulation. In patients with DM and microvascular complications, the high MPV is postulated as an independent risk factor for increased events[12].

This study project is first in our region to try and show positive association of increased MPV in patients with DM. Increased MPV has been observed as independent of other established determinants and have seen the association of ischemic stroke with increased MPV in diabetic patients. However, this doesn't apply to hemorrhagic strokes or strokes of unknown etiology. The correlation with the ischemic strokes is well established secondary to increased responsiveness of larger younger platelets with increased MPV[18-20], and the known beneficial effects of using antiplatelet therapeutic strategies in preventing ischemic stroke[21].

We have tried to control the confounders in every

Table 1: Age wise distribution of MPV among patients with type 2 DM with cerebrovascular disease

		Mean platelet volume (in fl)		Total
		< 9.00	>9	
Age (in years)	< 40	15	11	26
		57.7%	42.3%	100%
	41 - 50	22	17	39
		56.4%	43.6%	100%
	51- 60	9	21	30
		30.0%	70.0%	100%
	>60	7	35	42
		16.7%	83.3%	100%
Total		53	84	137
		38.7%	61.3%	100%

possible way while estimating the MPV. It is an established fact that the platelets continue to swell up in a time-dependent fashion after blood sampling in EDTA. Within 24 to 48 hours, the platelets swelling stops and so the assays for MPV were conducted in a time bound fashion to eliminate the chances of such errors[22-24]. We do admit that a large population of assays might have been done outside the proposed time faction. There is a small antiplatelet effect of angiotensin-converting enzyme (ACE) inhibitors including Perindopril[25]. In our study project, we didn't observe any significant effect on platelets parameters secondary to treatment offered. Different ACE inhibitors including Quinapril[26] and angiotensin receptor blocker Losartan[27,28] have demonstrated no effect on MPV estimation in the patients.

LIMITATION

This is first study project of its kind in our local population and is limited by small sample size and resources including funding. We strongly believe that large scale studies on the mass population enrolling both the diseased and the normal population are required to prove or refute findings of increased MPV as an independent predictor for stroke in patients with diabetes and cerebrovascular disease.

CONCLUSION

Increased MPV was found in a significant number of patients and was more in the males and patients with age greater than 50 years.

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