



TO KNOW THE ASSOCIATION OF PLATELET ACTIVITY ON GLYCEMIC STATUS AND VASCULAR COMPLICATIONS IN DIABETES MELLITUS

Pathology

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ABSTRACT

Background: Diabetes mellitus is a global pandemic disease. Hyperglycemia contributes to greater platelet reactivity through direct effects and by promoting glycation of proteins. Mean platelet volume (MPV) and Mean platelet count (MPC) is an indicator of average size and activity of the platelets and is high in diabetes mellitus. **Objectives:** 1) To find the association between MPC and MPV with HbA1c in diabetic patients. 2) To find the association of MPC and MPV with vascular complications in diabetic patients. **Methodology:** A retrospective study conducted in the Department of Pathology from January 2021 to June 2021. Data was collected from backbone stored in digital form. Sample size : 92 diabetic patients and are divided into 2 groups. 1) Group 1: HbA1c <7. 2) Group 2: HbA1c ≥7. Platelet count, MPV, HbA1c values and vascular complications were analyzed. **Results:** Out of 92 diabetic patients 74 had vascular complications. MPC in group 1 and group 2 was found to be 231.727 and 312.346 respectively with significant p value of 0.036 and mean difference of -80.6184. MPV in group 1 and group 2 was found to be 10.200 and 9.999 respectively which showed no significant correlation with p value of 0.528 and mean difference of 0.2012. The MPC and MPV in diabetic patients with complications were 332.056 and 10.239 respectively showing no significant correlation. **Conclusion:** MPC and MPV were found to be raised in group 2. MPC between the 2 groups showed statistically significant difference. However MPV does not show any significance between the two groups. Though there was no significant difference between Platelet count and vascular complication, MPV was higher in patients with complications. Diabetic patients suffer mostly from vascular complications, therefore platelet count and HbA1c can be a useful prognostic marker of vascular complications in diabetics.

KEYWORDS

Mean Platelet Volume, Diabetes mellitus, HbA1c.

INTRODUCTION

Diabetes is a worldwide pandemic¹. Chronic hyperglycemia, which is a hallmark of diabetes mellitus (DM) and results from insulin deficiency or dysfunction, has long-term detrimental effects on vascular structures and endothelial function². Blood cells called platelets play a key role in hemostasis by forming the primary platelet plug, which then triggers the formation of thrombi. The vascular complications of DM may develop as a result of the elevated platelet activity. The average size and activity of platelets are indicated by the mean platelet volume (MPV). Larger platelets are more active¹. Under physiological circumstances, a lower MPV and a higher platelet count are equivalent. However, in pathology associated with inflammation, thrombopoietin production is markedly increased, and cytokines like IL-6 activate megakaryocytes, resulting in a high platelet count and large platelets².

The goal of our study was to identify whether the platelets were activated in diabetes and its related vascular complications. By measuring the MPV and MPC in diabetics, it was possible to examine whether diabetics with and without vascular complications had different MPVs and MPCs as well as how the MPV and MPC correlated with various diabetes-related variables, including fasting blood sugar (FBS), glycosylated haemoglobin (HbA1c) and duration of diabetes.

MATERIALS AND METHODS

The study was done by retrieving the records stored as digital form in the software (Backbone) from the central laboratory of Yenepoya Medical College Hospital. The study was performed on 92 diabetic patients. Diabetic patients were divided into 2 groups.

- 1) GROUP I: HbA1c less than 7
- 2) GROUP II: HbA1c more than or equal to 7

MPC, MPV, HbA1c values were analyzed in diabetic patients.

Vascular complications include:

- i. Macrovascular complications (coronary artery disease, peripheral arterial disease, stroke)
- ii. Microvascular complications (diabetic nephropathy, diabetic retinopathy, diabetic neuropathy)

RESULTS

Age and gender distribution

The minimum age at presentation was 20 years and maximum age at presentation was 90 years. Out of 92 diabetic patients, males had more predilection than females. They were predominantly in the age group 51-60 years. All the Diabetic patients were divided into 2 groups on the basis of HbA1c, group A (HbA1c <7) and group B (HbA1c ≥7).

Table 1: various parameters in the study population

Parameter	Value/no./%
No. of Patients	92
Common age group	51-60 years
Males	55
Females	37
Mean duration of DM	5.29 years
Micro and macrovascular complications	74
Mean FBS	135.05mg/dl
Mean platelet count	387900
MPV	10.09fl

MPC in group 1 and group 2 was found to be 231.727 and 312.346 respectively which was highly significant with p value of 0.036 and mean difference of -80.6184. MPV in group 1 and group 2 was found to be 10.200 and 9.999 respectively which showed no significant correlation with p value of 0.528 and mean difference of 0.2012. Mean FBS in group 1 and group 2 was found to be 101.909 and 168.198 respectively which showed significant p value of 0.028.

Table 2: Association between FBG, MPC and MPV with the HbA1c levels in diabetic patients

	HbA1c	N	Mean	Std. Deviation	Mean Diff./Sign.	
FBG	<7	11	101.909	12.0371	-66.2884	significant
	>7	81	168.198	97.7606	p-value = .028	
MPC	<7	11	231.727	88.2656	-80.6184	significant
	>7	81	312.346	120.8155	p-value = .036	
MPV	<7	11	10.200	.9859	.2012	insignificant
	>7	81	9.999	.9889	p-value = .528	

Out of 92 diabetic subjects 75 patients had vascular complications like diabetic foot, diabetic retinopathy, diabetic nephropathy, hypertension, coronary artery disease, peripheral vascular disease. The MPC and MPV in diabetic patients with complications was 332.056

and 10.239 respectively. The p value was found to be 0.249 and 0.302 respectively which showed no significant correlation.

The MPC were correlated with the duration of diabetes mellitus but there was no significant p value found. MPC in patients with duration of DM >5 years was 302.553 and in patients with duration ≤5 years it was 302.815.

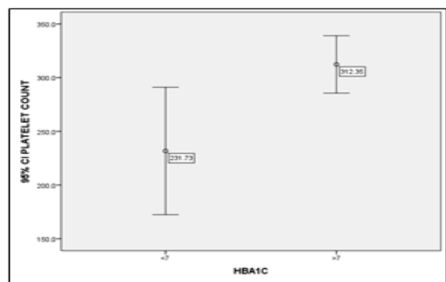


Figure 1: Graph showing the mean difference between MPC and HbA1c levels in diabetic patients.

DISCUSSION

The most serious complications of type 2 DM are vascular complications which includes both microvascular and macrovascular and have a negative impact on patient's life expectancy and quality of life as well as raising healthcare costs for issues that can be easily avoided by rigorous glycemic control³. Sustained hyperglycemia causes a cascade of interconnected changes that can result in visible endothelial dysfunction and vascular lesions in diabetic complications⁴. Platelet agonists such as collagen, adenosine diphosphate, epinephrine, and platelet activating factor have been shown to be inhibited by insulin. Hyperglycemia increases platelet reactivity both directly and indirectly through glycation of platelet proteins. Platelet aggregation has been linked to the development of micro and macrovascular disease in diabetics⁵.

Increased platelet activity has been proposed as a key factor in the development of vascular complications in type 2 diabetes. The MPV, a marker of platelet function, has been widely used to study platelet activation in disease. Younger, more active platelets with greater ability to aggregate have a higher MPV, whereas less active platelets have a lower MPV⁶.

In our study, Out of 92 diabetic patients 74 patients had vascular complications. MPC in group 1 (HbA1c ≥7) was significantly higher when compared to group 2 (HbA1c <7) with p value of 0.036. MPV between the 2 groups showed no significant correlation with p value of 0.528. The MPC and MPV in diabetic patients with complications showed no significant correlation. However MPV and MPC were higher in patients with complications.

In accordance to our study, Papanas N¹¹ conducted a study which showed that there was no significant correlation between MPV, HbA1c and vascular complications. However MPV levels remained higher in poorly controlled diabetics. In our study there was no significant MPV association with the duration of diabetes which was similar to the study conducted by Saluja M et al¹.

Brahmbhatt KJ² conducted a study where it showed the association between the MPV levels and HbA1C levels with the vascular complications were lost which was in accordance to our study. These findings were also supported by other studies conducted by Demirtunc R et al⁶ and Hekimsoy Z et al¹².

Several studies have shown significant association between MPV, HbA1C and vascular complications which is in contrast to our study. In a study conducted by Shimodaira M et al⁷ showed that there was a positive correlation between MPV and post challenge glucose level after 2 hours. Study conducted by Ji S et al⁸ showed that MPV levels were significantly higher in diabetic retinopathy patients when compared to patients without diabetic retinopathy. Cadirci K et al⁹ conducted a study which showed MPV levels in diabetic groups including diabetic nephropathy, diabetic neuropathy and diabetic retinopathy were significantly higher when compared to non diabetic patients. Manvar MJ et al¹⁰ conducted a study showed that the incidence of retinopathy and raised HbA1c was higher in poorly controlled diabetics when compared to controlled diabetics.

In addition, a higher MPV levels can also be associated with diabetics as well as non diabetic subjects. Thus, even in diabetics with good glycemic control, MPV may be important in predicting vascular complications.

Limitations

- Our study needs to be confirmed further in larger sample size.
- Platelet indices such as platelet distribution width and platelet large cell ratio could have been included as the prognostic parameter in assessing the vascular complications of diabetes mellitus.

CONCLUSION

MPC and MPV were found to be raised in group 2. Platelet count between the 2 groups showed statically significant difference with p value of 0.036. However MPV does not show any significance between the two groups. Though there was no significant difference between platelet count and vascular complication, MPV was higher in patients with complications. Diabetic patients suffer mostly from vascular complications, therefore platelet count and HbA1C can be a useful prognostic marker of vascular complications in diabetics.

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