



A STUDY TO DETERMINE THE MEAN PLATELET VOLUME (MPV) IN SUBJECT WITH DM.

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Abstract

Introduction- diabetes mellitus is a global pandemic. The increased platelet activity may play a role in the development of vascular complications of this metabolic disorder. The mean platelet volume (MPV) is an indicator of the average size and activity of platelets. Larger platelets are younger and exhibit more activity. Aim- To determine MPV in subject with Diabetes Mellitus. Material and Methods: Platelet count and MPV were measured in 100 T2DM patients and 100 Non Diabetic patients. Result: The mean platelet count and MPV were higher in diabetics as compared to non diabetic subjects. [277.5 \pm 81.3 vs 269.8 \pm 70.8] (P = 0.256), 10.3 \pm 0.7 vs 7.4 \pm 0.8 (P = <0.000)

Conclusions: Our results showed significantly higher MPV in diabetic patients than in the nondiabetic subjects. This indicates that elevated MPV could be either the cause for or due to the effect of the vascular complications. Hence, platelets may play a role and MPV can be used as a simple parameter to assess the vascular events in diabetes.

Keywords: Diabetes mellitus, mean platelet volume

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INTRODUCTION

Diabetes is an expanding global health concern. The majority of people with diabetes worldwide are between the ages of 40 and 59¹. Diabetes Mellitus disease is characterized by high blood sugar and patient suffering with diabetes has either an insufficient production of insulin or cannot utilize it well. It is a part of metabolic syndrome which comprises dyslipidemia, hypertension, impaired fibrinolysis, and increased procoagulation factors²⁻³. Type 2 DM induces atherosclerosis, circulation dysfunction, and dysregulation of coagulation⁴⁻⁵.

Platelets are the blood cells that are continuously produced in the bone marrow from megakaryocytes and are involved in hemostasis and arterial thrombosis and other physiological and pathophysiological processes⁸. Diabetic patients with type 2 diabetes show increased platelet responsiveness. It has been reported that platelets from diabetic patients synthesize more thromboxane than normal platelets². It is found that hyperglycemia causes increased platelet responsiveness and larger platelets. Larger platelets also release more prothrombotic factors such as thromboxane A₂⁹. It is also suggested that the increased platelet activity plays a major role in micro and macrovascular diabetic problems¹⁰.

MPV is a platelet size measure and a probable platelet reactivity marker¹³. Larger platelets are younger and show greater activity. Although MPV appears to be a simple variable; it can easily assess vascular complication in diabetic patients at relatively low cost. Higher MPV values mean larger platelets with a greater propensity for triggering thrombotic events and are more enzymatically and metabolically active¹⁴. Higher MPV is reported in patients with T2DM¹⁵, hypertension¹⁶, smoking¹⁷, hypercholesterolemia¹⁸, and obesity¹⁹, which signifies a collective mechanism by which these potential factors may significantly raise the risk of vascular events. Studies have suggested relatively high levels of MPV in diabetics²⁰⁻²¹, diabetic retinopathy²² and in certain cardiovascular events¹⁵. In other research, however; rates of MPV did not correlate with T2DM²²⁻²³. Therefore, the potential role of MPV in various diabetes vascular complication in T2DM remains unknown. While it has been reported that the assessment of platelet

activity by different methods has identified people at higher risk for diabetic complications. MPV as research tool yet to be used in routine clinical decision making.

In spite of this, MPV serves as a significant, cost-efficient and simple marker for these patients and for early diagnosis of vascular complications. Recent findings have shown that platelet – leukocyte collates in diabetes– have dramatically increased.

AIMS AND OBJECTIVES

To determine the Mean Platelet Volume (MPV) in subject with DM

MATERIALS & METHODS

1) SOURCE OF DATA and SAMPLING TECHNIQUE –

Patients of diabetes mellitus and controls who attended OPD/IPD services at Mahatma Gandhi Medical College & Hospital, Jaipur from March, 2021 to August, 2022 were taken.

2) DESIGN

- Case Control Study

3) Inclusion Criteria:

Diabetes Patients diagnosed according to below mentioned points:

- Symptoms of Diabetes plus RBS concentration more than 200mg/dl.
- Fasting plasma glucose more than 126 mg/dl.
- HBA1C more than 6.5%
- 2 hour plasma Glucose more than 200 mg/dl during glucose tolerance test.
- Non diabetic subjects as controls.

Exclusion Criteria:

- Abnormal platelet count (400×10³/μL)
- Use of drugs affecting platelet function (aspirin, warfarin, ticlopidine, or heparin)
- Using statin therapy 36
- Male patients with Hb<12mg/dl & females with Hb<10 mg/dl
- Pregnant females
- Patients with malignancy
- Iron deficiency anemia, Nutritional anemia, Hypo and Hyperthyroidism
- Recent Infections

RESULTS

Table: 1 Comparison of Platelets counts between the diabetic and nondiabetic subjects

Characteristic		Diabetic N=100	Non-Diabetic N=100	P Value
Platelets [x10 ⁹ /L]		277.5±81.3	269.8±70.8	0.256

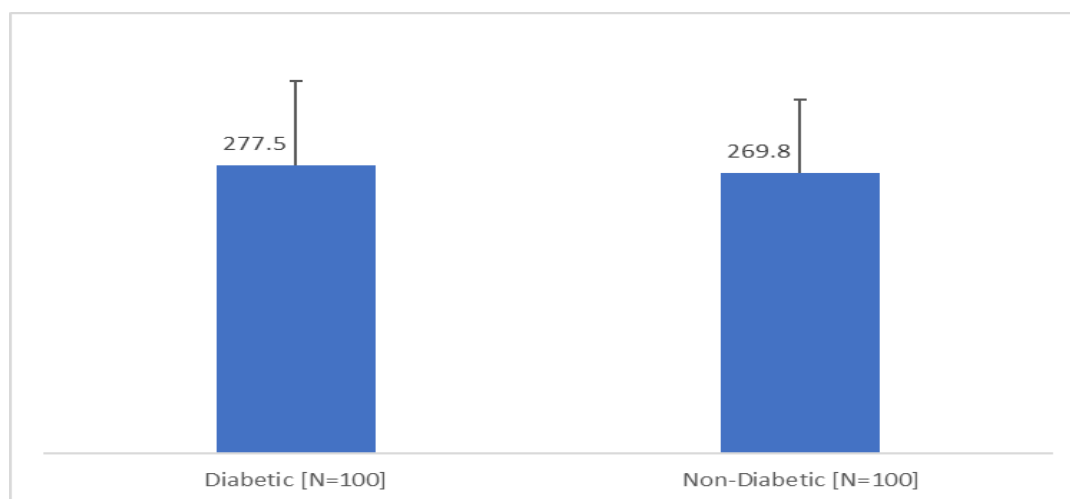


Figure 1: Comparison of Platelets counts between the diabetic and nondiabetic subjects

Table: 2 Comparison of Mean Platelets Volume [MPV] between the diabetic and nondiabetic subjects

Characteristic	Diabetic N=100	Non-Diabetic N=100	P Value
Mean Platelets Volume (MPV) [fL]	10.3±0.7	7.4±0.8	<0.000

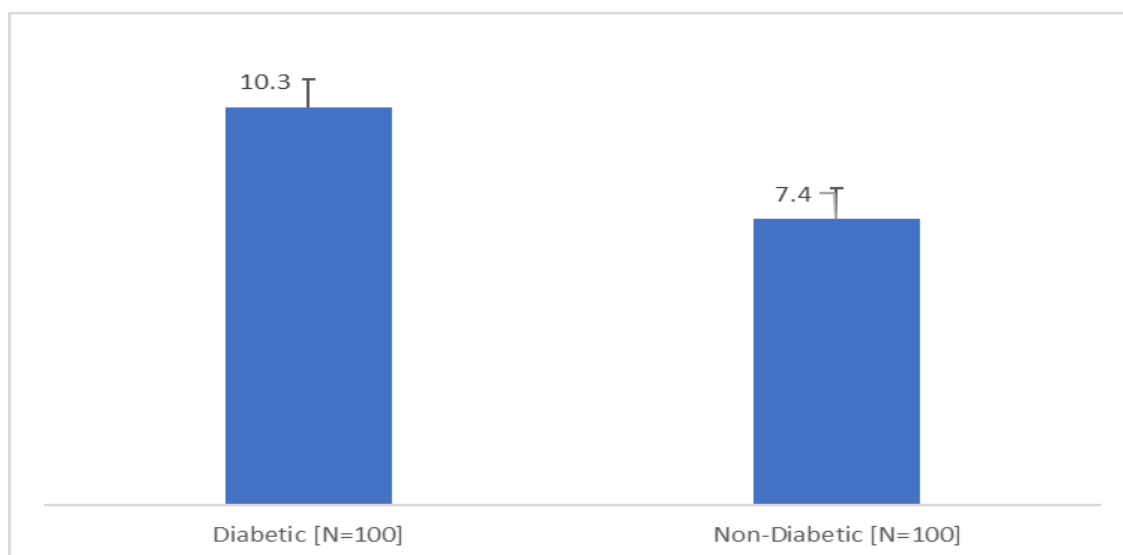


Fig. 2: Comparison of Mean Platelets Volume [MPV] between the diabetic and non-diabetic subjects

Table: 3 Group Comparison of Mean Platelets Volume [MPV] between the diabetic and non-diabetic subjects

Mean Platelet Volume group	Diabetic N=100	Non-Diabetic N=100	P Value
≤8.0 fL	4 [4.0]	71[71%]	0.000
8.01-10.00 fL	37[37%]	26[26%]	
10.01-12.00 fL	59[59%]	3[0.0]	

While studying MPV dispersion value, it was detected that 71% in non-diabetic group belonged to ≤ 8.00 fL MPV class interval with a mean MPV of 7.4 fL and 59% in diabetic group belonged to 10.01-12.00 fL MPV class interval with a mean MPV of 10.3 fL. ($p = <0.0001$) [Table 2&3 & Figure 1&2]

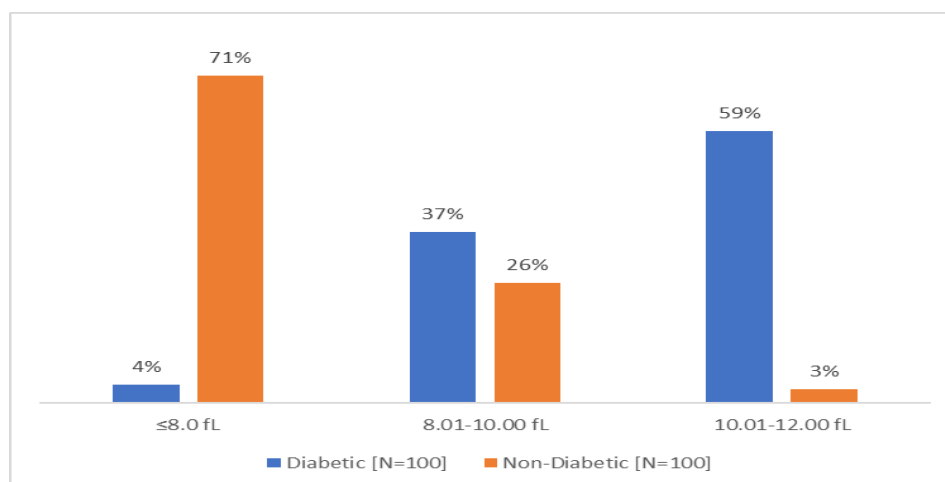


Figure 3 Comparison of Mean Platelets Volume [MPV] groups between the diabetic and nondiabetic subjects

DISCUSSION

Diabetes Mellitus is considered one of the advance metabolic syndrome due to chronic hyperglycemia and consequently affecting the peripheral nerves, kidneys, eyes, and micro- and macrovascular structures.^[24] Countries with the highest number of diabetics are in India (19 million), China (16 million), and the United States (14 million).^[153-154] The prevalence of diabetic microvascular complications is higher in individual with poor glycemic management, longer duration of DM, associated hypertension, and obesity.^[127] These factors lead to increased morbidities and mortalities in chronic hyperglycemia. Consequence due to DM and its vascular complications can cause a financial havoc, become a burden to a country's national economy and dent its growth. Highest number of diabetics in India faces such problems.

Platelets circulate and participate in hemostasis are small discoid blood cells. Platelets have function to seal the vascular defects through primary plug formation and provides the required phospholipid surface for the recruited and activated coagulation factors.^[154] Platelets change shape, adhere to subendothelial surfaces, secrete the contents of intracellular organelles, and aggregate to form a thrombus due to response to stimuli generated by the endothelium of blood vessels.^[154] These pro-aggregatory stimuli include thrombin, collagen, epinephrine, ADP (dense storage granules), and thromboxane A₂ (activated platelets).^[154] Thus, platelets may assume an important role in signaling of the development of advanced atherosclerosis in diabetes.^[155-156]

In our study, the mean platelet volume in the diabetic group was above than that of the nondiabetic group. Increased MPVs in patients with type II DM compared to normal population were reported in several studies.^[16,20, 126, 159] There

are limited number of studies about the relationship between MPV and diabetic nephropathy. Hekimsoy et al^[126] have shown that increased MPV was associated with microvascular complications such as microalbuminuria and retinopathy in 145 patients with Type II DM. Similarly, Papanas et al^[16] have demonstrated higher MPVs compared to normal population in their study with 265 patients with type II DM. Furthermore, higher MPVs were observed in patients with microalbuminuria and retinopathy compared to those without these conditions.

Another study has shown that increased platelet activity in the presence of glucose tolerance disorder contributed to an increased risk of cardiovascular disease^[20].

In our study, MPV was considerably higher in diabetics with HbA1c levels $\geq 6.5\%$ than in diabetics with HbA1c levels $< 6.5\%$. There was also a significant association between MPV and HbA1c, which was once more seen in the study done by Demirtunc et al.^[24] Therefore, it may be determined that glycemic management declines the hyper activity of the platelet function and thus may avert possible diabetic vascular complications. However, our study needs to be supplementary confirmed in larger studies.

These results are encouraging in that MPV may act as indicator of microvascular complications in diabetic patients. This is particularly important because:

- this indice is conveniently obtained from automated cell counters.
- microvascular complications of diabetes are significant causes of morbidity in diabetics and are usually spotted quite late in the course of disease.
- early signal of the presence of one of the complications would go a long way in dropping

the morbidity and health care costs in patients with diabetes.

CONCLUSION

Our study disclosed that in diabetes mellitus, platelets become more sensitive and aggregable and their mean platelet volume (MPV) is increased. The larger platelet size may be one factor in the increased risk of atherosclerosis associated with diabetes mellitus and associated vascular complications. Hence, MPV would be a useful predictive marker of cardio-vascular complications in diabetes. We also found that higher HbA1c concentration was directly proportional to increased MPV. However, the higher MPV as the cause or the end result of vascular complications needs to be further explored. Hence, we recommend that MPV can be used as a simple and cost effective tool to monitor the progression and management of DM and its cardio-vascular complications.

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