

**ORIGINAL RESEARCH**

# The role of platelet indices in diabetes mellitus - a comparative study of 160 cases among diabetic and non diabetic individuals in a tertiary care hospital in Eastern India

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## ABSTRACT

**Background:** The primary objective of this study is to find out the primary role of platelet indices and its comparative analysis between diabetics and non-diabetics alongside investigating their association with diabetic complications.

**Methods:** The study was conducted with a total of 160 patients (80 diabetics & 80 controls). The clinical history of patients was documented and blood samples were collected under proper aseptic conditions and analyzed using an automated hematology analyzer. Final data i.e., age, gender, Mean Platelet Volume (MPV), Plateletcrit (Pct), and associated complications was tabulated and statistics was done using the SPSS software.

**Results:** India is soon set to become the diabetes capital with a current prevalence rate of 9.3%. Diabetes Mellitus is a major cause of morbidity and mortality, worldwide. MPV and Pct were significantly raised in diabetics when compared to non-diabetics. Diabetic subjects with complications had higher values of Platelet Parameters.

**Conclusions:** This study primarily highlights the fact that increased platelet volume contributes to the hypercoagulable state of diabetes mellitus. Thus, platelet parameters serve as a simple yet effortless, cost-effective tool for predicting the prognosis of an impending thrombotic state in patients with diabetes mellitus.

**Key words:** diabetes mellitus; platelet volume; mean; platelet activations

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## INTRODUCTION

In Ancient India, ants were the principal investigators of a condition called madhumeha. If they were attracted to the urine, the said patient was believed to have the condition, which in the present day is known as diabetes. Diabetes is a term that originated from the Greek word *diabetes*, meaning “to siphon”, and interestingly, it was officially introduced in medical literature in 300 BC by the Egyptian physician Apollonius of Memphis.[1]

As per the World Health Organization (WHO), diabetes mellitus (DM) is an endocrine origin,

metabolic disorder distinguished by chronic hyperglycemia affecting carbohydrate, fat, and protein metabolism caused by defects in insulin secretion, insulin action, or both. Currently, 171 million people worldwide are suffering from diabetes, with India in the lead.[2]

Hyperglycemia caused by insulin deficiency or resistance induces glycation of platelet proteins, leading to a “prothrombotic state”. [3]. So, diabetics often have altered platelet parameters like Mean Platelet Volume (MPV) and Plateletcrit (PCT). Mean Platelet volume is an indicator of platelet production,

stimulation, and aggregation. Not only diabetics, but patients with stroke and metabolic syndrome also had an increased MPV.[4] On the other hand, increased Plateletcrit is strongly correlated with poor nerve conduction and the presence of neuropathy, especially in type 2 diabetes mellitus patients.[5]

In this study, we aimed to evaluate the role of platelet indices in diabetics as well as the association with the increased risk of complications.

## MATERIALS AND METHODS

This study is a cross-sectional, comparative type of study, where 80 patients of T2DM were included in this research in accordance with the inclusion and exclusion criteria along with 80 healthy subjects as the control group in between January 2023 and June 2023.

Patient particulars, symptoms, history of past illness and complications(if any) were properly collected and tabulated. In unison with the American Diabetes Association, DM was diagnosed with criteria of fasting blood glucose levels of  $\geq 126$  mg/dl or 2 hours post-prandial blood glucose levels of  $\geq 140$  mg/dl. Individuals with blood glucose levels below 110 mg/dl were considered as controls. Retinopathy, nephropathy, or neuropathy were some of the preliminary complications considered in this study. Treatment history i.e., patients on oral hypoglycemics were also considered and their effect on platelet function was also assessed.

For the platelet study, 2 ml of venous blood was drawn and collected in an EDTA (ethylene diamine tetraacetic acid) vial from the antecubital vein.

Automated Hematology Analyzer Sysmex XN 1000 was used to analyze the sample. Simultaneously, pre-prandial and post-prandial blood samples were collected and tested for blood glucose levels and HbA1C.

Appropriate Statistical analysis was done as and when required with the SPSS software version 24.0 (Statistical Product for Services Solutions).

### Exclusion Criteria

The following patients were excluded.

- Patients on antiplatelet drugs.
- Diagnosed malignancy cases.

## RESULTS

Among 80 diabetics and 80 control, the age ranged between 30 and 75 years. At 95% confidence interval (CI), the mean age of diabetics was  $50.4625 \pm 2.976$  years and that of the control group was  $49.4375 \pm 3.392$  years. It was observed that most of the patients were above 45 years of age. The total number of males and females including both cases and controls were 88(55%) and 72(45%), respectively. The diabetic group included 45 males (56.25%) and 35 females (43.75%) whereas the nondiabetic group had 43 males (53.75%) and 37 females (46.25%). Complications were associated with 33 subjects in the diabetic group (41.25%) among whom 20 were males and 13 were females.

The pre-prandial, post-prandial blood sugar levels and HbA1C were used to rule out any hidden diabetics if present in the control group. No diabetics were identified in the above category.

**Table 1: Comparison of Platelet indices in diabetic controls vs non-diabetic controls.**

Parameters	Diabetics Mean $\pm$ SD	Nondiabetics Mean $\pm$ SD	p-value
MPV	12.145 $\pm$ 0.353	8.8488 $\pm$ 0.342	<.00001
Pct	0.2573 $\pm$ 0.0115	0.2236 $\pm$ 0.003	<.00001

Mean MPV and mean Pct both were elevated in diabetics (MPV: 12.145  $\pm$  0.353, Pct: 0.2573  $\pm$  0.0115) in comparison to nondiabetics (MPV: 8.8488  $\pm$  0.342, Pct: 0.2236  $\pm$  0.003).

**Table 2: Analysis of Platelet indices in diabetic controls with and without complications.**

	MPV (fl, Mean $\pm$ SD)	Pct (% , Mean $\pm$ SD)
DM without complication	11.9596 $\pm$ 0.477	0.2557 $\pm$ 0.0173
DM with complication	12.4091 $\pm$ 0.517	0.2594 $\pm$ 0.0135
p-value	0.23	0.76

The mean MPV in Diabetic subjects with complications was higher (12.4091  $\pm$  0.517 fl) in respect to those without complications (11.9596  $\pm$  0.477 fl). However, both MPV and Pct did not show any statistical significance.

An incidental noteworthy observation in this study was that a handful of diabetic subjects mostly on SITAGLIPTIN, characteristically showed normalized platelet indices.

## DISCUSSION

Diabetes mellitus is a global health crisis and India is soon set to become the diabetes capital by the year 2030.[2,6] India has a 9.3% prevalence rate of

Diabetes Mellitus and is a major cause of morbidity and mortality.[6,7] Insulin is the major hormone secreted by the pancreas which is essential to counteract the effects of Platelet agonists like the Platelet activating factor(PAF). Usually in the event of an injury, PAF along with collagen, epinephrine, and ADP are triggers of the coagulation cascade. Hence, Insulin deficiency, resistance, or both leads to increased thrombotic activity and consequently to microvascular complications.[8] DM patients also have hypertriglyceridemia, a major cofactor contributing to platelet reactivity.[9]

In our study, the mean age of onset was 50.46 years. Studies by Carillo *et al.* demonstrated the mean age of

onset as 45.1 years and 45 years in men and women, respectively.[10]

Males with lower BMI levels were increasingly susceptible to developing diabetes compared to females [11] which was in concordance with our research.

Karamen *et al.* showed the association between elevated MPV and DM patients, singly alongside those having complications like cerebrovascular events, myocardial ischemia, and atherosclerosis.[12] We derived similar results, although the correlation of increased MPV to diabetes induced complications was statistically insignificant to comment upon. Currently, the utility of MPV as a diagnostic marker of inflammation is emphasized by many researchers.[13,14,15,16] Some studies also elucidated that altered MPV was hugely associated with the duration of diabetes.[17]

Plateletcrit (Pct) is defined as “the ratio of platelets per unit volume of blood”.[18] It is a superior parameter in contrast to MPV alone.[19] Innumerable studies have shown the direct repercussion of increased plateletcrit on the action potential conduction of peripheral nerves.[5] Ji *et al.* on the other hand observed that there was no significant interdependence between plateletcrit and diabetic complications like retinopathy.[20] Our study observed similar results.

## CONCLUSION

To conclude, our study primarily highlights the fact that increased platelet volume contributes to the hypercoagulable state of diabetes mellitus. Thus, platelet parameters serve as a simple yet effortless, cost-effective tool for predicting the prognosis of an impending thrombotic state in patients with diabetes mellitus.

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## CONFLICTS OF INTEREST

There are no conflicts of interest.

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