# Assessment of mean platelet volume in type 2 diabetes mellitus

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## Abstract
In the present century, Diabetes mellitus (DM) is a major public health problem worldwide. There is an increased activity of platelets in diabetes mellitus, which in due course of time might lead to vascular complications. The present study was carried out with an aim to evaluate the Mean Platelet Volume (MPV) in patients with type II DM by comparing with a healthy control group. We also looked for any correlation between MPV and HbA1c, fasting blood glucose (FBS) and post prandial blood glucose (PPBS). A total of 60 cases were included in the study, among which 30 were diabetic patients and 30 were non-diabetic controls. A statistically significant positive Pearson correlation was seen between MPV and HbA1c levels (p-value= <0.001) among the diabetic patients. However, there was no statistical correlation of MPV with FBS, and PPBS in the diabetic group.

**Keywords:** MPV, Diabetes Mellitus, HbA1c, FBS, PPBS.

## Introduction
Diabetes mellitus (DM) is emerging as a major public health problem worldwide. Genetic, environmental and pro-inflammatory factors play an important role in the pathogenesis of Type 2 Diabetes.[1] There is an increased activity of platelets as well as coagulation proteins in Diabetes Mellitus.[2]

It has been suggested by various studies that increased activity of platelets in due course of time leads to vascular complications in diabetic patients.[3,4] Researchers have also found that one of the causal factor in the development of myocardial infarction, thromboembolism and stroke is an increased Mean Platelet Volume (MPV).[5] It has also been suggested that in type 2 DM, cardiovascular complication may be associated with HbA1c[6] and MPV.[7,8]

The present study was carried out with an aim to evaluate the MPV in patients with type II DM by comparing with a healthy control group and also to look for any correlation between MPV and HbA1c, fasting blood glucose and post prandial blood glucose.

## Materials and Methods
The present study was carried out in the department of Pathology, Assam Medical College, Dibrugarh. Duration of study was from July to September 2017. This was a prospective study carried on 30 cases of type 2 diabetic patients and 30 healthy controls. Informed consent was taken from the patients. All the 30 cases as well as 30 controls were evaluated for the following tests; complete blood counts including MPV, fasting blood glucose, post prandial blood glucose, and HbA1c levels.

### Sample Collection
Blood was collected from the antecubital vein with sterile disposable needle and syringe. Required amount of blood was collected in EDTA vial and was labeled accordingly. The samples were kept in room temperature and all the samples were processed within 4 hours of collection.

Complete blood count was done by the Sysmex XS 800i (5 part automated haematology analyser). Complete blood count includes the following parameters; haemoglobin concentration, white blood cell count, differential count, red blood cell count, packed cell volume or hematocrit, mean corpuscular volume (MCV), mean haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), red cell distribution width (RDW), platelet count and mean platelet volume (MPV).

For blood glucose estimation, samples were collected in sodium fluoride vials. Estimation of blood glucose was done by the hexokinase method. For estimation of HbA1c, samples were collected in EDTA vial and were analysed by HPLC machine.

Statistical analysis: Statistical evaluation was done using Student's t test and Pearson correlation coefficient (r value as the coefficient). Data were expressed as mean +/- standard deviation. A p-value of <0.05 was considered significant.

## Results
In the present study, a total of 60 cases, comprising of 30 diabetic patients and 30 non-diabetic healthy controls, were included. Among the diabetic patients, there were 18 male and 12 female cases, whereas among the controls there were 14 males and 16 females. The mean age of the diabetic cases was 49.9 years, whereas that of the controls was 47.6 years. For the diabetic population, mean MPV was 11.3 +/- 1.6, while that of the control group was 12.14+/-1.36 (p-value =< 0.05). The mean FBS among the diabetic population was 157.65+/-6.09, while that of the control group was 80.68+/-3.52 (p-value =< 0.0001). The mean PPBS among the diabetics was 253.7+/-5.8, while the mean PPBS among controls was 128.3+/-4.1(p-value =< 0.0001). For the diabetic population, the mean HbA1c was 9.87+/-

2.69, while that of the controls was 5.73+/-0.35 (p-value=< 0.0001). (Table 1)

In the present study, a statistically significant positive Pearson correlation was seen between MPV and HbA1c levels (p-value=< 0.001) among the diabetic patients. However, no statistical correlation was found between MPV and FBS (p-value=0.31), PPBS (p-value=0.34) in the diabetic group. (Table 2)

**Table 1: Various parameters with their mean values among diabetics and control**

| Parameters | Diabetic | Non-diabetic | P value |
|---|---|---|---|
| Age | 49.9 | 47.6 | _ |
| Males | 18 (60%) | 14 (46.6%) | _ |
| Females | 12 (40%) | 16 (53.3%) | _ |
| MPV | 11.3 +/-1.6 | 12.14+/-1.36 | < 0.05 |
| FBS | 157.65+/-6.09 | 80.68+/-3.52 | < 0.0001 |
| PPBS | 253.7+/-5.8 | 128.3+/-4.1 | < 0.0001 |
| HbA1c | 9.87+/-2.69 | 5.73+/-0.35 | < 0.0001 |

**Table 2: Comparison of MPV to various parameters**

| Characteristic | | r-value | p-value |
|---|---|---|---|
| MPV | HbA1c | 0.61 | <0.001 |
| MPV | FBS | -0.19 | 0.31 |
| MPV | PPBS | -0.18 | 0.34 |

## Discussion

Diabetes mellitus is a group of metabolic disorders with the common feature of hyperglycemia, resulting from defects in insulin secretion, insulin action, or both. Persistent hyperglycemia causes long term complications of diabetes. Macrovascular disease causes atherosclerosis among diabetics, and it predisposes the patient to myocardial infarction, stroke and lower extremity ischemia. The effects of microvascular disease are profound mostly in the retina, kidney and peripheral nerves.[1]

MPV measures the average size of platelets in a volume of blood. In patients of myocardial infarction, an increase in MPV has been observed.[9]

In our study, the mean platelet volume was lower among the diabetic population than that of the controls, which was in contrast to the studies conducted by Shah et al,[10] Ates et al.[11] Hekimsoy et al,[12] Demirtunc et al,[13] Zuberi et al,[5] Jindal et al.[14] Papanas et al,[8] and Thomas et al.[15] A reason for this difference might be because of ongoing treatment of the diabetic population. However, Akinsegun A et al.[16] found MPV, similar to our finding.

Our study revealed, a statistically significant positive Pearson correlation between MPV and HbA1c levels (p-value=< 0.001). Similar result was reported by Demirtunc et al.[13] However, there was no correlation between MPV and FBS (p-value=0.31), and PPBS (p-value=0.34) in the present study. Hasan Z et al.[17] and Yenigün et al.[18] also did not find any association between MPV and FBS and PPBS in their studies.

One major limitation of our study was a relatively smaller sample size. Further studies should be carried out with greater number of cases and longer duration of follow up of the patients, to highlight more on the association of mean platelet volume and diabetes mellitus.

## Conclusion

The present study revealed, a statistically significant positive Pearson correlation between MPV and HbA1c. Hence, MPV can be used to monitor disease progression of Diabetes and might also be used as a potential prognostic marker of cardio-vascular complications in diabetes.

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**Conflict of Interest:** None.

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