Research Article

Evaluation of Mean Platelet Volume in Patients with Type 2 Diabetes Mellitus and Non-Diabetic Subjects

Shilpa Vijay Sankhe[1], Vyankatesh T. Anchinmane[2]*, Pramod S. Kamble[3]
1. Tutor, Department of Pathology, Zydus Medical College and Hospital, Dahod, Gujarat, India.
2. Professor, Department of Pathology, Zydus Medical College and Hospital, Dahod, Gujarat, India.
3. Associate Professor, GMERS Medical College, Vadnagar, Mehsana, Gujarat, India.
***Corresponding author's E-mail:** vyankatesha78@gmail.com

Received: 13-05-2026; **Revised:** 26-07-2026; **Accepted:** 30-07-2026; **Published online:** 20-08-2026.

ABSTRACT

Diabetes mellitus (DM) is rapidly growing non-communicable disease leading to serious complications. DM is classified into two major groups namely type 1 and type 2 diabetes. The type 2 DM cases comprise 90 to 95% of the total DM cases. The type 2 DM mainly comprises dyslipidemia, hypertension along with impaired hematological indices. As per literature, the mean platelet volume found to be significantly increased in the diabetic patients. In the present prospective study, the type 2 DM confirm diagnosed 100 cases and 100 non- diabetic cases were studied. It was observed that the mean platelet volume results were significantly increased in 99% type 2 DM cases, as compared to non-diabetic cases. The mean platelet volume parameter showed 98.5% accuracy, 98.01% sensitivity, 98.98% specificity, 99% positive predictive value (PPV) and 98% negative predictive value (NPV) for detection of type 2 DM when compared to non- diabetic cases group. It is concluded that mean platelet volume parameter was economical, non-invasive, reliable and low cost predictor for type 2 DM cases.

Keywords: Type 2 diabetes mellitus, mean platelet volume and predictor.

INTRODUCTION

The DM is a global public health problem. The cases of DM are rapidly increasing. In year 1990, the DM cases were 200 million and in year 2022, they were rose to 830 million cases and lead more than 2 million deaths in year 2021. [1] The precise early diagnosis DM in any individual helps in implementation of preventative and therapeutic measures to decrease the risk of DM and its in future associated complications. The chronic hyperglycemia in DM leads to leads to long-term complications and is responsible for metabolic, cellular and blood disturbances. [2]

The metabolisms of red blood cells (RBCs), white blood cells (WBCs), platelets and hemostasis systems are severely influenced by DM. The platelets have significant role in the initiation and propagation of process of thrombosis. In type 2 DM cases, the platelets show increased reactivity and activation when compared to healthy cases. [3]

Many studies are conducted in the past with the parameters- red blood cell (RBC) count, RBC indices, mean platelet volume, neutrophil/lymphocyte ratio (NLR) and platelet/neutrophil ratio (PNR) which showed significant differences between type 2 DM patients and controls.[4] The present study was conducted to evaluate accuracy of mean platelet volume for detection of type 2 DM cases.

MATERIALS AND METHODS

The prospective study was conducted for a period of 6 months in tertiary care Hospital. The type 2 DM diagnosed 100 cases and 100 non- diabetic cases were included in the study. The clinical diagnosis cases of anaemia, hypertension, congestive heart failure, thrombocytopenia and cases with history of stroke, antiplatelet medications etc., which may affect platelets size, were excluded from the study. The diagnosis of type 2 DM cases was confirmed with laboratory results of fasting and 2 hours postprandial blood sugar level of ≥126 mg/dl and ≥200 mg/dl respectively, along with the HbA1C (Glycated haemoglobin) results of more than 6.5%. The HbA1C result of less than 5.6% is labeled normal/ non-diabetic case. The results of blood sugar and HbA1C were obtained from fully automatic biochemistry analyzer. The mean platelet volume results were noted from CBC report received from 5 parts Haematology Analyser. [5] The SPSS software was utilized for statistical analysis. The mean platelet volume parameter was analyzed for accuracy, sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for diagnosis of type 2 DM cases.

RESULTS AND DISCUSSION

The DM is a chronic disease which is affecting mainly the peripheral nerves, kidneys, eyes along with vascular structures and is responsible for significant number of cases for morbidity and mortality regardless of their age, geographic location and sex. [1] As per International Diabetes Federation (IDF) report 2021, approximately 10.5% of that time world population was suffering with DM. For the projected DM cases in year 2045, the estimated healthcare cost is approximately 1054 billion$. [6] Hence, in view of severity of disease, the screening for DM cases becomes mandatory to avoid severe complications of undetected cases at earlier stage.

The type 2 DM is characterized by impaired insulin secretion along with increased tissue insulin resistance.

Hyperglycemia is one of the diagnostic finding in DM. It is observed that the acute hyperglycemia induces increased amount of platelet reactivity and their said activation can be observed in healthy persons. The similar platelet reactivity and increased activation is found in DM cases due to dysregulated signaling pathways and is mainly associated with hyperglycemia, hyperlipidemia, insulin resistance and oxidant state, which are found in DM. The continuous sustained hyperglycemia gives rise to a sequence of interrelated alterations which leads to endothelial dysfunction and vascular lesions of diabetic complications. [7]

The mean platelet volume is the marker of platelet size, function and activation and is measured hematology analyzers. [8] The larger size platelets are younger, more reactive and have tendency to aggregate. These larger size platelets release more amount of serotonin, β-thromboglobulin and produce more quantity of thromboxane A2 than small sized platelets; which leads to thrombotic vascular complications in type 2 DM. [7, 8]

In the present study, total one hundred type 2 DM cases were included in the study of which 73 were male and 27 were female. Also there were 100 non-diabetic cases which were utilized as control. Out of 100 type 2 DM cases, 99 cases showed significantly higher mean platelet volume than the non-diabetic control group. The mean platelet volume in type 2 DM cases showed sensitivity, specificity, accuracy, PPV and NPV of 98.01%, 98.98%, 98.5%, 99% and 98% respectively, on comparison of non-diabetic control group. (Table 1)

Table 1: Mean platelet volume (MPV) parameter evaluation for type 2 DM cases

	Type 2 DM Cases	Normal cases (Control)	Total	Predictive value (PV)
MPV Positive	99	02	101	**PPV (99.00 %)**
MPV Negative	01	98	99	**NPV (98.00%)**
Total	100	100	200	
	Sensitivity (98.01 %)	**Specificity (98.98%)**	**Accuracy (98.50 %)**	

The similar findings were observed in the past. Demirtunc et al. from his study results suggested a close relationship between poor glycemic control and increased platelet activity in patients with type 2 DM. [8] Hekimsoy Z et al. found significantly higher MPV in diabetic patients than in the non-diabetic controls in their study. [9] The similar findings were observed by Papanas N et al. in his study. [10] The limitations of this study are that the co-relation study between the association of mean platelet volume and the duration of diabetes and its complications were not done.

CONCLUSION

In this study, it was observed that in type 2 DM cases, the platelets become more reactive and their mean platelet volume is increased. DM and its complications are huge financial burden to any country's economy and going to increase tremendously in future. Hence, the simple, reliable, easily available and economical mean platelet volume parameter can be applied for early precise diagnosis of type 2 DM cases. Also, it will be helpful to control further morbidity and mortality due to type 2 DM cases. The more studies are necessary for to understand usefulness and limitations of mean platelet volume parameter in the diagnosis and prognosis of type 2 DM.

Source of Support: The author(s) received no financial support for the research, authorship, and/or publication of this article

Conflict of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

1. Diabetes. World Health Organization. 2023. Available from: https://www.who.int/news-room/fact-sheets/detail/diabetes
2. Agu KC. Diabetes mellitus: A review of some of the prognostic markers of response to treatment and management. Journal of Insulin Resistance. 2018; 3(1):1-0.
3. Christian M, Adebayo A, Chinyere N, Wisdom N. Some hematological parameters in diabetic patients in Port Harcourt Nigeria. Asian J Multidiscip Stud. 2015; 3(2):21–25.
4. Essawi K, Dobie G, Shaabi MF, Hakami W, Saboor M, Madkhali AM, Hamami AA, Allallah WH, Akhter MS, Mobarki AA, Hamali HA. Comparative Analysis of Red Blood Cells, White Blood Cells, Platelet Count, and Indices in Type 2 Diabetes Mellitus Patients and Normal Controls: Association and Clinical Implications. Diabetes Metab Syndr Obes. 2023; 16:3123-3132. https://doi.org/10.2147/DMSO.S422373
5. Mehta M, Prasad A, Kalapureddy V, Narayanam H, Kondaveeti SB. Insights into HbA1c: Key Role in Diabetes Screening and Associated Conditions - A Comprehensive Review. J Pharm Bioallied Sci. 2025; 17(Suppl 2):S1064-S1066. doi:10.4103/jpbs.jpbs_1631_24
6. GBD 2021 Diabetes Collaborators. Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: a systematic analysis for the Global Burden of Disease Study 2021. Lancet. 2023; 402(10397):203-234. doi:10.1016/S0140-6736(23)01301-6
7. Undas A, Wiek I, Stepien E, Zmudka K, Tracz W. Hyperglycemia is associated with enhanced thrombin formation, platelet activation, and fibrin clot resistance to

lysis in patients with acute coronary syndrome. Diabetes care. 2008; 31(8):1590-5.

8. Demirtunc R, Duman D, Basar M, Bilgi M, Teomete M, Garip T. The relationship between glycemic control and platelet activity in type 2 diabetes mellitus. Journal of Diabetes and its Complications. 2009; 23(2):89-94.
9. Hekimsoy Z, Payzinb B, Ornek T, Kandogan G. Mean platelet volume in Type 2 diabetic patients. J Diabetes Complications. 2004; 18:173-6.
10. Papanas N, Symeonidis G, Maltezos E, Mavridis G, Karavagel i E, Vosnakidis T. Mean platelet volume in patients with type 2 diabetes mellitus. Platelets. 2004; 15:475-8.