

Original Research

Evaluate Platelet Volume Indices with HbA1c in Diabetes Mellitus-type II patients and Non-Diabetics

Pawan Saini

MD (GEN Medicine), Senior Specialist, District Hospital, Sriganganagar, Rajasthan India

ABSTRACT:

Background: Diabetes mellitus (DM) is possibly one of the oldest diseases known to man. In Egyptian manuscript, it was first reported about 3000 years ago. Increased mean platelet volume (MPV) and platelet distribution width (PDW) can be related to thrombotic potential in diabetics. As very few studies have been done in this regard, our study aims to further explore the field which may aid in early detection and treatment of vascular complications in diabetic patients. **Materials & methods:** A total of 100 diabetic and 100 non-diabetic subjects were enrolled. Ethical approval was obtained from institutional ethical committee and written consent was obtained from all the patients after explaining in detail the entire research protocol. Comparative evaluation of platelet volume indices with HbA1c levels in diabetes mellitus type-2 and non diabetics was assessed using appropriate investigations. All the samples were processed within 1 hour of collection to minimize variations due to sample ageing. Platelet Volume Indices (PVI) were analysed using auto-analyser. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. **Results:** Mean MPV values among patients of diabetic and non-diabetic was 10.95 and 9.95 respectively. Mean PDW values among patients of diabetic and non-diabetic was 16.56 and 16.12 respectively. Non-significant correlation of glycaemic profile with platelet volume indices was observed in overall diabetic group. **Conclusion:** Mean PDW values among patients of diabetic and non-diabetic was 16.56 and 16.12 respectively. Non-significant correlation of glycaemic profile with platelet volume indices was observed in overall diabetic group.

Key words: Diabetes, Platelet indices

Received: 21 November, 2021

Accepted: 27 December, 2021

Corresponding author: Pawan Saini, MD (GEN Medicine), Senior Specialist, District Hospital, Sriganganagar, Rajasthan India

This article may be cited as: Saini P. Evaluate Platelet Volume Indices with HbA1c in Diabetes Mellitus-type II patients and Non-Diabetics. J Adv Med Dent Scie Res 2022;10(1):125-127.

INTRODUCTION

Diabetes mellitus (DM) is possibly one of the oldest diseases known to man. In Egyptian manuscript, it was first reported about 3000 years ago. Type 2 DM is a part of metabolic syndrome that comprises of hypertension, dyslipidemia, impaired fibrinolysis and increased procoagulation factors. There is increased rate of morbidity and mortality in type 2 DM which is attributed due to vascular disorders such as coronary artery disease. Type 2 DM induces atherosclerosis, dysregulated coagulation profile and circulation dysfunction. It has been reported that cardiovascular mortality risk is correlated with blood glucose concentration in type 2 DM patients. Increased blood glucose levels (hyperglycaemia) are thought to have harmful effects on the blood vessels.¹⁻⁴ DM is taken into account as a “prothrombotic state” which is due to sustained hyperglycaemia,

dyslipidemia and insulin resistance that causes endothelial and pericyte injury. There is enhanced platelet activity in diabetes which is because of altered platelet morphology and function that contributes to the current “prothrombotic state”. Larger platelets contain denser granules and are metabolically and enzymatically more active than smaller platelets, hence even have high thrombotic potential. Therefore, increased mean platelet volume (MPV) and platelet distribution width (PDW) can be related to thrombotic potential in diabetics.⁵⁻⁷ As very few studies have been done in this regard, our study aims to further explore the field which may aid in early detection and treatment of vascular complications in diabetic patients.

MATERIALS AND METHODS

The present study was conducted in the department of general medicine of medical institute and it included evaluation Platelet Volume Indices with HbA1c in Diabetes Mellitus-type II patients and Non-Diabetics. A total of 100 diabetic and 100 non-diabetic subjects were enrolled. Ethical approval was obtained from institutional ethical committee and written consent was obtained from all the patients after explaining in detail the entire research protocol. Comparative evaluation of platelet volume indices with HbA1c levels in diabetes mellitus type-2 and non diabetics was assessed using appropriate investigations. For taking blood samples from the patient, SOP (Standard Operational Procedure) was used as below-

Venous blood samples were collected from all the subjects in both groups under proper aseptic precautions for complete blood count (Platelet indices) and HbA1c levels. 3 ml of blood was

collected in a vacutainer containing EDTA for CBC (Platelet indices) and HbA1c. All the samples were processed within 1 hour of collection to minimize variations due to sample ageing. Platelet Volume Indices (PVI) were analysed using auto-analyser. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Chi-square test, student t test and Pearson's correlation was used for evaluation of level of significance.

RESULTS

Mean age of the diabetic and non-diabetic subjects was 43.5 years and 41.8 years respectively. Mean MPV values among patients of diabetic and non-diabetic was 10.95 and 9.95 respectively. Mean PDW values among patients of diabetic and non-diabetic was 16.56 and 16.12 respectively. Non-significant correlation of glycaemic profile with platelet volume indices was observed in overall diabetic group.

Table 1: Platelet Volume Indices

Platelet Volume Indices	Diabetic	Control	p- value
MPV	10.92	9.95	0.704
PDW	16.56	16.12	0.118

Table 2: Correlation of glycaemic profile with platelet volume indices within overall diabetic group (Group A + Group B)

Spearman's rho correlation		MPV	PDW
HbA1c	Correlation coefficient	0.042	0.098
	p- value	0.512	0.358
	N	100	100

*: Significant

DISCUSSION

Diabetes Mellitus (DM) is characterized by hyperglycemia accompanied with the biochemical alterations in carbohydrate, protein and lipid metabolism.¹¹ There are two general types of diabetes mellitus, type 1 diabetes which is also called as insulin- dependent diabetes mellitus (IDDM) and is caused by lack of insulin secretion. The second type is type 2 diabetes also called as (NIDDM), is caused by decreased sensitivity of target tissues to metabolic effects of insulin. This reduced sensitivity to insulin is often called insulin resistance.⁸⁻¹⁰

Increase in incidence of DM is a major health concern. Once considered, a disease of the western countries, type 2 DM is now a global health priority. The problem of DM has been estimated to be 3-5%. Type-2 DM accounts for about 80% of DM.⁸⁻¹¹

In the present study, Mean age of the diabetic and non-diabetic subjects was 43.5 years and 41.8 years respectively. Mean MPV values among patients of diabetic and non-diabetic was 10.95 and 9.95 respectively. Saluja M et al conducted a study on 160 Type 2 DM patients to determine the MPV in diabetics with different glycaemic control (HbA1C). All patients were divided into 2 groups, group A and group B. Group A consisted of patients having HbA1C \leq 8 % and Group B consisted of patients

having HbA1C $>$ 8 %. Automated blood cell counters were used to measure platelet counts and MPV in 160 patients. Blood glucose levels and HbA1C were also measured. It was observed in their study that MPV was raised in Group B diabetics as compared to the diabetics with lower HbA1C. Hence, it was concluded that MPV had a positive correlation with fasting blood glucose and HbA1C levels (P=0.0001). Their results showed significantly higher MPV in diabetic patients with higher HbA1C (poor glycaemic control).¹²

In the present study, Mean PDW values among patients of diabetic and non-diabetic was 16.56 and 16.12 respectively. Non-significant correlation of glycaemic profile with platelet volume indices was observed in overall diabetic group. A study conducted by Bhatta S et al determined the MPV and platelet count in patients with Type 2- DM, impaired fasting glucose and non diabetic controls. In this study, 300 subjects were included which were further grouped into 100 subjects in each group on the basis of fasting blood glucose levels. Groups were as – group- 1 included non-diabetic controls, group-2 included patients with impaired fasting glucose levels and group-3 included patients suffering from type-2 DM. It was observed that mean platelet volume was significantly higher in diabetics and persons with impaired fasting glucose levels (7.40 \pm 0.77 fl and 6.62

± 0.58 fl), respectively as compared to non diabetic controls (6.06 ± 0.41 fl) ($p < 0.001$). There was no significant difference in the platelet count between the three groups ($p = 0.869$). Mean platelet volume was observed to be increased in patients with type 2 diabetes mellitus and impaired fasting glucose levels.¹³ Ali MH et al assessed the alteration of blood parameters in diabetic patients and compared them with healthy controls. In this study, 230 diabetic patients and 100 healthy controls were included, which consisted of 46 males and 184 females; with the age group ranging from 20-70 years. Statistically significant difference was observed in RBC and WBC count, MCV and RDW with p-value of ≤ 0.05 , whereas no significant difference was observed in platelet parameters with p-value of ≥ 0.05 when compared with controls. Blood parameters such as RBC's, MCV, RDW, and WBC's were significantly higher among diabetic patients.¹⁴

CONCLUSION

In controlled diabetic patients, platelet indices are unaffected.

REFERENCES

1. Yilmaz T, Yilmaz A. Relationship between Altered Platelet Morphological Parameters and Retinopathy in Patients with Type 2 Diabetes Mellitus. *J Ophthalmol*. 2016;2016:1-5.
2. Citirik M, Beyazyildiz E, Simsek M, Beyazyildiz O, Haznedaroglu IC. MPV may reflect subclinical platelet activation in diabetic patients with and without diabetic retinopathy. *Eye*. 2015 Mar;29(3):376-9.
3. Shilpi K, Potekar RM. A Study of Platelet Indices in Type 2 Diabetes Mellitus Patients. *Indian J Hematol Blood Transfus*. 2018 Jan;34(1):115-20.
4. Sushma KL, Rangaswamy M. Study of Platelet Indices in Type 2 Diabetic Patients and Its Correlation With Vascular Complications. *Ann Pathol Lab Med*. 2017 Oct 30;4(5):A591-8.
5. Demirtunc R1, Duman D, Basar M, Bilgi M, Teomete M, Garip T. The relationship between glycemic control and platelet activity in type 2 diabetes mellitus. *J Diabetes Complications*. 2009 Mar-Apr;23(2):89-94.
6. Kodiatte TA, Manikyam UK, Rao SB. Mean platelet volume in type 2 Diabetes Mellitus. *J Lab Physicians*. 2012; 4:5-9.
7. Akinsegun A, Akinola Olusola D, Sarah JO, Olajumoke O, Adewumi A, Majeed O, Anthonia O et al. Mean platelet volume and platelet counts in type 2 diabetes: mellitus on treatment and non-diabetic mellitus controls in Lagos, Nigeria. *Pan Afr Med J*. 2014 May 12;18:42.
8. Muhammad I, Haider I, Badshah A. Correlation between glycosylated hemoglobin and platelet activity among patients with type 2 diabetes mellitus. *J Postgrad Med Inst*. 2015; 29(2):105-8.
9. Bhattacharjee P, Datta A, Debbarma R.K., Das S.K. Platelet indices in diabetics and influence of glycemic control – a hospital based study in North-East India. *Int J Med Res Rev* 2016;4(12):2186-2192.doi:10.17511/ijmrr. 2016.i12.18.
10. Jaman S, Rezwan S, Alam S, Islam R. Association of Mean Platelet Volume and Platelet Distribution Width with HbA1c. *J Endocrinol Diab*. 2017; 4(4):1-6.
11. Zaccardi F1, Rocca B2, Rizzi A3, Ciminello A4, Teofili L4, Ghirlanda G3, De Stefano V4, Pitocco D3. Platelet indices and glucose control in type 1 and type 2 diabetes mellitus: A case-control study. *Nutr Metab Cardiovasc Dis*. 2017 Oct;27(10):902-909.
12. Saluja M1, Swami YK2, Meena SR3. Study of Impact of Glycemic Status (HbA1c) on Platelet Activity measured by Mean Platelet Volume & Vascular Complications in Diabetics. *J Assoc Physicians India*. 2019 Apr;67(4):26-29.
13. Bhatta S1, Singh S2, Gautam S3, Osti BP1. Mean Platelet Volume and Platelet Count in Patients with Type 2 Diabetes Mellitus and Impaired Fasting Glucose. *J Nepal Health Res Council*. 2019 Jan 28;16(41):392-395.
14. Ali MH, Hassan AJ. Assessment of the alteration of blood indices in patients with type 2 diabetic mellitus: A cross-sectional study. *Mustansiriyah Med J* 2019;18:24-30