https://doi.org/10.46389/rjd-2024-618
www.jrdiabet.ro

Rom J Diabetes Nutr Metab Dis
2024; Volume 31, Issue 1, pages 618-624

PLATELET SIZE IN DIABETES: A COMPREHENSIVE ANALYSIS OF MEAN PLATELET VOLUME IN MICROVASCULAR COMPLICATIONS OF DIABETES

Dr Jibin Simon[1], Dr K.V Rajalakshmi[2], Dr Ananthakumar P.K[3], Dr Bhubaneswar[4] & Dr Sharan Bose[5]

[1]Postgraduate, Department of General Medicine Saveetha Medical College and Hospital, 162, Poonamallee High Rd, Poonamallee, Chennai, Tamil Nadu 600077, India
[2]Professor, Department of General Medicine Saveetha Medical College and Hospital, 162, Poonamallee High Rd, Poonamallee, Chennai, Tamil Nadu 600077, India
[3]Associate Professor, Department of General Medicine Saveetha Medical College and Hospital, 162, Poonamallee High Rd, Poonamallee, Chennai, Tamil Nadu 600077, India
[4]Assistant Professor, Department of General Medicine Saveetha Medical College and Hospital, 162, Poonamallee High Rd, Poonamallee, Chennai, Tamil Nadu 600077, India
[5]Postgraduate Department of General Medicine Saveetha Medical College and Hospital, 162, Poonamallee High Rd, Poonamallee, Chennai, Tamil Nadu 600077, India

ABSTRACT

Introduction: Diabetes mellitus (DM) poses a global health challenge, with associated vascular complications contributing to morbidity and mortality. Mean platelet volume (MPV) has emerged as a marker of platelet activity, reflecting increased reactivity and thrombotic risk. This study investigates the relationship between MPV and microvascular complications in diabetes

Materials and methods: A case-control study involving 330 patients, including 165 with diabetic retinopathy (cases) and 165 without (controls), was conducted at Saveetha Medical College. Patients' MPV and HbA1c levels were measured, and statistical analysis was performed using IBM SPSS Statistics

Observation and results: The majority of patients were aged 41-60 and predominantly male. Significant differences in MPV and HbA1c were observed between the case and control groups ($p < 0.01$). The case group exhibited a significantly higher mean MPV compared to controls (12.75 vs. 10.67, $p = 0.0005$), indicating a potential biomarker for microvascular complications in diabetes.

Conclusion: Increased MPV serves as a predictive marker for microvascular complications in diabetes, facilitating early diagnosis and risk assessment. Utilizing MPV in clinical practice could

enhance the management and prevention of diabetic vascular issues.
Keywords: Mean Platelet Volume (MPV), Diabetic Retinopathy, Diabetes Mellitus, Microvascular complications of Diabetes.

INTRODUCTION

Diabetes mellitus (DM) is a worldwide public health issue [1]. The World Health Organisation estimates that 346 million people globally suffered from diabetes in 2011 [2]. It is highlighted that elevated platelet activity contributes to the development of vascular problems associated with this metabolic disorder [3]. Patients with diabetes are more likely to experience micro- and macrovascular complications, and platelets may play a role in these conditions by changing the form and function of the blood cells [4]. MPV is a marker of platelet size and activity on average. Larger platelets are younger, more reactive, and more aggregable. As a result, they have denser granules, emit more serotonin and -thrombomodulin, and create more thromboxane A2 [5]. All of them can have a pro-coagulant effect, resulting in thrombotic vascular problems. This shows a link between platelet function, particularly MPV, and diabetic vascular problems, implying that changes in MPV reflect the state of thrombogenesis [6]. High MPV is emerging as a new risk factor for vascular complications related to diabetes, particularly atherothrombosis. [7]. The study's purpose is to look into the relationship between MPV in people with diabetes who have Microvascular complications of Diabetes.

MATERIALS AND METHODS

Study design: Case-control study
Sample size: 330 patients
Study population: A total of 165 patients aged above 18 years.

Methodology and research design:

At Saveetha Medical College, 330 people over the age of 18 will participate in case-control research, comprising 165 patients with diabetic retinopathy—microvascular consequences of the disease—and 165 patients without such difficulties. An ophthalmoscopic examination was used to evaluate diabetic retinopathy. Every patient had their HbA1C and mean platelet volume investigated.

Inclusion criteria:

Type 1 & Type 2 Diabetes Mellitus patients aged more than 18 Years who presented to Medical OPD and were admitted to Saveetha Medical College & Hospital.

Exclusion criteria:

- Patients with Gestational Diabetes Mellitus
- Patients on antiplatelets

- Recent or acute systemic infection
- History of clinical evidence of heart failure
- Patients with chronic liver disease

OBSERVATION AND RESULTS

Data was collected with the help of IBM SPSS Statistics for Windows, Version 23.0, and the acquired data were analysed. (IBM Corp, Armonk, NY). Frequency analysis, percentage analysis, and mean & S.D. were employed for categorical and continuous variables to describe the data using descriptive statistics. The Independent sample t-test was employed to determine the significant difference between the bivariate samples in Independent groups. Chi-Square analysis was performed to determine the relevance of qualitative categorical data. In both of the aforementioned statistical models, a probability value of.05 is considered significant.

Table 1: Age distribution

Age distribution		
	Frequency	Percent
Upto 20 yrs	5	1.5
21 - 30 yrs	34	10.3
31 - 40 yrs	77	23.3
41 - 50 yrs	85	25,7
51 - 60 yrs	69	20.9
61 - 70 yrs	41	12.4
71 - 80 yrs	15	4.5
Above 80 yrs	4	1.2
Total	330	100. 0

Table 2: Gender distribution

Gender distribution		
	Frequency	Percent

Female	162	49
Male	168	51
Total	330	100. 0

Table 3: Diabetic retinopathy distribution

Diabetic retinopathy		
	Frequency	Percent
Controls (no Retinopathy)	165	50
Cases (with Retinopathy)	165	50
Total	330	100. 0

The above figure shows diabetic retinopathy distribution were Normal is 38 .2 %, Retinopathy is 61.8%

Table 8: Comparison of MPV between the Groups by Independent sample t-test

Variable	Groups	N	Mean	SD	t-value	p-value
MPV	Cases	165	12.75	1.87	12.397	0.0005 **
	Controls	165	10.67	1.07		
** Highly Statistical Significance at p < 0.01 level						

Table 10 : Comparison of Hba1c between the Groups by Independent sample t

-test

Variable	Groups	N	Mean	SD	t-value	p-value
Hba1 c	Cases	165	8.67	1.76	7.468	0.0005 **
	Controls	165	7.50	0.99		
** Highly Statistical Significance at p < 0.01 level						

Discussion

Diabetes mellitus (DM) is a worldwide public health issue [1]. The World Health Organisation estimates that 346 million people globally suffered from diabetes in 2011 [2]. It is highlighted that elevated platelet activity contributes to the development of vascular problems associated with this metabolic disorder

Chronic hyperglycemia, a feature of diabetes mellitus (DM) is a complex metabolic condition that can lead to issues affecting the kidneys, eyes, peripheral nerves, and micro- and macrovascular systems [8]. Individuals with poor glycemic control, long-standing diabetes mellitus, concomitant hypertension, and obesity have increased rates of diabetic microvascular complications [9]. Given the rising frequency of diabetes mellitus and its associated vascular loads, it is imperative to prevent vascular complications and closely monitor the disease. The two basic characteristics of type 2 diabetes are elevated tissue insulin resistance and decreased insulin secretion [10]. Persistent hyperglycemia induces a number of connected changes that might result in vascular lesions and obvious endothelial dysfunction in diabetic complications [11]. Possible processes by which elevated glucose promotes vascular abnormalities include disruptions in polyol pathways, activation of protein kinase C, and formation of advanced glycation end products [12].

Platelets undergo morphological changes, attach to subendothelial surfaces, secrete intracellular organelle contents, and aggregate to form a thrombus in response to stimuli produced by the endothelium of blood arteries [13]. Therefore, platelets may play a crucial role in alerting diabetics to the onset of severe atherosclerosis [14]. The mean platelet volume and activity are indicated by MPV. Younger, more irritable, and reactive platelets are larger in size. Because of this, compared to smaller platelets, they have denser granules, emit more serotonin and β-thromboglobulin, and make more thromboxane A2 [15]. Any of these could have a procoagulant effect and result in consequences from thrombotic vascular disease. This implies a connection between diabetic vascular problems and platelet function, particularly MPV, suggesting that variations in MPV reflect the state of thrombogenesis [15]. An increased risk factor for the vascular consequences of diabetes mellitus, of which atherothrombosis is a significant cause, is high MPV [16]. As a result,

DM is thought to be a "prothrombotic state" characterized by elevated platelet reactivity [17].

The majority of the patients in the current study were between the ages of 41 and 50, then 31 and 40 and 51 and 60. The study sample was predominately male. The two groups had statistically significant variations in MPV and HbA1c. The control group's mean MPV was 10.67, while the group with microvascular problems had a mean MPV of 12.75 ($p = 0.0005$). We discovered that the group with diabetic retinopathy, had a mean platelet volume that was statistically significant. According to this, an increase in mean platelet volume may serve as a biomarker for the early diagnosis of potential problems in diabetes.

Conclusion

Our study shows an increase in MPV, associated with microvascular complication of diabetes. A possible explanation for the higher risk of atherosclerosis linked to diabetes mellitus and its related vascular problems could be the larger size of platelets. Therefore, MPV might be a helpful prognostic indicator for diabetic microvascular complications. It can thus be used as an easy-to-use, reasonably priced tool for tracking and calculating the risk of microvascular problems.

References

1. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections. *Diabetes Care.* 1998;21:1414–31
2. World Health Organization August 2011
3. 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. *J Diabetes Complications.* 2009;23:89–94
4. Hekimsoy Z, Payzinb B, Ornek T, Kandogan G. Mean platelet volume in Type 2 diabetic patients. *J Diabetes Complications.* 2004;18:173–6.
5. Chang HA, Hwang HS, Park HK, Chun MY, Sung JY. The Role of Mean Platelet Volume as a Predicting Factor of Asymptomatic Coronary Artery Disease. *Korean J Fam Med.* 2010;31:600–6
6. Bae SH, Lee J, Roh KH, Kim J. Platelet activation in patients with diabetic retinopathy. *Korean J Ophthalmol.* 2003;17:140–4.
7. Zuberi BF, Akhtar N, Afsar S. Comparison of mean platelet volume in patients with diabetes mellitus, impaired fasting glucose and non-diabetic subjects. *Singapore Med J.* 2008;49:114–6.
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. *J Diabetes Complications.* 2009;23:89–94
9. Zuberi BF, Akhtar N, Afsar S. Comparison of mean platelet volume in patients with diabetes mellitus, impaired fasting glucose and non-diabetic subjects. *Singapore Med J.* 2008;49:114–6

10. 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. *J Diabetes Complications.* 2009;23:89–94
11. Bae SH, Lee J, Roh KH, Kim J. Platelet activation in patients with diabetic retinopathy. *Korean J Ophthalmol.* 2003;17:140–4
12. Maitra A. The Endocrine System. In: Kumar V, Abbas AK, Fausto N, Aster JC, editors. *Robbins and Cotran Pathologic Basis of Disease.* 8th ed. New Delhi: Elsevier; 2010. pp. 1097–164
13. Mitchell RN. Hemodynamic Disorders, Thromboembolic Disease and Shock. In: Kumar V, Abbas AK, Fausto N, Aster JC, editors. *Robbins and Cotran Pathologic Basis of Disease.* 8th ed. New Delhi: Elsevier; 2010. pp. 111–34
14. Colwell JA, Nesto RW. The platelet in diabetes-focus on prevention of ischemic events. *Diabetes Care.* 2003;26:2181–8.
15. Hekimsoy Z, Payzinb B, Ornek T, Kandogan G. Mean platelet volume in Type 2 diabetic patients. *J Diabetes Complications.* 2004;18:173–6
16. Zuberi BF, Akhtar N, Afsar S. Comparison of mean platelet volume in patients with diabetes mellitus, impaired fasting glucose and non-diabetic subjects. *Singapore Med J.* 2008;49:114–6.
17. Jindal S, Gupta S, Gupta R, Kakkar A, Singh HV, Gupta K, et al. Platelet indices in diabetes mellitus: indicators of diabetic microvascular complications. *Hematology.* 2011;16:86–9

