



EVALUATION OF ACTIVITY OF PLATELETS IN DIABETES MELLITUS - A KEY ROLE IN DIAGNOSIS

Dr.Manoharan A

Assistant professor, Department of Pathology, Sri Lakshmi Narayana institute of medical sciences, Puducherry.

Dr. Ravichandran.S

Assistant professor, Department of Biochemistry, Sri Lakshmi Narayana institute of medical sciences, Puducherry. - Corresponding author

Dr.Pammy Sinha

Prof., Professor and Head, Department of Pathology, Sri Lakshmi Narayana institute of medical sciences, Puducherry.

Dr.Jayalakshmi.G

Prof., Dean & Professor in Department of Microbiology, Sri Lakshmi Narayana institute of medical sciences, Puducherry

ABSTRACT

Introduction: Platelets or thrombocytes are small, disc shaped clear cell fragments which measure 2–3 μm in diameter, which are derived from its precursor megakaryocytes by fragmentation. They are anucleated cells which plays a vital role in hemostasis and thrombosis. Platelets normally circulate in the bloodstream in a quiescent state, but it gets activated following damage to the vessel wall, leading to rapid formation of a platelet aggregate or vascular plug and occlusion of the site of damage. The morphological variations in assessing Mean Platelet Volume (MPV) have important implications for assessing the functional expressions of platelets. The activity of platelets can be very well observed in the mean platelet volume (MPV), which acts as a marker of platelet activity. The MPV is affected by aging of platelets and varies according to the balance between production and destruction. Platelet count and MPV are strongly associated with prognosis in critically ill patients. Elevated MPV values are noted in uncontrolled diabetes mellitus (DM).

Objectives:

1. To compare the MPV values among diabetics along with healthy non-diabetic people.
2. To determine the age and sex group among diabetic and non-diabetic patients.

Materials and Methods: The patients were classified as diabetic patients and non diabetic patients and mean platelet volume (MPV) were calculated. Totally 295 patients were taken for our study, out of which 180 were diabetic and 115 were non diabetic. Patient's medical history was obtained. The parameters were analysed statistically.

Results: Among diabetic patients, 120 patients were males and 60 patients were females and mean MPV was 11.0 fL. In 115 non-diabetic controls 82 patients were males and 33 patients were females and mean MPV was 9.5 fL. Among diabetics the mean age group was 55 \pm 5 and in non diabetics mean age group was 40 \pm 5. Among diabetic patients 30 patients (16.6%) showed clinical symptoms, in which they showed MPV higher than 11.5.

Conclusion: Mean platelet volume values are significantly elevated in uncontrolled diabetic patients when compared with non diabetic patients. And these patients with higher MPV will be more prone for complications. So, by assessing MPV values we can predict the diabetic patients whether they are prone to severity or not. MPV can be considered as a prognostic marker for disease progression for diabetes.

KEYWORDS : Mean platelet volume, Diabetes mellitus.

INTRODUCTION:

Platelets or thrombocytes are small, disc shaped clear cell fragments which measure 2–3 μm in diameter¹, which are derived from its precursor megakaryocytes by a process of fragmentation.² They are anucleated cells which involves a key role in hemostasis and thrombosis. Platelets normally flow in the bloodstream in a quiescent state, but it gets activated following damage to the vessel wall, leading to rapid formation of a platelet aggregate or vascular plug and occlusion of the site of damage.³ The morphological variabilities in assessing Mean Platelet Volume (MPV) have vital implications for analyzing the functional activity of platelets. Increased activity has been noted in Platelets with increased volume which indicates Mean platelet volume as a marker of platelet activity. The MPV is affected by aging of platelets and varies according to the balance between production and destruction. Platelet count and MPV are strongly associated with prognosis in critically ill patients^{4,5}.

Diabetes mellitus (DM) is the major spreading health problem all over the world with increased death rate due to the increased risk of developing atherosclerosis and a variety of turbulence at the both cellular as well as metabolic levels. More the granules more the metabolic activity of platelets, which is seen in larger platelets. This might be the basis of the link between increased MPV and increased activity^{4,5,6}.

Normally, the platelet count ranges between 150,000/ μl and 400,000/ μl and the mean platelet volume varies between 7.5 and

10.5 fl. There are various studies stating that age determines the size of the platelets and thus MPV and few studies states that there is no correlation between the size of the platelets and age. This controversy study makes to further research in the platelet activity. The platelets which are immature or those which are recently released have larger amount of granules when compared to mature smaller platelets. This indicates the larger activity of platelets. These larger platelets are released from the bone marrow and exhibit some alterations in function as compared to smaller platelets. The electron microscopy shows the presence of glycogen as well as classic masses in platelets. The increased metabolic activity is due to increased process of glycogenolysis and glycolysis which is very well observed in larger platelets which helps to measure the platelet functional activity.⁷⁻¹⁰ Thus, the Platelet size (MPV) has become an key marker of platelet function.

Aim

1. To compare the mean platelet volume between diabetic and non-diabetic patients.
2. To determine the age and sex group among diabetic and non-diabetic patients.

Materials and Methods

The patients were classified as diabetic patients and non diabetic patients and mean platelet volume (MPV) were calculated. 295 patients were studied out of which 180 were diabetic and 115 were non diabetic. Patient's medical history was obtained. The results were analysed statistically.

Results

Among diabetic patients, 120 patients were males and 60 patients were females and mean MPV was 11.0 fL. In 115 non-diabetic controls 82 patients were males and 33 patients (Table 1) were females and mean MPV was 9.5 fL. Among diabetics the mean age group was 55±5 and in non diabetics mean age group was 40±5. Among diabetic patients 30 patients(16.6%) showed clinical symptoms, in which they showed MPV higher than 11.5.

Table 1 and chart 1: Patients based on sex group

Patients	Male	Female
Diabetic	120	60
Non-Diabetic	82	33

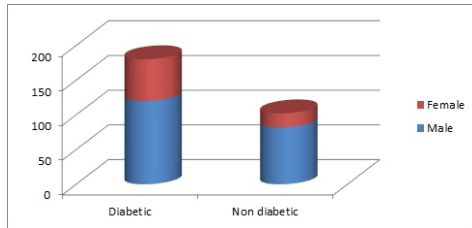


Chart 2: Mean age group of patients:

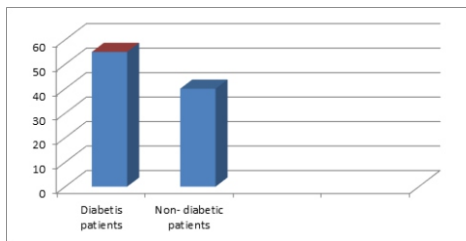
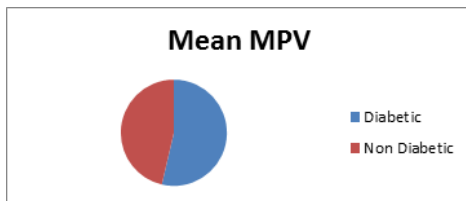


Table 2 and Chart 3: MPV values among diabetic and non-diabetic patients:

Patients	Mean MPV
Diabetic	11.0
Non-Diabetic	9.5



DISCUSSION:

Diabetes mellitus (DM) is a common metabolic disorder which is globally spreading which share the common phenomenon of hyperglycemia. There are multiple classification of DM present and are caused by the multiple factors which include genetics, environmental factors, and life-style choices. Thus DM are multifactorial. Based on the etiology of DM, the important factors which contribute to DM are reduced insulin secretion, decreased glucose utilization and increased glucose production. This metabolic activity in DM affects multiple organ systems which causes end-stage renal disease (ESRD), nontraumatic lower extremity amputations, adult blindness and even multiorgan failure. The incidence of DM is gradually worldwide and it will be the leading cause of morbidity and mortality.¹¹⁻¹²

CLASSIFICATION

Earlier classification of DM is based on the age of onset or type of therapy. Recently, the two broad categories of DM are designated type 1 and type 2. Among Type 1 DM are of 2 types 1A and 1B. Type 1A diabetes mellitus(DM) results from the destruction of autoimmune beta cell, which leads to deficiency in insulin whereas type 1B diabetes mellitus(DM) there is shortage of immunologic

markers suggestive of an beta cell destruction by autoimmune process.

Second group is the type 2 DM, which is categorized by insulin resistance of variable degree, high glucose production, and impaired insulin secretion. Here also the genetic and metabolic defects plays an imperative role in causing hyperglycemia. The two terms of DM are insulin-dependent diabetes mellitus (IDDM) and noninsulin-dependent diabetes mellitus (NIDDM). Since many persons with type 2 DM ultimately need insulin management for effective control of glycemia. Type 1 DM commonly occurs at the younger age group whereas the type 2 DM occurs at adolescents and with increasing age group.¹³⁻¹⁴

The platelets are formed from the megakaryocytes of bone marrow, which measures 2-3 µm in diameter, which usually remains alive for 5–9 days. About two third of the platelets are in the blood circulation and one third is stocked in spleen. The average platelet count is 1,50,000–4,00,000 /microL of blood. Each megakaryocyte has the capacity to produce around 5000–10000 platelets. An amount of 10¹¹ platelets can be produced per day in an average adult human; old platelets are destroyed in the spleen and liver (Kupffer cells) by a process called phagocytosis. Normally, only a minimal fraction of the platelet mass is taken in the process of hemostasis, so rest of the platelets flow in blood stream until they become senescent and are removed by phagocytic cells. A decline in platelet count induces an increase in the size, number and ploidy of megakaryocytes, leads to release of further platelets into the blood circulation. This process is synchronized by thrombopoietin (TPO) binding to its megakaryocyte receptor, a protooncogene c-mpl.^{3,7}

Among diabetic patients, 120 patients were males and 60 patients were females and mean MPV was 11.0 fL which is in correlation with rajesh et al.¹⁵⁻¹⁷ In 115 non-diabetic controls 82 patients were males and 33 patients (Table 1) were females and mean MPV was 9.5 fL. Among diabetics the mean age group was 55±5 and in non diabetics mean age group was 40±5. Among diabetic patients 30 patients(16.6%) showed clinical symptoms, in which they showed MPV higher than 11.5.

CONCLUSION:

Mean platelet volume values are higher in unrestrained diabetic patients when compared with non diabetics. And these patients with higher MPV will be more prone for complications. So, by assessing MPV values we can predict the diabetic patients whether they are prone to severity or not. MPV can be considered as a predictive marker for disease progression for diabetes.

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