## Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies

Journal home page: www.jamdsr.com

doi: 10.21276/jamdsr

ICV 2018= 82.06

(e) ISSN Online: 2321-9599;

(p) ISSN Print: 2348-6805

# **Original Research**

## **Comparison of platelet indices in diabetics and healthy subjects**

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## ABSTRACT:

**Background:** Diabetes mellitus (DM) has been recognized as a 'prothrombotic tendency' with increased platelet reactivity. The present study was conducted to assess platelet indices in diabetics and healthy subjects. **Materials & Methods:** 120 cases of diabetes mellitus of both genderswere put in group I and healthy control in group II. 5 mlvenous blood were drawn from the antecubital vein and immediately mixed in EDTA vacutainers. The platelet indices such as MPV, PDW and P-LCR was determined in both groups. **Results:** Out of 120 patients, males were 70 and females were 50. The mean MPV in group I was 12.6 fl and in group II was 9.1 fl, PDW was 14.8 fl in group I and 10.6 fl in group II and P- LCR was 34.4% in group I and 25.2% in group II. The difference was significant (P< 0.05). **Conclusion:** Platelet indices were higher in diabetics in comparison to healthy subjects.

Key words: Platelet indices, Diabetics, EDTA

Received: September 15, 2019

Accepted: October 20, 2019

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This article may be cited as: Jain A. Comparison of platelet indices in diabetics and healthy subjects. J Adv Med Dent Scie Res 2019;7(11):287-289.

## **INTRODUCTION**

Diabetes mellitus (DM) has been recognized as a 'prothrombotic tendency' with increased platelet reactivity. This enhanced reactivity has been postulated to play a role in the microvascular complications of diabetes. Among platelet indices, mean platelet volume (MPV) reflects changes in either platelet stimulation or the rate of platelet production.<sup>1</sup> Platelet distribution width (PDW) is a measure of platelet heterogeneity, which in turn may be due to aging of platelets or heterogeneous demarcation of megakaryocytes. The third platelet index, platelet-large cell ratio (P-LCR) is the measure of larger platelets.<sup>2</sup>

The association of increased MPV, PDW, P-LCR, and platelet count with diseases related to endothelial dysfunction such as metabolic syndrome, diabetes, coronary artery disease (CAD), and malignancy has been shown in many studies.<sup>3</sup> The newer hematologicalanalyzers are giving variety of platelet parameters which helps in easy detection of change in platelet structure, which may help in early detection of prothrombotic state of the platelets. These can act as an alarm for diagnosing initiation/progression of diabetic complications.<sup>4</sup>

Mean platelet volume (MPV) is an indicator of average size and activity of the platelets and is reported to be high in diabetes mellitus and is considered as a risk factor for heart disease. Similarly, platelet distribution width (PDW) is an indicator of variation in platelet size which may be a sign of active platelet release. Platelet large cell ratio (PLCR) is directly related to PDW and MPV.<sup>5</sup>The present study was conducted to assess platelet indices in diabetics and healthy subjects.

#### **MATERIALS & METHODS**

The present study consisted of 120 cases of diabetes mellitus of both genders. All were enrolled after obtaining their written consent.

Data such as name, age, etc. was recorded. Cases were put in group I and healthy control in group II. 5 mlvenous blood were drawn from the antecubital vein and immediately mixed in EDTA vacutainers. The sample was run within 2 hours of venepuncture using the five parts differentiated automated hematology analyzer Sysmex XN-1000 and the platelet indices such as MPV, PDW and P-LCR was determined. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

## **RESULTS** Table I Distribution of patients

Total- 120				
Gender	Males	Females		
Number	70	50		

Table I shows that out of 120 patients, males were 70 and females were 50.

## Table II Assessment of platelet indices

Platelet indices	Group I	Group II	P value
MPV	12.6	9.1	0.01
PDW	14.8	10.6	0.02
P- LCR	34.4	25.2	0.01

Table II, graph I shows that mean MPV in group I was 12.6 fl and in group II was 9.1fl, PDW was 14.8fl in group I and 10.6fl in group II and P- LCR was 34.4% in group I and 25.2% in group II. The difference was significant (P< 0.05).

## Graph IAssessment of platelet indices



#### DISCUSSION

Mellitus characterized Diabetes is by hyperglycemia resulting in micro and complications affecting the nerves, macrovascular kidneys, eyes, CVS etc.It is associated with varying degree of hyperglycemia accompanied with the biochemical alterations in carbohydrate, protein and metabolism.<sup>6</sup>The lipid injurious effects of hyperglycemia are characterized as macrovascular and microvascular complications. Altered platelet morphology and functions have been linked with the pathological processes and high risk of vascular disease.7 The platelet indices - (Platelet - PLT, mean platelet volume - MPV, platelet distribution width -PDW and platelet large cell ratio- PLCR) arethe determinants of platelet functionality, among which increased mean platelet volume (MPV) and platelet distribution width (PDW) were found to be attributedin the causation of thromboembolic complications.8 The present study was conducted to

assess platelet indices in diabetics and healthy subjects.

We found that out of 120 patients, males were 70 and females were 50. Jindal et al<sup>9</sup>included 75 subjects with DM (50 with one or more microvascular complications) and 50 non-selected patients from the hospital as controls. Anticoagulated blood (ethylene diamine tetracetic acid) was collected and analyzed in an automated blood cell counter for platelet count and indices [MPV, platelet distribution width (PDW) and platelet-large cell ratio].MPV, PDW and platelet-large cell ratio were all significantly higher in diabetic patients compared to the control subjects (P<0.05 for all). Among the diabetics, PDW was higher in those with complications as compared to those without. On stepwise discriminant analysis using age, duration of diabetes, platelet count and platelet indices, 78.6% of patients with diabetic complications were accurately classified. Interestingly, only two input variables (PDW and MPV) qualified for the final discriminant model.

We observed that mean MPV in group I was 12.6 fl and in group II was 9.1 fl, PDW was 14.8 fl in group I and 10.6 fl in group II and P- LCR was 34.4% in group I and 25.2% in group II. Hyperactivity of platelets have an important role in the initiation of thrombosis and atherosclerotic lesions.<sup>10</sup> Larger platelets are more active enzymatically and metabolically and have a higher thrombotic ability small sized platelets.<sup>11</sup> as compared to the Sustained hyperglycemia leads to alterations in the vessel wall leading to endothelial dysfunction and vascular lesions in diabetic complications.<sup>8</sup> Formation of advanced glycation end products, activation of protein kinase C and disturbances in polyol pathways are the possible mechanisms by which increased glucose induces vascular abnormalities.12

Insulin resistance plays a pivotal role in the development of diabetic dyslipidemia by influencing several factors. In insulin resistance and Type 2 diabetes, increased efflux of free fatty acids from adipose tissue and impaired insulin mediated skeletal muscle uptake of free fatty acids increase fatty acid influx into the liver. A cluster of interrelated plasma lipid and lipoprotein abnormalities associated with alterations in very LDL metabolism contribute to the risk for atherosclerosis and CAD in the majority of patients with type 2 diabetes.<sup>13</sup>

Kodiatte et al<sup>14</sup>determined the MPV in diabetics compared to nondiabetics, to see if there is a difference in MPV between diabetics with and without vascular complications, and to determine the correlation of MPV with fasting blood glucose, glycosylated hemoglobin (HbA1c), body-mass index, and duration of diabetes in the diabetic patients. Platelet counts and MPV were measured in 300 type 2 diabetic patients and 300 nondiabetic subjects using an automated blood cell counter. The blood glucose levels and HbA1c levels were also measured. The mean platelet counts and MPV were higher in diabetics compared to the nondiabetic subjects  $[277.46 \pm 81 \text{ X } 109/1 \text{ vs. } 269.79 \pm 78 \text{ X } 109/1 \text{ (P}=$ (0.256)],  $(8.29 \pm 0.74)$  fl versus  $(7.47 \pm 0.73)$  fl (P= 0.001), respectively. MPV showed a strong positive correlation with fasting blood glucose, postprandial glucose and HbA1C levels (P=0.001).

## CONCLUSION

Authors found that platelet indices were higher in diabetics in comparison to healthy subjects.

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